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**INVESTIGATION INTO THE DEPTH OF CURE  
OF  
RESIN-MODIFIED GLASS-IONOMER RESTORATIVE MATERIALS**

**by**

**Howard W. Roberts, DMD**

**A Dissertation submitted to the Faculty of the  
Graduate School, Marquette University,  
in Partial Fulfillment of  
the Requirements for  
the Degree of  
Master of Science**

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## ABSTRACT

This investigation involved an attempt at delineating the depth of cure of resin-modified glass-ionomer restorative dental materials. Samples of different thicknesses using Vitremer Core Material and Restorative (3M/ESPE), Fuji II LC (GC America), and Photac-Fil Quick (3M/ESPE) were evaluated as to solubility, Knoop hardness, and thermal analysis techniques that included specific heat determination as well as differential scanning calorimetry thermal scans. Specimens were evaluated at time periods that included immediately after fabrication, 24 hours, one week, one month, and at three months. Overall results found that the solubility method chosen for this investigation did not provide the necessary sensitivity for depth of cure analysis of resin-modified glass-ionomer restorative materials. Hardness and thermal analysis provided evidence of a continuing, post-photopolymerization reaction that resulted in increased hardness, specific heat, and thermal requirements over the storage times. Furthermore, the resin-modified glass-ionomer restorative materials demonstrated water storage behavior similar to conventional glass-ionomer materials, in that water gained by the materials became more bound as storage time increased. Individual instances were observed in which the physical properties of 3 mm thick specimens were similar to that observed of 2 mm specimens, however these findings were not consistent throughout the investigation. Based on the conditions of this study, it is recommended that resin-modified glass-ionomer restorative materials should not be cured in thicknesses greater than two millimeters.

## ABSTRACT

This investigation involved an attempt at delineating the depth of cure of resin-modified glass-ionomer restorative dental materials. Samples of different thicknesses using Vitremer Core Material and Restorative (3M/ESPE), Fuji II LC (GC America), and Photac-Fil Quick (3M/ESPE) were evaluated as to solubility, Knoop hardness, and thermal analysis techniques that included specific heat determination as well as differential scanning calorimetry thermal scans. Specimens were evaluated at time periods that included immediately after fabrication, 24 hours, one week, one month, and at three months. Overall results found that the solubility method chosen for this investigation did not provide the necessary sensitivity for depth of cure analysis of resin-modified glass-ionomer restorative materials. Hardness and thermal analysis provided evidence of a continuing, post-photopolymerization reaction that resulted in increased hardness, specific heat, and thermal requirements over the storage times. Furthermore, the resin-modified glass-ionomer restorative materials demonstrated water storage behavior similar to conventional glass-ionomer materials, in that water gained by the materials became more bound as storage time increased. Individual instances were observed in which the physical properties of 3 mm thick specimens were similar to that observed of 2 mm specimens, however these findings were not consistent throughout the investigation. Based on the conditions of this study, it is recommended that resin-modified glass-ionomer restorative materials should not be cured in thicknesses greater than two millimeters.

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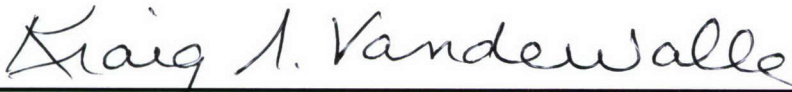
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**CHAPTER 1:**  
**INTRODUCTION AND LITERATURE REVIEW**

Glass-ionomer cements were invented and developed by Wilson and Kent in the early 1970's.<sup>1</sup> Glass ionomer cements generally consist of a mixture of various polyacrylic acids and tartaric acid that react with a fluoroaluminosilicate glass. The setting reaction occurs via an acid-base reaction between the acids and the calcium and aluminum ions that are leached from the glass component.<sup>2,3</sup> The early glass-ionomer cements have undergone incremental changes in formulations in attempts to improve their physical properties and clinical handling characteristics.<sup>3</sup> These modifications have included the use of alternative polyacids,<sup>3</sup> water-activated dehydrated polyacid powders,<sup>3,4</sup> cermets,<sup>5</sup> metal additions,<sup>6,7</sup> and smaller mean glass particle size.<sup>8</sup>

Resin-modified glass-ionomers (RMGI) are materials that consist substantially of glass-ionomer components (water-soluble polymeric acids, ion-leachable glass, and water) combined with organic, photopolymerizable monomers and an initiation system.<sup>9</sup> Although the exact composition of the RMGI materials is proprietary, the resin composition in the set material has been estimated to be approximately 4.5 to six percent.<sup>10</sup> These materials were developed to hopefully improve the mechanical properties and early moisture sensitivity observed with the conventional glass-ionomer materials.<sup>11,12</sup> The RMGI materials basically exist in two forms: One in which part of the water is replaced by water-soluble, photopolymerizable 2-hydroxyethylmethacrylate monomer (HEMA), and one in which methacrylate groups are predominately grafted onto the polyacrylic molecules.<sup>13,14</sup> Fuji II LC (GC America Corp, Alsip, IL) and Photac-Fil Quick (3M ESPE, St. Paul, MN) have been identified as members of the former, while Vitremer (3M ESPE) is considered to be a member of the latter.<sup>13-15</sup> Although HEMA is the predominate methacrylate used,<sup>16-18</sup> some formulations may use a combination of HEMA and diurethane dimethacrylate.<sup>18</sup>

Nicholson<sup>3</sup> described the setting reaction of RMGI materials as complex compared to conventional glass ionomer materials, especially in terms of the interactions of HEMA and other added constituents. Although a required constituent, HEMA lengthens both the working and

setting times of a glass ionomer material, as well as decreases the compressive strength.<sup>19,20</sup>

HEMA also affects the configuration of the polyacrylic acid component and has been theorized to induce possible phase separations: polymerized HEMA components are water insoluble and may precipitate out of solution, establishing different domains within the material.<sup>16</sup>

Paradoxically, some RMGI materials have been reported to not afford a long working time in the clinical environment, as the light-activated polymerization component of some products have been described as sensitive to ambient light exposure.<sup>21</sup> Some concern has been voiced regarding deeper regions of RMGI materials where light penetration may not be of sufficient concentration for photopolymerization.<sup>3</sup> Manufacturers have added additional chemically-activated (i.e., auto cure) methods in order to address clinical concerns.<sup>21</sup> There is some apprehension concerning the leaching of unreacted monomers, as such, RMGI materials may be the subject of future biocompatibility investigations.<sup>22</sup> Interestingly, a recent report details the formation of a HEMA-free RMGI material that may address future cytotoxicity concerns of HEMA in these materials.<sup>23</sup>

### **RMGI Setting Reaction**

The setting reaction of RMGI materials has been studied as a function of delay or omission of visible light activation,<sup>13</sup> with the chemical setting process also investigated using infrared spectroscopy.<sup>24-27</sup> Li *et al.*<sup>27</sup> investigated the setting behavior of 2-mm thick samples of RMGI materials using Fourier transform infrared (FTIR) spectroscopy and diametral tensile strength (DTS). They reported that DTS improved with time, which reflected a continuing setting reaction. FTIR analysis reported only aliphatic C=C groups were present in the RMGI liquid and resin but could not determine if the HEMA groups were free in solution or grafted on the polyacrylic acid backbone chain. In comparing the effect of delaying visible light curing on the strength of RMGI, Li *et al.* reported in the absence of light activation Vitremer obtained a higher DTS compared to Photac Fil Aplicap.<sup>27</sup> Interestingly, delay of photoinitiation had no effect on Vitremer, whereas delay of light activation significantly lowered the DTS of Photac-Fil.<sup>27</sup>

Kakaboura *et al.*<sup>28</sup> also used FTIR spectroscopic analysis using one-millimeter-thick RMGI specimens, identifying the  $1638\text{ cm}^{-1}$  methacrylate C=C stretch vs. the  $1712\text{ cm}^{-1}$  ester C=O stretch as a means for assessing the resin reaction. For monitoring the acid/base reaction, the authors compared the  $1740\text{ cm}^{-1}$  ester stretch to the  $1600\text{-}1500\text{ cm}^{-1}$  peak of carboxylate salts formed. They reported that Fuji II LC, Photac-Fil, and Vitremer did exhibit an acid/base reaction after 20 minutes of dark storage and that the acid/base reaction was significantly slowed by the light activation process.<sup>28</sup> Of the three RMGI products investigated, Photac-Fil Aplicap (a previous formulation of Photac-Fil Quick) formed the lowest acid/base reaction products while no difference was found between Fuji II LC and Vitremer. The authors suggested that this finding was due to fact that Photac Fil Aplicap contained most of the polyacrylic acid in the powder component, and required more water infiltration for full reaction. After 20 minutes of dark storage, Fuji II LC and Photac-Fil Aplicap were found to have limited methacrylate curing efficiency, whereas Vitremer exhibited a self-curing methacrylate curing reaction that did not appear to interfere with the acid/base reaction. However, the authors could not speculate on the influence of immediate light activation on the retardation of the acid/base reaction.<sup>28</sup>

de Gee *et al.*<sup>13</sup> studied the effects of delay/omission of photopolymerization on the three-body wear characteristics of Fuji II LC, Photac-Fil, and Vitremer. These researchers reported that Photac-Fil Aplicap did not seem to contain an auto-polymerization catalyst for the HEMA component, and while delayed light activation favored the development of the acid-base component, total omission of light activation resulted in a relatively weak material that could leach unpolymerized HEMA.<sup>13</sup> In contrast, Fuji II LC was found to contain an auto-curing HEMA mechanism, but in omission of light activation the poly-HEMA chains polymerized at a rate that retarded the acid/base reaction which led the authors to speculate that the HEMA network approached full formation within a few minutes of mixing. Vitremer, in whose structure is formed by a chemical integration of the polyalkenoate and poly-HEMA network, was found to have better physical properties and the researchers observed that the HEMA auto-cure polymerization reaction did not appear to interfere with the simultaneous acid/base reaction.<sup>13</sup>

Ando *et al.*<sup>29</sup> reported on the effect of delay of light curing for up to 40 minutes of a RMGI orthodontic cement (Fuji Ortho LC, GC America). These researchers found that although a trend towards reduction of bond strength was observed, there was no significant difference between tensile bond strengths of the RMGI orthodontic cement observed between 0, 5, 20, and 40 minutes delay of light exposure.<sup>29</sup>

Wan *et al.*<sup>24</sup> investigated Fuji II LC using FTIR spectroscopy and reported that although the photopolymerized reaction is responsible for the initial set, the detected acid-base reaction continued at a rate that leveled at 168 hours after mixing. They confirmed earlier reports<sup>3</sup> that HEMA retards the acid-base reaction by inducing stereochemical changes to the polyacrylic polymer, while the set HEMA resin matrix established physical barriers that slowed the process of diffusion.<sup>24</sup> Watson *et al.*<sup>30</sup> evaluated the RMGI/dentin interface during the initial setting reaction using laser-scanning confocal microscopy and reported that water movement from the dentinal tubules into the RMGI material was observed during light polymerization and further theorized that this water movement was essential for the formation of the “absorption layer” observed with RMGI materials.<sup>30</sup> Young<sup>31</sup> noted the difficulty of using FTIR spectroscopy for distinguishing RMGI setting changes due to photopolymerization and those arising from the acid-base reaction. Young observed peak loss at 1322 and 1300  $\text{cm}^{-1}$  bands due to water (1640  $\text{cm}^{-1}$  stretch band) masking the 1633  $\text{cm}^{-1}$  C=C stretch band and reported that 90 percent of the monomer was polymerized after 20 seconds of light exposure.<sup>31</sup> However, the acid-base reaction of unpolymerized sections were reported to proceed slower compared to conventional glass ionomer products.<sup>31</sup> Young *et al.*<sup>32</sup> studied the acid/base reaction of glass ionomer cements using Raman spectroscopy and confirmed the necessity of water availability for the acid/base initial reaction to proceed.

Palmer *et al.*<sup>33</sup> evaluated the HEMA released as a function of curing method for two RMGI liner and two RMGI restorative materials. Both of the restorative materials polymerized by five minutes when auto-cured in the absence of light activation, but both materials released

significantly more HEMA compared to the same products that were photopolymerized. These researchers also reported that HEMA release from both RMGI materials was similar after photopolymerization, but Vitremer restorative material released significantly less HEMA than Fuji II LC, suggesting that the Fuji II LC auto-cure mechanism is less efficient compared to Vitremer restorative.<sup>33</sup> Interestingly, Palmer *et al.* corroborated earlier research by Kanchanasita *et al.*<sup>34</sup> that Fuji II LC would benefit from a visible light photopolymerization time longer than that recommended by the manufacturer.<sup>33</sup>

### **RMGI Adhesion Studies**

Resin-modified glass-ionomer products have been demonstrated to adhere to both enamel and dentin.<sup>35-46</sup> The adhesion mechanism was first described by Wilson *et al.*<sup>48</sup> through the development of ionic crosslinks at the restorative-tooth interface via the then-described “ion exchange layer.” In the ion-exchange layer, Wilson *et al.*<sup>48</sup> postulated the formation of an ionic bond between the polyacrylic acid and the hydroxyapatite component of the mineralized tissue. This mechanism was later confirmed by Yoshida *et al.*<sup>49</sup> using X-ray Photoelectron Spectroscopy while the same investigators further detailed the interaction between the polyalkenoic acids and hydroxyapatite in a later report.<sup>50</sup> The bonding of RMGI to dentin was later found to be two-fold, being both the ionic bond between tooth hydroxyapatite and polyacrylic acids as confirmed by Yoshida *et al.*<sup>49,50</sup> but also by a micromechanical means by the formation of a hybrid layer, analogous to, but of smaller thickness of that seen with dentin bonding agent systems.<sup>51-53</sup>

Sidhu and Watson<sup>54</sup> studied the RMGI tooth/restoration interfacial characteristics using confocal fluorescence microscopy and theorized that the seemingly structure-less, identified “absorption layer” was possibly due to water movement within the RMGI material, either by water diffusion within the setting restoration material or from the dentin and pulp of a vital tooth. The absorption layer was also observed to form over time after initial setting of the RMGI matrix and was found only in deep dentin, not being present when the RMGI material was bonded to

enamel or superficial dentin.<sup>54</sup> Sidhu *et al.*<sup>55</sup> investigated the shear bond strength of RMGI materials and reported that the absorption layer appeared to have an important role in mediating the bond between RMGI and dentin. Tay *et al.*<sup>56</sup> further researched the absorption layer and confirmed that it was formed only in the presence of available moisture and was a necessary feature for the development of bond strength of the RMGI to dentin. Furthermore, silver-nitrate staining techniques identified capillary pore spaces that were theorized to provide the continuous water, arising from the hydrated dentin, required for full development of the absorption layer.<sup>56</sup>

Yiu *et al.*<sup>57</sup> investigated the interaction of RMGI materials with moist dentin using transmission electron microscopy (TEM) and scanning electron microscopy (SEM) ultrastructural methods and reported unique spherical bodies within the RMGI matrix only in areas that were close to the RMGI-dentin interface. Further analysis of these spherical bodies allowed the authors to theorize that the spherical body core was composed of a poly-HEMA matrix derived from water transmission from the moist dentin, while the periphery contained products from the slower ongoing acid-base reaction.<sup>57</sup> Pereira *et al.*<sup>47</sup> investigated RMGI restorative material bond strength to dentin as a function of dentin regional differences and simulated pulpal pressure, and reported that pulpal pressure had a strong influence on bond strength. These researchers also observed that although water is essential to the RMGI setting reaction, excess water may be detrimental to the early setting reaction.<sup>47</sup>

### **RMGI Depth of Cure Studies**

The depth of cure of RMGI materials has been reported in some studies and reviews, with various methodology and materials reported. Burke *et al.*<sup>58</sup> investigated the depth of cure of early RMGI lining agents using a scrape methodology and reported that the liners displayed greater hardness at increased depths when measured 12 hours after photopolymerization, suggesting that the RMGI products possessed an auto-cure acid/base reaction in addition to photopolymerization. Swift *et al.*<sup>59</sup> investigated the depth of cure of Fuji II LC, Photac-Fil

Aplicap, and Vitremer compared to two compomers. They photopolymerized rectangular 5 mm x 5 mm molds that were 9 mm in depth and measured the Knoop Hardness at time intervals of 10 minutes, 24 hours, and seven days after photopolymerization. For all materials tested, only the top five millimeters of the specimens had enough consistent hardness for measurement. At the end of seven days, there was no statistical difference in hardness between specimen top surfaces and five-millimeter levels. However, due to lower hardness values at increased depths, the authors recommended that it would be prudent to place and cure RMGI materials in two to three millimeter increments.<sup>59</sup> One literature review<sup>21</sup> reported depth of cure values of RMGI lining and restorative materials that ranged from 1.54 to 2.26 mm for lining materials and 2.68 to 2.97 for restorative materials. However, this review only referenced the methodology used for depth of cure determinations and does not identify the source of the data.<sup>21</sup> Accordingly, it cannot be ascertained if this reported data has been subject to scientific peer review.

The depth of cure of RMGI materials has not received the attention that has been directed to the resin composite restorations. The main cause for this lack of interest may be due to the fact that most clinicians oversimplify RMGI materials compared to conventional glass-ionomer materials and reason that the depth of cure is not as significant, assuming that the acid/base component reaction will compensate for inadequate penetration of light.<sup>3</sup> Research has established that the RMGI material setting reaction is indeed complex and earlier investigations regarding RMGI depth of cure may have been too simplistic in nature. For instance, early laboratory studies were not comprehensive in scope as per physical properties and no investigations to date have included *in vitro* models that investigate the *in vivo* pulpal pressure hydration effect on the physical properties of the deeper RMGI regions. Accordingly, it can be conjectured that water influx from pulpal pressure may have a dilution effect on these deeper regions that have not experienced photopolymerization, with a possible negative effect on material physical and mechanical properties.

**Purpose**

The purpose of this investigation was to characterize the depth of cure of resin-modified glass-ionomer restorative materials using physical property testing to include hardness, solubility, as well as thermal analysis using differential scanning calorimetry. The research hypothesis is that RMGI materials will display a depth of cure gradient that is more dependent on visible light penetration rather than what residual acid-base chemical setting reaction that may remain.

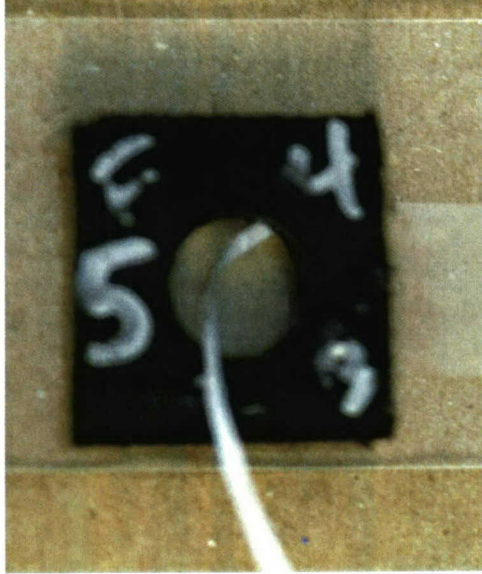
**CHAPTER TWO:  
METHODS AND MATERIALS**

The RMGI materials consisted of Fuji II LC (GC America), Vitremer (3M/ESPE), and Photac Fil Quick (3M/ESPE). All materials were prepared and mixed per manufacturers instructions in a dental materials lab fitted with special lighting that excluded the light spectrum to which photoinitiators are sensitive (F40/GO Gold, Sylvania, Danvers, MA 01923), except for specimens prepared for thermal analysis which was accomplished in a different laboratory. For precapsulated materials, mechanical mixing was accomplished with a microprocessor-controlled calibrated and programmed mixing unit (Automix, Sybron Dental Specialties, Orange CA). Materials that were not precapsulated were manually prepared per manufacturer directions, placed in a syringe delivery system (AccuDose Low Viscosity, Centrix Inc., Shelton CT), and injected into respective molds. Visible light polymerization was accomplished using a halogen-based, visible-light polymerization unit (Optilux 501, Sybron Dental Specialties, Orange CA) whose performance was assessed using a laboratory laser power meter (PowerMax 5200 with PM10 Probe, Molelectron, Portland OR) before each use. When not in use, specimens were stored in dark conditions at  $98 \pm 2$  percent humidity at  $37 \pm 2$  °C.

For the purpose of this master's thesis, physical property and thermal analysis methods were observed, depending on the method, at intervals of immediately after fabrication, 24 hours, one week, one month, and at three months. Continued observations will continue after completion of the thesis at six, nine, and twelve months after preparation for the purpose of information gathering for submission of manuscripts.

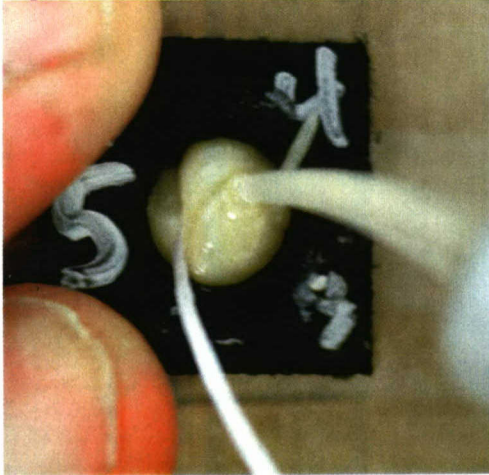
**Solubility:** Solubility testing was based on ANSI/ADA Specification No. 27: Resin-Based Filling Materials (1997),<sup>60</sup> using Delrin molds with a diameter of 8.0 mm and depths of 2, 3, 4, and 5 mm. Ten specimens (five molds experimental and five molds control) were prepared for each material and time period evaluated. Specimens of each respective depth were placed on a mylar-covered glass slide and placed on a dental vibrator. Immediately prior to placing the material, a pre-weighed, 50 mm long piece of unwaxed dental floss was positioned so that approximately 4 mm extended into the bottom of each empty mold (Figure 1).

**Figure 1. Solubility Specimen Mold Before Material Placement**

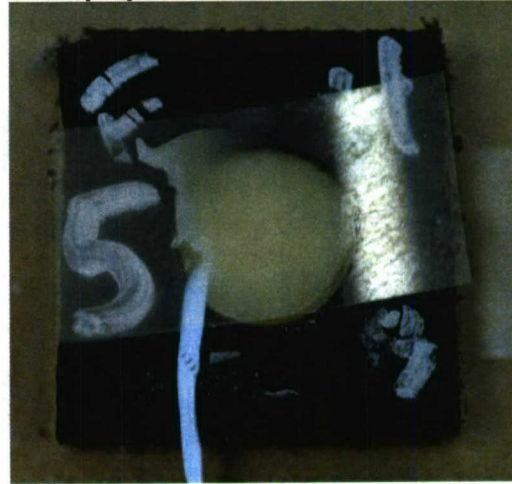


Specimens were filled the entire depth of the mold (Figure 2) and the top surface was then covered with a mylar strip and a glass slide with pressure placed in order to produce a flat surface (Figure 3). The experimental specimens were photopolymerized for the manufacturer recommended curing time from the top of the mold (Figure 4) and then stored (Figure 5). Control specimens were photopolymerized from both top and bottom of the molds for the manufacturer recommended curing time.

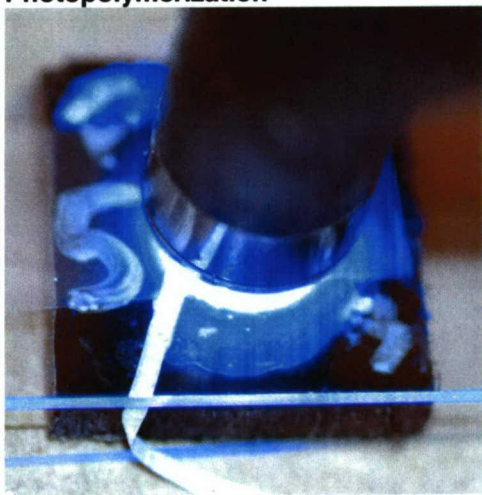
**Figure 2. Material Placement**



**Figure 3. Specimen Prior to Photopolymerization**



**Figure 4. Specimen  
Photopolymerization**



**Figure 5. Specimen Before Storage**



At the appointed time of evaluation, each specimen was removed from its respective mold and was weighed to the nearest 0.001 g, the weight of the floss subtracted, and this value designated as Wt1. Each specimen was placed into a bottle containing 100 mL of distilled water in a manner in which they were suspended from contact with the bottle and completely immersed in the water. The bottle was then sealed and stored for 24 hours at  $37 \pm 2$  °C, after which the specimens were removed from the water, rinsed with distilled water, and blot dried with absorbent paper, and then weighed. The specimens were then stored in a desiccator for 24 hours at a relative humidity of  $10 \pm 5$  percent and then weighed to the nearest 0.001 g. The specimens were weighed daily until a constant weight was reached ( $\pm 0.001$  g). The weight of the floss was subtracted from this value with the result designated as the final weight (Wt2). The solubility (S), expressed as a percentage of weight, was calculated using the formula:

$$S = \frac{Wt1 - Wt2}{Wt1} \times 100$$

Mean solubility was compared with analysis of variance (ANOVA) followed by Scheffé's post-hoc pairwise comparison test to determine if significant differences existed as per curing method and depth of cure at the 0.05 level of significance.

**Hardness:** Delrin molds were used with a diameter of 5.0 mm and depths of 2, 3, 4, and 5 mm. Five molds of each depth were prepared for each time period evaluated. Specimens of each respective depth were placed on a mylar-covered glass slide and filled the entire depth of the cylinder. The top surface was then covered with a mylar strip and a glass slide with pressure placed in order to produce a flat surface. The specimens were photopolymerized from the top orientation for the time recommended by the manufacturer and then stored in dark conditions as previously specified.

At the appointed time of evaluation Knoop Hardness numbers (KHN) were determined with a hardness tester (M-400-G2, LECO, St Joseph, MI) using a 100 g load and a dwell time of 10 s. Three replicate Knoop Hardness (KH) measurements were made at the center of the top and bottom surfaces at the appointed time period for evaluation. The three values from each specimen surface were averaged to yield a top and bottom summary value for each specimen. The summary values for each of the specimen surfaces were then averaged to yield a mean and standard deviation. Values were compared with ANOVA followed by Scheffé's post-hoc pairwise comparison test to determine if significant differences existed among the depths of cure at the 0.05 level of significance.

**Differential Scanning Calorimetry:** RMGI materials were prepared as per manufacturer's recommendations and placed either in 40  $\mu$ l differential scanning calorimetry (DSC) aluminum crucibles (Mettler Toledo GmbH, Schwerzenbach CH) for the 2 mm depth sample, or 100  $\mu$ l aluminum DSC crucibles for the 3 and 4 mm depth samples. Five mm depth samples were not prepared for the DSC evaluation due to the lack of a suitable crucible. Each respective material was polymerized with a visible light-curing unit for the manufacturer recommended time, weighed on an analytical balance (AG245, Mettler Toledo GmbH), and then stored in dark

conditions as previously specified. An unfilled reference aluminum DSC crucible of both 40- and 100  $\mu\text{l}$  was also stored with each sample group. At the appointed time of evaluation, specimens were weighed, placed into a DSC unit (DSC822<sup>o</sup>, Mettler Toledo GmbH), and were first subjected to a specific heat capacity determination thermal scan from 20 °C to 60 °C at a rate of 10 °C per minute as per the protocol of Khalil and Atkins.<sup>61</sup> Each scan was preceded and followed by a five-minute isothermal 20 °C period. Each specimen was subjected to three heat capacity determination scans with the weight of the specimen registered between each scan. The heat capacity of each scan was determined as the mean of the specific heat values calculated by the DSC software (Star<sup>o</sup>, Version 8.10, Mettler Toledo GmbH) over the temperature range. The average of the three specific heat determination scans was recorded as the mean with standard deviation for each sample, as well as the weight loss using the analytical balance. After the three specific heat capacity determination scans, the specimen was then subjected to a thermal scan of 37 °C to 240 °C<sup>61</sup> with the thermal flow characteristics of the material analyzed with thermal analysis software (Star<sup>o</sup>, Version 8.10, Mettler Toledo GmbH). Mean specific heat capacity, thermal scan findings, and weight loss was determined for each material thickness and compared with ANOVA and Scheffe' *post hoc* multiple comparison tests.

**CHAPTER THREE:**  
**RESULTS**

## Solubility

The complete solubility data can be found in Tables 64-93 in Appendix A.

**Table 1. Vitremer Mean Solubility Results (%)**

Time/Thickness	EXPERIMENTAL		CONTROL		t-test p =
	Mean	SD	Mean	SD	
<b>IMMEDIATE</b>					
2 mm	4.19	0.28	3.91	0.35	0.193
3 mm	4.70	0.47	4.27	0.40	0.160
4 mm	7.60	1.89	5.05	0.17	<b>0.017</b>
5 mm	5.46	0.24	4.76	0.28	<b>0.003</b>
<b>24 Hour</b>					
2 mm	5.58	0.53	5.69	0.28	0.682
3 mm	5.45	0.36	5.65	0.50	0.511
4 mm	5.79	0.34	5.04	0.46	<b>0.020</b>
5 mm	4.83	0.29	4.85	0.29	0.891
<b>ONE WEEK</b>					
2 mm	5.41	0.44	6.06	0.41	<b>0.041</b>
3 mm	5.47	0.61	5.52	0.41	0.874
4 mm	5.20	0.41	5.60	0.39	0.167
5 mm	5.61	0.47	6.01	0.73	0.337
<b>ONE MONTH</b>					
2 mm	7.05	0.78	6.52	0.31	0.195
3 mm	7.79	0.65	7.49	0.79	0.540
4 mm	6.32	0.33	7.23	0.89	0.060
5 mm	7.84	0.68	8.69	0.68	0.086
<b>THREE MONTH</b>					
2 mm	4.93	0.55	4.51	0.15	0.140
3 mm	5.29	0.48	5.43	0.50	0.668
4 mm	5.97	0.36	5.17	0.75	0.062
5 mm	5.75	0.52	5.90	0.84	0.743

n = 5  
p values presented in red are statistically significant p < 0.05

Mean solubility results for the Vitremer samples can be seen in Table 1. Multivariate ANOVA analysis of the Vitremer solubility results as a function of specimen cure method, thickness, and storage time identified significant differences (p < 0.0001) in solubility for all factors, with an interaction

noted between the factors storage time and thickness (p < 0.0001) for both curing methods.

Within the experimental group, solubility at the one-month storage time was significantly greater (p < 0.0001) than all of the other storage times. Considering experimental group thickness, the 4 mm samples demonstrated a trend with the most solubility, exhibiting significantly more solubility than the 2 mm samples (p = 0.001) but did not exhibit significant difference than the 3 mm or 5 mm samples.

The Vitremer control group similarly exhibited significantly more solubility at the one-month storage time ( $p < 0.0001$ ) but there were differences noted between the other thicknesses as well. The immediate Vitremer control samples demonstrated significantly less ( $p \leq 0.001$ ) solubility than the other storage times, while there were no significant differences identified between the 24-hour and one week and the one-week and one-month storage times. *Post hoc* analysis of the Vitremer control samples as a function of thickness showed that the 5 mm samples exhibited significantly more solubility ( $p < 0.0001$ ) than the 2 mm samples, with no difference in solubility noted between the 2 mm, 3 mm, and 4 mm samples ( $p = 0.190$ ) and the 3 mm, 4 mm, and 5 mm samples ( $p = 0.051$ ).

Independent t-test analysis comparing the Vitremer experimental and control samples at equal sample thickness and storage times revealed, except for four instances, that there was no overall difference in solubility between the two curing methods. The immediate 4 mm and 5 mm as well as the 24-hour 4 mm control samples were found to exhibit significantly less solubility than the experimental samples for the same thickness and storage time. Paradoxically, the one-week 2 mm control samples were found to exhibit significantly more solubility than the experimental samples of the same thickness and storage time.

**Table 2. Fuji II LC Mean Solubility Results (%)**

Time/Thickness	EXPERIMENTAL		CONTROL		t-test p =
	Mean	SD	Mean	SD	
<b>IMMEDIATE</b>					
2 mm	3.89	0.31	2.61	1.03	0.029
3 mm	3.82	1.80	1.80	0.46	<0.0001
4 mm	4.77	1.87	2.15	0.12	0.014
5 mm	4.79	0.20	2.13	0.09	<0.0001
<b>24 HOURS</b>					
2 mm	3.85	0.18	3.29	0.09	<0.0001
3 mm	3.24	0.11	3.18	0.06	0.288
4 mm	3.22	0.16	3.03	0.07	0.039
5 mm	3.20	0.10	2.91	0.06	0.001
<b>ONE WEEK</b>					
2 mm	4.90	1.65	5.12	0.20	0.767
3 mm	4.64	0.12	4.59	0.10	0.473
4 mm	4.79	0.20	4.69	0.22	0.485
5 mm	4.74	0.68	4.58	0.12	0.619
<b>ONE MONTH</b>					
2 mm	5.11	0.24	4.89	0.24	0.181
3 mm	5.17	0.13	5.01	0.11	0.076
4 mm	5.32	0.41	4.96	0.16	0.108
5 mm	5.25	0.22	4.80	0.15	0.005
<b>THREE MONTHS</b>					
2 mm	4.72	0.58	4.04	0.13	0.034
3 mm	5.56	0.86	4.11	0.37	0.008
4 mm	4.72	0.29	4.14	0.33	0.018
5 mm	4.39	0.17	3.84	0.20	0.002

n = 5  
p values presented in red are statistically significant p < 0.05

The results for the Fuji II LC solubility samples can be seen in Table 2. Multivariate ANOVA analysis of the results as a function of specimen cure method identified significant differences (p < 0.0001) in solubility both within and between the two groups. In addition, there

were differences noted between the two curing method groups when analyzed within the groups with two-way ANOVA as a function of time and thickness.

For the Fuji II LC experimental solubility group there was an identified interaction between the two factors of storage time and thickness (p = 0.044) while Scheffe *post hoc* analysis did not identify a significant difference in solubility when considering thickness (p = 0.960) for the experimental group. A significant difference (p < 0.0001) was identified within the experimental group for the factor storage time, with the one-month samples indicated with significantly more solubility (p < 0.002) than the immediate and 24-hour samples. However, the one-month samples exhibited statistically similar solubility with the one-week and three-month samples (p = 0.334).

The Fuji II LC control solubility group was identified as having significant differences within the group for both sample thickness and storage time ( $p < 0.001$ ) with no interaction between the factors of thickness and storage time ( $p = 0.079$ ). The Fuji II LC 2 mm samples were found to exhibit significantly more solubility than 3 mm and 5 mm ( $p < 0.039$ ) but were statistically similar to the 4 mm samples ( $p = 0.157$ ). *Post hoc* analysis for the Fuji II LC control samples as a function of storage time indicated that the one-month samples exhibited significantly more solubility ( $p < 0.0001$ ) than the other storage times except for the one-week samples ( $p = 0.556$ ).

Independent t-test analysis comparing the Fuji II LC experimental and control samples at equal sample thickness and storage times revealed that over half of the control samples exhibited significantly less solubility than the experimental samples. This was most frequently noted with the immediate, 24-hour, and three-month groups. There were no significant differences in solubility noted between paired samples within the one-week group, and the majority of the one-month group.

The results of the Photac-Fil Quick solubility can be seen in Table 3. Multivariate ANOVA analysis of the results as a function of specimen cure method identified significant differences ( $p < 0.0001$ ) in solubility both within and between the two groups. Additionally, there were differences noted between the two groups when analyzed within each group using two-way ANOVA analysis as a function of time and thickness.

Similar to the Fuji II LC samples, the Photac-Fil Quick experimental solubility group exhibited an interaction between the two factors of specimen thickness and storage time ( $p < 0.0001$ ) but a significant difference was not found in solubility between the different sample thicknesses ( $p = 0.690$ ). A significant difference in solubility was noted when analyzed per storage time ( $p < 0.0001$ ) with the one-month experimental samples demonstrating significantly more solubility

**Table 3. Photac-Fil Quick Mean Solubility Results (%)**

Time/Thickness	EXPERIMENTAL		CONTROL		t-test p =
	Mean	SD	Mean	SD	
<b>IMMEDIATE</b>					
2 mm	3.89	1.10	4.00	0.51	0.842
3 mm	4.96	1.38	3.60	0.33	0.0642
4 mm	5.52	0.83	3.65	0.16	0.001
5 mm	5.64	0.70	3.29	0.17	<0.0001
<b>24 Hour</b>					
2 mm	7.96	0.43	6.01	0.33	<0.0001
3 mm	6.58	0.72	5.45	0.55	0.024
4 mm	6.00	0.46	5.28	0.19	0.012
5 mm	5.75	0.37	5.25	0.85	0.257
<b>ONE WEEK</b>					
2 mm	6.07	1.07	5.89	0.44	0.719
3 mm	6.80	0.20	5.53	0.58	0.002
4 mm	6.15	0.35	5.91	0.37	0.328
5 mm	6.31	0.20	5.71	0.41	0.019
<b>ONE MONTH</b>					
2 mm	7.17	0.50	6.24	0.41	0.013
3 mm	6.30	0.34	5.69	0.14	0.006
4 mm	6.78	0.22	5.62	0.14	<0.0001
5 mm	6.31	0.52	5.46	0.13	<0.0001
<b>THREE MONTH</b>					
2 mm	5.44	0.27	5.26	0.25	0.332
3 mm	5.21	0.28	4.86	0.37	0.129
4 mm	5.56	0.41	5.12	0.21	0.066
5 mm	5.46	0.13	5.09	0.46	0.204

n = 5  
p values presented in red are statistically significant p < 0.05

than the immediate and three-month samples (p < 0.0001) but statistically similar to the 24-hour and one-week samples (p = 0.660). The Photac-Fil Quick control group was identified as

having significant differences within the group for both sample thickness and storage time (p < 0.001) but without an identified interaction between the factors of thickness and storage time (p = 0.523). The Photac-Fil Quick 2 mm control samples were found to curiously exhibit significantly more solubility than the other thicknesses (p < 0.018) with no significant difference noted between the other thicknesses (p = 0.590). *Post hoc* analysis of the Photac-Fil Quick control samples as a function of storage time indicated that the 24-hour, one-week, and one-month samples were statistically similar (p = 0.359) and exhibited significantly more solubility than the immediate samples (p < 0.0001) and the three-month samples (p = 0.034).

Independent t-test analysis of the Photac-Fil Quick experimental and control samples at equal sample thickness and storage times revealed that over half of the control samples exhibited significantly less solubility than the experimental samples. This was most frequently noted with the 24-hour and one-month groups. There were no significant differences in solubility noted between paired samples between the samples at three months, with mixed results with the immediate and one-week groups.

### Hardness

The complete data concerning hardness testing may be observed in Tables 94 – 105 in Appendix B.

The mean KHN value results for Vitremer can be observed in Table 4. The data was analyzed

**Table 4. Vitremer Mean Hardness Results (KHN)**

	24 Hours	1 Week	1 Month	3 Months
2mm Top	24.5	22.4	27.1	27.1
sd	0.4	0.3	0.4	0.5
2mm Bottom	23.1	19.9	24.4	24.9
sd	0.3	0.2	0.4	0.6
3mm Top	24.9	22.4	26.7	23.3
sd	0.3	0.3	0.3	0.5
3mm Bottom	22.7	18.0	23.9	20.0
sd	0.4	0.1	0.6	0.5
4mm Top	23.9	22.1	27.7	21.7
sd	0.4	0.2	0.4	0.4
4mm Bottom	20.5	17.3	21.4	16.6
sd	0.7	0.2	0.2	0.2
5mm Top	24.1	22.8	27.8	24.5
sd	0.6	0.2	0.5	0.4
5mm Bottom	17.1	15.4	18.5	16.8
sd	0.6	0.2	0.2	0.5

n = 5

for possible differences in hardness of different layers as a function of thickness and if any possible changes over the stated storage periods. In the comparison of top surface hardness, ANOVA did not identify a significant difference ( $p = 0.47$ ) in the top surface hardness values at the 24-hour storage time, but identified differences at one week ( $p = .0054$ ), one-month ( $p =$

$0.0064$ ), and three months ( $p = 0.01$ ). At the one-month storage time, the only significant differences were noted between the 3 mm and 5 mm top surfaces ( $p = 0.045$ ), while for the three-month aged specimens Scheffe multiple comparison test identified a difference only between the 2 mm and 4 mm top surfaces ( $p = 0.0107$ ).

For the Vitremer top surface hardness compared over the three-month storage times, ANOVA identified a significant difference ( $p < 0.0001$ ) within the 2 mm samples ( $p < 0.0001$ ), the 3 mm samples ( $p = 0.0002$ ), the 4 mm samples ( $p = 0.0004$ ), and the 5 mm samples ( $p < 0.0001$ ).

Comparisons	Thickness			
	2 mm	3 mm	4 mm	5 mm
	p value			
24-Hour vs. 1 Week	<b>0.0098</b>	<b>0.0179</b>	0.3286	<b>0.0469</b>
24-Hour vs. 1 Month	0.2829	0.2569	0.067	<b>&lt; 0.0001</b>
24-Hour vs. 3 Months	0.1663	0.5458	0.2663	0.8408
1 Week vs. 1 Month	<b>0.0002</b>	<b>0.0003</b>	<b>0.0018</b>	<b>&lt; 0.0001</b>
1 Week vs. 3 Months	<b>0.0001</b>	0.2288	0.9989	<b>0.0086</b>
1 Month vs. 3 Months	0.9873	<b>0.0208</b>	<b>0.0014</b>	<b>&lt; 0.0001</b>
n = 5 Results shaded red are considered significant at a 95% confidence interval				

Comparisons	Thickness			
	2 mm	3 mm	4 mm	5 mm
	p value			
24-Hour vs. 1 Week	<b>&lt; 0.0001</b>	<b>&lt; 0.0001</b>	<b>0.016</b>	0.258
24-Hour vs. 1 Month	0.867	0.425	0.834	0.745
24-Hour vs. 3 Months	0.108	0.068	<b>0.024</b>	0.834
1 Week vs. 1 Month	<b>&lt; 0.0001</b>	<b>&lt; 0.0001</b>	<b>0.003</b>	<b>0.042</b>
1 Week vs. 3 Months	<b>&lt; 0.0001</b>	<b>0.007</b>	0.997	0.713
1 Month vs. 3 Months	0.375	<b>0.003</b>	<b>0.004</b>	0.282
n = 5 Results shaded red are considered significant at a 95% confidence interval				

The results of the *post hoc* multi comparison tests can be seen in Table 5. Concerning the analysis of the Vitremer bottom KHN over the storage times, one-way ANOVA identified a significant difference within the 2 mm ( $p < 0.0001$ ), 3 mm ( $p < 0.0001$ ),

4 mm ( $p < 0.0001$ ) and 5 mm ( $p = 0.033$ ) sample groups. The results of the *post hoc* multi comparison tests can be seen in Table 6.

The mean bottom/top KHN ratios of the Vitremer samples by thickness and time can be seen in Table 7. For each thickness analyzed over the storage time, ANOVA did not identify a difference within the 2 mm, 4 mm, or 5 mm groups over the storage time. However, a difference ( $p < 0.0001$ ) was identified within the 3 mm samples with the one week samples

**Table 7. Vitremer Mean Bottom/Top KHN Ratios (%)**

	24 Hours	1 Week	1 Month	3 Months
<b>2mm</b>	93.0	88.7	89.8	93.4
sd	1.1	1.3	1.1	6.5
<b>3mm</b>	90.5	79.8	89.6	86.4
sd	1.7	1.4	2.4	3.5
<b>4mm</b>	84.7	77.7	77.2	80.1
sd	5.9	1.8	1.8	9.8
<b>5mm</b>	71.5	67.6	66.3	67.0
sd	9.9	1.2	1.3	5.6

n = 5

identified as having a significantly lower mean bottom/top ratio than the other storage time periods ( $p < 0.0001$ ). When the bottom/top ratio of the entire Vitremer group was

compared with two-way ANOVA, a significant difference ( $p < 0.0001$ ) was identified within the group with no interaction found between time and thickness ( $p = 0.258$ ). Scheffe *post hoc* analysis identified that all thicknesses exhibited a significantly different mean bottom/top KHN ratio ( $p < 0.0001$ ) from each other. When the KHN bottom/top ratio was analyzed as a function of time, Scheffe identified a significant difference between the 24-hour groups and one-week ( $p = 0.001$ ) with no significant difference noted between any of the other storage times.

**Table 8. Fuji II LC Mean Hardness Results (KHN)**

	24 Hours	1 Week	1 Month	3 Months
<b>2mm Top</b>	20.8	20.7	20.0	20.6
sd	0.3	0.3	0.5	1.0
<b>2mm Bottom</b>	18.4	18.8	18.2	18.6
sd	0.3	0.5	0.3	0.5
<b>3mm Top</b>	20.4	20.6	20.1	20.6
sd	0.3	0.3	0.6	0.1
<b>3mm Bottom</b>	15.2	18.2	16.7	19.4
sd	0.2	0.3	0.2	0.1
<b>4mm Top</b>	20.2	21.3	19.6	21.3
sd	0.1	0.4	0.4	0.3
<b>4mm Bottom</b>	11.6	15.4	11.8	13.1
sd	0.3	0.6	0.5	0.5
<b>5mm Top</b>	20.2	21.3	20.1	21.0
sd	0.3	0.2	0.4	0.2
<b>5mm Bottom</b>	9.7	12.8	10.9	10.6
sd	0.4	0.5	0.4	0.4

n = 5

The results of the Fuji II LC hardness testing can be seen in Table 8. For the Fuji II LC samples, ANOVA did not identify a significant difference for the top surfaces at the 24-hour storage ( $p = 0.05$ ), one-week ( $p = 0.47$ ), one-month ( $p = 0.51$ ), or the three-month ( $p = 0.24$ ) storage times.

Analysis of the Fuji II LC top surfaces over the storage times did not identify a significant change in the top surface hardness with the 2 mm samples ( $p = 0.1320$ ), 3 mm samples ( $p = 0.3659$ ), nor the 5 mm samples ( $p = 0.0671$ ). ANOVA identified a significant change within the 4 mm samples ( $p = 0.001$ ) with Scheffe finding a difference between the one-week and one-month samples ( $p = 0.0009$ ) and the one-month and three-month samples ( $p = 0.0004$ ). For the Fuji II LC bottom surfaces over the different storage times, ANOVA did not identify a difference within the 2 mm samples ( $p = 0.372$ ), but identified differences with bottom surface hardness with the 3 mm ( $p < 0.0001$ ), 4 mm ( $p < 0.0001$ ), and 5 mm ( $p < 0.0001$ ) samples. The results of the *post hoc* analysis can be seen in Table 9.

Comparisons	Thickness			
	2 mm	3 mm	4 mm	5 mm
	p value			
24-Hour vs. 1 Week	0.793	< 0.0001	0.001	< 0.0001
24-Hour vs. 1 Month	0.919	0.001	0.629	0.254
24-Hour vs. 3 Months	0.948	< 0.0001	0.109	0.136
1 Week vs. 1 Month	0.425	0.001	0.010	0.002
1 Week vs. 3 Months	0.981	0.025	0.109	0.004
1 Month vs. 3 Months	0.648	< 0.0001	0.629	0.981

n = 5  
Results shaded red are considered significant at a 95% confidence interval

The Fuji II LC bottom/top KHN ratio results can be observed in Table 10. When analyzed per thickness as a function of storage time, ANOVA did not

	24 Hours	1 Week	1 Month	3 Months
<b>2mm</b>	88.4	92.7	91.1	91.3
sd	1.9	9.3	2.7	4.2
<b>3mm</b>	74.7	88.5	82.8	94.0
sd	1.4	2.3	3.8	1.8
<b>4mm</b>	55.8	72.1	62.5	62.2
sd	6.1	2.0	5.8	6.2
<b>5mm</b>	47.6	60.1	52.9	51.4
sd	1.5	3.9	5.7	3.8

n = 5

identify a significant different in change of the KHN ratio for the 2 mm samples ( $p = 0.641$ ). ANOVA did identify significant changes in the 3 mm ( $p < 0.0001$ ), 4 mm

( $p = 0.002$ ), and 5 mm ( $p = 0.001$ ) groups. The results of the *post hoc* multi comparison test can be seen in Table 11.

Comparisons	Thickness			
	2 mm	3 mm	4 mm	5 mm
	p value			
24-Hour vs. 1 Week	0.658	< 0.0001	0.002	0.002
24-Hour vs. 1 Month	0.885	0.001	0.298	0.274
24-Hour vs. 3 Months	0.857	< 0.0001	0.348	0.541
1 Week vs. 1 Month	0.972	0.019	0.082	0.077
1 Week vs. 3 Months	0.982	0.027	0.067	0.028
1 Month vs. 3 Months	0.99	< 0.0001	0.99	0.954

n = 5  
Results shaded red are considered significant at a 95% confidence interval

	24 Hours	1 Week	1 Month	3 Months
<b>2mm Top</b>	11.5	13.7	17.5	17.0
sd	0.4	0.3	0.5	0.5
<b>2mm Bottom</b>	9.4	12.0	16.3	15.4
sd	0.2	0.2	0.1	0.4
<b>3mm Top</b>	11.6	13.6	18.1	16.8
sd	0.4	0.2	0.6	0.2
<b>3mm Bottom</b>	9.2	11.3	15.6	13.5
sd	0.1	0.3	0.2	0.5
<b>4mm Top</b>	12.0	12.8	18.2	16.9
sd	0.2	0.3	0.2	0.1
<b>4mm Bottom</b>	8.4	10.5	14.5	11.2
sd	0.5	0.2	0.4	0.1
<b>5mm Top</b>	11.6	12.7	17.9	17.3
sd	0.3	0.2	0.6	0.4
<b>5mm Bottom</b>	8.7	10.2	11.2	10.7
sd	0.4	0.1	0.2	0.2

n = 5

The results of the Photac-Fil Quick Knoop hardness testing can be seen in Table 12. For the analysis of the top surface KHN of the Photac-Fil Quick samples over the different storage times, no difference was noted between the top surface hardness at the 24-hour storage ( $p = 0.73$ ), one-month ( $p = 0.50$ ), nor three-month ( $p = 0.05$ ) storage times. However, a significant difference in top surface hardness was noted

( $p = 0.008$ ) within the one-week group, with a significant difference found between the 2 mm and 5 mm top surfaces ( $p = 0.0213$ ). Regarding the changes of top surface hardness as a function of time, ANOVA identified significant differences for all of the thicknesses: 2 mm ( $p <$

0.0001), 3 mm ( $p = 0.0014$ ), 4 mm ( $p = 0.0004$ ), and 5 mm ( $p < 0.0001$ ). Results of the Scheffe *post hoc* tests can be seen in Table 13.

Comparisons	Thickness			
	2 mm	3 mm	4 mm	5 mm
	p value			
24-Hour vs. 1 Week	< 0.0001	0.5369	0.3286	0.0469
24-Hour vs. 1 Month	< 0.0001	0.0317	0.067	< 0.0001
24-Hour vs. 3 Months	< 0.0001	0.9894	0.2663	0.8408
1 Week vs. 1 Month	< 0.0001	0.0019	0.0018	< 0.0001
1 Week vs. 3 Months	< 0.0001	0.3654	0.9989	0.0086
1 Month vs. 3 Months	0.2031	0.0586	0.0014	< 0.0001
n = 5 Results shaded red are considered significant at a 95% confidence interval				

Comparisons	Thickness			
	2 mm	3 mm	4 mm	5 mm
	p value			
24-Hour vs. 1 Week	< 0.0001	< 0.0001	0.001	0.366
24-Hour vs. 1 Month	< 0.0001	< 0.0001	< 0.0001	0.028
24-Hour vs. 3 Months	< 0.0001	< 0.0001	< 0.0001	0.032
1 Week vs. 1 Month	< 0.0001	< 0.0001	< 0.0001	0.491
1 Week vs. 3 Months	< 0.0001	< 0.0001	0.629	0.524
1 Month vs. 3 Months	0.337	< 0.0001	< 0.0001	0.99
n = 5 Results shaded red are considered significant at a 95% confidence interval				

With analysis of the Photac-Fil Quick bottom surface hardness over the storage times, ANOVA also identified a significant change in KHN with all thicknesses: 2 mm ( $p < 0.0001$ ), 3 mm ( $p < 0.0001$ ), 4 mm ( $p < 0.0001$ ), and 5 mm ( $p = 0.01$ ).

Results of the Scheffe *post hoc* multi comparison test for each of these groups can be seen in Table 14.

The mean bottom/top KHN ratio for the Photac-Fil Quick groups over the storage time can be seen in Table 15. ANOVA analysis of each thickness over the different storage times identified a significant difference within the 2 mm ( $p = 0.02$ ), 3 mm ( $p = 0.055$ ), 4 mm ( $p < 0.0001$ ), and 5

mm samples ( $p = 0.003$ ). When the change in bottom/top KHN ratios were analyzed by two-way ANOVA as a function of specimen thickness and storage time, a significant difference was identified ( $p < 0.0001$ ) with a significant interaction also identified between the effects of time

**Table 15. Photac-Fil Quick Mean Bottom/Top KHN Ratios (%)**

	24 Hours	1 Week	1 Month	3 Months
<b>2mm</b>	82.8	87.9	92.1	91.6
<b>sd</b>	5.9	4.7	4.3	2.9
<b>3mm</b>	78.8	83.6	86.8	80.9
<b>sd</b>	5.5	4.7	4.2	2.5
<b>4mm</b>	70.8	81.3	80.6	65.6
<b>sd</b>	2.6	2.9	4.6	4.0
<b>5mm</b>	75.4	77.8	61.7	62.7
<b>sd</b>	10.5	6.3	4.1	6.0

n = 5

and thickness ( $p < 0.0001$ ). Results of the Scheffe *post hoc* analysis can be seen in Table 16.

**Table 16. Scheffe Multi Comparisons For Photac-Fil Quick Mean Bottom/Top KHN Ratios**

Comparisons	Thickness			
	2 mm	3 mm	4 mm	5 mm
	p value			
24-Hour vs. 1 Week	0.402	0.415	<b>0.003</b>	0.961
24-Hour vs. 1 Month	<b>0.042</b>	0.075	<b>0.006</b>	0.056
24-Hour vs. 3 Months	0.058	0.901	0.201	0.083
1 Week vs. 1 Month	0.569	0.728	0.992	<b>0.021</b>
1 Week vs. 3 Months	0.663	0.810	<b>&lt; 0.0001</b>	<b>0.032</b>
1 Month vs. 3 Months	0.999	0.249	<b>&lt; 0.0001</b>	0.997

n = 5

Results shaded red are considered significant at a 95% confidence interval

## Differential Scanning Calorimetry

**Table 17. Vitremer Mean Specific Heat Results (J/g°C)**

Time Period	2mm	3mm	4mm
Immediate	1.21 (0.06)	1.06 (0.03)	0.96 (0.04)
24 Hours	1.22 (0.09)	1.05 (0.05)	0.92 (0.09)
1 Week	1.28 (0.02)	1.10 (0.04)	0.98 (0.03)
1 Month	1.26 (0.02)	1.12 (0.02)	1.04 (0.05)
3 Months	1.36 (0.08)	1.23 (0.11)	1.15 (0.04)

n = 5

## Specific Heat

**Determination:** Data

concerning the specific heat determinations can be found in Tables 106 – 108,

Appendix C. The mean specific heat determination results for Vitremer as per thickness and time period can be seen in Table 17. For all storage time periods, the 2-mm thickness samples exhibited higher specific heat than the 3- or 4-mm thick samples. Two-way ANOVA analysis of the Vitremer specific heat results as a function of thickness over storage time identified

<b>Table 18. Scheffe Multi Comparisons For Vitremer Specific Heat per Thickness Over Storage Time</b>			
Comparisons	Thickness		
	2 mm	3 mm	4 mm
	p value		
Immediate vs. 24-Hours	0.99	0.998	0.911
Immediate vs. 1 Week	0.508	0.941	0.973
Immediate vs. 1 Month	0.870	0.673	0.328
Immediate vs. 3 Months	<b>0.025</b>	<b>0.008</b>	<b>0.001</b>
24 Hours vs. 1 Week	0.621	0.822	0.598
24 Hours vs. 1 Month	0.935	0.483	0.078
24 Hours vs. 3 Months	<b>0.038</b>	<b>0.004</b>	<b>&lt; 0.0001</b>
1 Week vs. 1 Month	0.967	0.977	0.656
1 Week vs. 3 Months	0.481	<b>0.046</b>	<b>0.003</b>
1 Month vs. 3 Months	0.180	0.147	0.108

n = 5  
Results shaded red are considered significant at a 95% confidence interval

significant differences in both thickness and time ( $p < 0.0001$ ) without a significant interaction ( $p = 0.690$ ). Accordingly, Scheffe analysis found that over the storage times there were significant differences between in Vitremer specific heat values between all thicknesses ( $p <$

$0.0001$ ) with significant differences in specific heat noted between the three-month and all of the other times ( $p < 0.0001$ ). Results of the Scheffe *post hoc* testing for the Vitremer groups can be seen in Table 18. One-way ANOVA of the sample specific heat per thickness over the different storage times identified a significant increase within the 2 mm ( $p = 0.009$ ), 3 mm ( $p = 0.001$ ), and 4 mm ( $p < 0.0001$ ) samples.

<b>Table 19. Fuji II LC Mean Specific Heat Results (J/g°C)</b>			
Time Period	2mm	3mm	4mm
Immediate	1.04 (0.02)	0.93 (0.03)	0.83 (0.03)
24 Hours	1.21 (0.01)	0.97 (0.02)	0.91 (0.02)
1 Week	1.17 (0.02)	1.07 (0.05)	1.02 (0.04)
1 Month	1.16 (0.08)	0.97 (0.03)	0.96 (0.03)
3 Months	1.05 (0.17)	0.99 (0.03)	0.97 (0.05)

n = 5

The mean specific heat determination results for Fuji II LC as per thickness and storage time can be seen in Table 19. Two-way ANOVA

analysis of the Fuji II LC specific heat results as a function of thickness and storage time identified significant differences with both time and thickness ( $p < 0.0001$ ) and identified a significant interaction between the two factors ( $p = 0.003$ ). The results of the Scheffe multi comparison test concerning sample storage time can be seen in Table X. One-way ANOVA of the different thicknesses over the different storage times identified a significant change within the 2 mm ( $p = 0.013$ ), 3 mm ( $p < 0.0001$ ), and 4 mm samples ( $p < 0.0001$ ). Results of the Scheffe *post hoc* analysis for each of the thicknesses can be seen in Table 20.

<b>Table 20. Scheffe Multi Comparisons For Fuji II LC Specific Heat per Thickness Over Storage Time</b>			
Comparisons	Thickness		
	2 mm	3 mm	4 mm
	p value		
Immediate vs. 24-Hours	<b>0.032</b>	0.367	<b>0.020</b>
Immediate vs. 1 Week	0.132	<b>&lt; 0.0001</b>	<b>&lt; 0.0001</b>
Immediate vs. 1 Month	0.184	0.562	<b>&lt; 0.0001</b>
Immediate vs. 3 Months	0.999	0.137	<b>&lt; 0.0001</b>
24 Hours vs. 1 Week	0.953	<b>0.006</b>	<b>0.006</b>
24 Hours vs. 1 Month	0.896	0.997	0.424
24 Hours vs. 3 Months	0.052	0.976	0.305
1 Week vs. 1 Month	0.999	<b>0.003</b>	0.239
1 Week vs. 3 Months	0.196	<b>0.023</b>	0.342
1 Month vs. 3 Months	0.265	0.884	0.999

n = 5  
Results shaded red are considered significant at a 95% confidence interval

**Table 21. Photac-Fil Quick Mean Specific Heat Results (J/g°C)**

Time Period	2mm	3mm	4mm
Immediate	1.08 (0.03)	0.93 (0.05)	0.83 (0.02)
24 Hours	1.19 (0.04)	1.11 (0.03)	0.89 (0.06)
1 Week	1.05 (0.12)	0.93 (0.03)	0.95 (0.03)
1 Month	1.08 (0.11)	1.00 (0.04)	0.92 (0.06)
3 Months	1.16 (0.05)	1.02 (0.01)	0.97 (0.03)

n = 5

The mean specific heat determination results for Photac-Fil Quick can be seen in Table 21. Two-way ANOVA analysis of the specific heat changes as a

function of both time and thickness identified significant specific heat changes with the Photac-Fil Quick samples for both time and thickness ( $p < 0.0001$ ) with a significant interaction between the two factors ( $p = 0.002$ ). The results of the Scheffe *post hoc* analysis can be seen in Table 22. One-way ANOVA did not identify a significant specific heat difference with the 2 mm samples over the storage time ( $p = 0.65$ ), but identified a significant difference with the 3 mm ( $p < 0.0001$ ) and 4 mm samples ( $p = 0.001$ ).

Comparisons	Thickness		
	2 mm	3 mm	4 mm
	p value		
Immediate vs. 24-Hours	0.355	< 0.0001	0.410
Immediate vs. 1 Week	0.994	0.999	0.011
Immediate vs. 1 Month	0.999	0.091	0.084
Immediate vs. 3 Months	0.634	0.009	0.003
24 Hours vs. 1 Week	0.182	< 0.0001	0.377
24 Hours vs. 1 Month	0.372	0.002	0.888
24 Hours vs. 3 Months	0.989	0.025	0.136
1 Week vs. 1 Month	0.992	0.141	0.888
1 Week vs. 3 Months	0.391	0.015	0.972
1 Month vs. 3 Months	0.655	0.825	0.554
n = 5 Results shaded red are considered significant at a 95% confidence interval			

#### **Differential Scanning Calorimetry Thermal Scan:**

The complete data detailing the differential scanning calorimetry thermal results and peak temperatures can be found in Appendix D, Tables 109 – 111.

The mean results for the Vitremer thermal scan for each thickness and storage time period can be seen in Table 23. The enthalpy results are listed as negative because it was an endothermic phenomenon.

**Table 23. Vitremer Thermal Scan Mean Results (J/g)**

Time Period	2mm	sd	3mm	sd	4mm	sd
Immediate	-2.97	0.75	-40.78	6.62	-47.26	8.52
24 Hours	-27.39	8.27	-47.95	4.12	-54.99	5.62
1 Week	-43.33	6.51	-64.18	6.42	-67.69	8.51
1 Month	-49.72	4.26	-88.69	10.39	-103.45	16.39
3 Months	-90.03	13.82	-103.56	20.73	-104.17	35.08

n = 5

**Table 24. Scheffe Multi Comparisons For Vitremer Differential Scanning Calorimetry Thermal Results**

Comparisons	Thickness		
	2 mm	3 mm	4 mm
	p value		
Immediate vs. 24-Hours	0.003	0.935	0.985
Immediate vs. 1 Week	< 0.0001	0.114	0.652
Immediate vs. 1 Month	< 0.0001	< 0.0001	0.008
Immediate vs. 3 Months	< 0.0001	< 0.0001	0.007
24 Hours vs. 1 Week	0.077	0.417	0.912
24 Hours vs. 1 Month	0.007	0.002	0.025
24 Hours vs. 3 Months	< 0.0001	< 0.0001	0.023
1 Week vs. 1 Month	0.808	0.089	0.149
1 Week vs. 3 Months	< 0.0001	0.002	0.136
1 Month vs. 3 Months	< 0.0001	0.502	0.999

n = 5

Results shaded red are considered significant at a 95% confidence interval

Two-way ANOVA analysis of the Vitremer enthalpy results as a factor of both thickness and storage time identified significant changes concerning both thickness ( $p < 0.0001$ ) and time ( $p < 0.0001$ ) but did not identify any significant interactions between the two factors ( $p = 0.144$ ).

The Scheffe *post hoc* analysis can be seen in

Table 24. Using one-way ANOVA to analyze thermal changes of each thickness as a function of time, a significant difference was identified within the 2 mm ( $p < 0.0001$ ), 3 mm ( $p < 0.0001$ ), and 4 mm ( $p < 0.0001$ ) samples as the respective samples aged.

The results of the mean peak temperature associated with the endothermic peak of the thermal scan for the Vitremer samples can be seen in Table 25. Two-way ANOVA analysis of the data for both thickness and storage time identified significantly different peak temperatures for both sample thickness and storage time ( $p < 0.0001$ ) and indicated significant interactions between the two factors ( $p < 0.0001$ ).

**Table 25. Vitremer Thermal Scan Mean Peak Temperature Results ( °C)**

Time Period	2mm	sd	3mm	sd	4mm	sd
Immediate	182.94	4.80	157.83	1.99	150.72	9.17
24 Hours	108.02	2.91	130.81	8.85	133.52	2.53
1 Week	110.68	3.25	134.56	5.79	133.71	2.84
1 Month	114.63	2.65	132.05	0.96	131.49	1.21
3 Months	121.54	3.19	129.78	1.68	130.69	4.52

n = 5

One-way ANOVA of the data identified significant differences for the individual thicknesses over storage time revealed significant mean peak temperature differences between the 2 mm and 3 mm ( $p = 0.012$ ) as well as between the 2 mm and 4 mm specimens ( $p = 0.006$ ) but not between the 3 mm and 4mm specimens ( $p = 0.924$ ). Results of the Scheffe multicomparison tests can be seen in Tables 26 and 27.

**Table 26. Scheffe Multi Comparisons For Vitremer Differential Scanning Calorimetry Thermal Peak Results**

Comparisons	Thickness		
	2 mm	3 mm	4 mm
	p value		
Immediate vs. 24-Hours	< 0.0001	0.935	0.002
Immediate vs. 1 Week	< 0.0001	0.114	0.002
Immediate vs. 1 Month	< 0.0001	< 0.0001	0.001
Immediate vs. 3 Months	< 0.0001	< 0.0001	< 0.0001
24 Hours vs. 1 Week	0.824	0.879	0.999
24 Hours vs. 1 Month	0.093	0.998	0.986
24 Hours vs. 3 Months	< 0.0001	0.999	0.953
1 Week vs. 1 Month	0.525	0.969	0.980
1 Week vs. 3 Months	0.002	0.752	0.941
1 Month vs. 3 Months	0.074	0.979	0.999

n = 5

Results shaded red are considered significant at a 95% confidence interval

Comparisons	Storage Time				
	Immediate	24 Hour	One Week	One Month	Three Months
	p value				
2 mm vs. 3 mm	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.012
2 mm vs. 4 mm	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.006
3 mm vs. 4 mm	0.238	0.790	0.958	0.890	0.924

n = 5  
Results shaded red are considered significant at a 95% confidence interval

The mean enthalpy results for the Fuji II LC samples can be observed in Table 28.

Time Period	2mm	sd	3mm	sd	4mm	sd
Immediate	-15.37	12.64	-33.53	3.88	-34.48	2.46
24 Hours	-36.87	4.77	-34.65	5.90	-38.81	3.43
1 Week	-52.41	3.35	-80.03	1.46	-72.90	1.96
1 Month	-46.12	10.50	-76.58	5.54	-78.28	4.83
3 Months	-47.66	7.24	-74.94	2.71	-81.54	5.63

n = 5

Comparisons	Thickness		
	2 mm	3 mm	4 mm
	p value		
Immediate vs. 24-Hours	0.014	0.998	0.658
Immediate vs. 1 Week	< 0.0001	< 0.0001	< 0.0001
Immediate vs. 1 Month	< 0.0001	< 0.0001	< 0.0001
Immediate vs. 3 Months	< 0.0001	< 0.0001	< 0.0001
24 Hours vs. 1 Week	0.116	< 0.0001	< 0.0001
24 Hours vs. 1 Month	0.570	< 0.0001	< 0.0001
24 Hours vs. 3 Months	0.421	< 0.0001	< 0.0001
1 Week vs. 1 Month	0.843	0.885	0.459
1 Week vs. 3 Months	0.936	0.589	0.080
1 Month vs. 3 Months	0.999	0.989	0.842

n = 5  
Results shaded red are considered significant at a 95% confidence interval

Two-way ANOVA of the Fuji II LC enthalpy results identified a significant difference for both thickness and storage time ( $p < 0.0001$ ) as well as an interaction between the effects of time and thickness ( $p < 0.0001$ ). One-way ANOVA of the Fuji II LC samples as a function of individual thickness over time

revealed a significant difference with the 2 mm ( $p < 0.0001$ ), 3 mm ( $p < 0.0001$ ), and 4 mm samples ( $p < 0.0001$ ). Results of the Scheffe multi comparison analysis can be seen in Table 29.

Comparisons	Storage Time				
	Immediate	24 Hour	One Week	One Month	Three Months
	p value				
2 mm vs. 3 mm	0.011	0.799	< 0.0001	< 0.0001	< 0.0001
2 mm vs. 4 mm	0.008	0.842	< 0.0001	< 0.0001	< 0.0001
3 mm vs. 4 mm	0.982	0.471	0.003	0.941	0.238

n = 5  
Results shaded red are considered significant at a 95% confidence interval

One-way ANOVA of the Fuji II thickness per time period identified a significant difference between the different thicknesses at the immediate ( $p < 0.004$ ), one-week ( $p < 0.0001$ ), one-month ( $p < 0.0001$ ), and three-month time groups ( $p < 0.0001$ ). A significant difference was not noted in the 24-hour sample group ( $p = 0.470$ ). Results of the *post hoc* tests can be seen in Table 30.

The mean results of the peak temperature associated with the endothermic peak during the thermal scan for the Fuji II LC samples can be seen in Table 31.

Time Period	2mm	sd	3mm	sd	4mm	sd
Immediate	142.43	54.93	174.70	3.13	163.61	1.22
24 Hours	126.53	17.29	146.68	9.81	141.19	2.63
1 Week	126.15	12.76	147.29	1.28	137.95	1.35
1 Month	128.58	7.66	142.89	2.23	135.63	3.98
3 Months	132.87	9.81	141.71	1.00	138.86	4.03

n = 5

Two-way ANOVA of the mean Fuji II LC enthalpy peak identified significant differences within the samples ( $p < 0.0001$ ) for both thickness and storage time period but did not indicate a significant interaction between the two factors ( $p = 0.911$ ). One-way ANOVA of the Fuji II LC

Comparisons	Thickness		
	2 mm	3 mm	4 mm
	p value		
Immediate vs. 24-Hours	0.926	< 0.0001	< 0.0001
Immediate vs. 1 Week	0.919	< 0.0001	< 0.0001
Immediate vs. 1 Month	0.954	< 0.0001	< 0.0001
Immediate vs. 3 Months	0.988	< 0.0001	< 0.0001
24 Hours vs. 1 Week	0.999	0.999	0.645
24 Hours vs. 1 Month	0.999	0.865	0.163
24 Hours vs. 3 Months	0.998	0.706	0.860
1 Week vs. 1 Month	0.999	0.789	0.861
1 Week vs. 3 Months	0.997	0.611	0.995
1 Month vs. 3 Months	0.999	0.998	0.655
n = 5 Results shaded red are considered significant at a 95% confidence interval			

separate thicknesses as a function of storage time did not identify a significant difference in mean peak temperature with the 2 mm ( $p = 0.865$ ), but identified a significant change in peak temperature within the 3 mm ( $p < 0.0001$ ) and 4 mm samples ( $p < 0.0001$ ) as a function of storage time. Results of

the *post hoc* analysis can be seen in Table 32.

One-way ANOVA analysis of the Fuji II LC thermal scan peak temperature as a function of storage time did not identify a significant difference in peak temperature with the immediate group ( $p = 0.301$ ), 24-hour group ( $p = 0.053$ ), or the three-month samples ( $p = 0.116$ ).

However, a significant change of peak enthalpy temperature was found within the one-week samples ( $p = 0.003$ ) and the one-month samples ( $p = 0.004$ ). Results of the Scheffe *post hoc* analysis can be seen in Table 33.

Comparisons	Storage Time				
	Immediate	24 Hour	One Week	One Month	Three Months
	p value				
2 mm vs. 3 mm	0.311	0.061	0.003	0.004	0.125
2 mm vs. 4 mm	0.588	0.194	0.81	0.153	0.352
3 mm vs. 4 mm	0.861	0.772	0.184	0.139	0.776
n = 5 Results shaded red are considered significant at a 95% confidence interval					

The mean enthalpy results of the Photac-Fil Quick samples can be seen in Table 34.

Time Period	2mm	sd	3mm	sd	4mm	sd
Immediate	-7.76	7.66	-34.08	5.84	-43.54	2.60
24 Hours	-34.97	2.40	-70.90	3.15	-58.27	8.62
1 Week	-46.79	13.72	-67.72	4.58	-70.99	5.58
1 Month	-47.73	6.28	-74.03	2.00	-77.16	3.76
3 Months	-59.08	7.40	-92.25	2.39	-99.95	2.44

n = 5

Two-way ANOVA of the mean enthalpy as a function of time and samples thickness identified a significant difference for both time and thickness ( $p < 0.0001$ ) and an interaction between the two factors ( $p = 0.002$ ). One-way ANOVA analysis of the individual thicknesses over the storage time revealed a significant difference with the 2 mm ( $p < 0.0001$ ), 3 mm ( $p < 0.0001$ ), and 4 mm samples ( $p < 0.0001$ ) as they aged over the storage times. Results of the Scheffe *post hoc* testing can be seen in Table 35. One-way ANOVA analysis of the change in thermal

Comparisons	Thickness		
	2 mm	3 mm	4 mm
	p value		
Immediate vs. 24-Hours	0.001	< 0.0001	0.014
Immediate vs. 1 Week	< 0.0001	< 0.0001	< 0.0001
Immediate vs. 1 Month	< 0.0001	< 0.0001	< 0.0001
Immediate vs. 3 Months	< 0.0001	< 0.0001	< 0.0001
24 Hours vs. 1 Week	0.319	0.849	0.041
24 Hours vs. 1 Month	0.250	0.855	0.001
24 Hours vs. 3 Months	0.005	< 0.0001	< 0.0001
1 Week vs. 1 Month	0.999	0.292	0.588
1 Week vs. 3 Months	0.283	< 0.0001	< 0.0001
1 Month vs. 3 Months	0.358	< 0.0001	< 0.0001

n = 5  
Results shaded red are considered significant at a 95% confidence interval

enthalpy for the collective groups as a function of storage time identified significant differences within the different thicknesses at the immediate ( $p < 0.0001$ ), 24-hour ( $p < 0.0001$ ), one-week ( $p = 0.003$ ), one-month ( $p < 0.001$ ), and three-month ( $p < 0.0001$ ) storage times. The results of the multi comparison

testing can be seen in Table 36.

Comparisons	Storage Time				
	Immediate	24 Hour	One Week	One Month	Three Months
	p value				
2 mm vs. 3 mm	< 0.0001	< 0.0001	0.012	< 0.0001	< 0.0001
2 mm vs. 4 mm	< 0.0001	< 0.0001	0.005	< 0.0001	< 0.0001
3 mm vs. 4 mm	0.085	0.021	0.856	0.569	0.077

n = 5  
Results shaded red are considered significant at a 95% confidence interval

Results of the Photac-Fil Quick mean peak temperature of the DSC thermal scan can be seen in Table 37. Two-way ANOVA analysis of the mean thermal peak temperature values as a function of storage time and thickness indicated significant differences within the samples ( $p < 0.0001$ ) with interactions identified between the two factors ( $p < 0.0001$ ).

Time Period	2mm	sd	3mm	sd	4mm	sd
Immediate	123.27	49.51	194.33	4.16	174.59	1.06
24 Hours	134.69	23.75	149.37	5.59	154.31	3.36
1 Week	141.22	4.42	145.34	2.08	143.29	1.79
1 Month	136.69	2.91	140.14	0.42	141.02	0.91
3 Months	129.47	4.01	137.51	0.51	137.43	1.91

n = 5

One-way ANOVA of the mean peak values for Photac-Fil Quick for the individual sample thicknesses over the storage times did not identify a significant difference within the 2 mm samples ( $p = 0.813$ ), but found a significant change in temperature within the 3 mm samples ( $p < 0.0001$ ), and the 4 mm samples ( $p < 0.0001$ ) over the storage times. Results of the Scheffe *post hoc* analysis can be seen in Table 38.

**Table 38. Scheffe Multi Comparisons For Photac-Fil Quick Differential Scanning Calorimetry Thermal Peak Results**

Comparisons	Thickness		
	2 mm	3 mm	4 mm
	p value		
Immediate vs. 24-Hours	0.968	< 0.0001	< 0.0001
Immediate vs. 1 Week	0.855	< 0.0001	< 0.0001
Immediate vs. 1 Month	0.944	< 0.0001	< 0.0001
Immediate vs. 3 Months	0.997	< 0.0001	< 0.0001
24 Hours vs. 1 Week	0.996	0.562	< 0.0001
24 Hours vs. 1 Month	0.999	0.015	< 0.0001
24 Hours vs. 3 Months	0.998	0.001	< 0.0001
1 Week vs. 1 Month	0.999	0.315	0.638
1 Week vs. 3 Months	0.995	0.049	0.012
1 Month vs. 3 Months	0.994	0.858	0.214

n = 5  
Results shaded are considered significant at a 95% confidence interval

One-way ANOVA of the Photac-Fil Quick mean thermal peak values for the samples as a function of storage time identified a significant difference in thermal peak values within the immediate ( $p = 0.006$ ), one-month ( $p = 0.006$ ), and three-month ( $p = 0.001$ ) storage groups. However, a significant difference was not found at 24-hours ( $p =$

0.121) and at one-week ( $p = 0.155$ ). Results of the *post hoc* analysis can be seen in Table 39.

**Table 39. Scheffe Multi Comparisons For Photac-Fil Quick Differential Scanning Calorimetry Thermal Peak Temperature Results**

Comparisons	Storage Time				
	Immediate	24 Hour	One Week	One Month	Three Months
	p value				
2 mm vs. 3 mm	0.007	0.305	0.155	0.033	0.002
2 mm vs. 4 mm	0.047	0.139	0.589	0.009	0.002
3 mm vs. 4 mm	0.569	0.864	0.596	0.746	0.999

n = 5  
Results shaded are considered significant at a 95% confidence interval

#### Differential Scanning Calorimetry Thermal Weight Change

The complete data for the weight changes during thermal analysis can be seen in Appendix E, Tables 112 – 116 for Vitremer, Tables 117 – 121 for Fuji II LC, and Tables 122 – 126 for Photac-Fil Quick.

For all tables, "H2O Gain" represents the sample weight difference noted between fabrication and the end of storage in 100% humidity. "H2O Loss" represents the amount of weight change noted during the specific heat determinations, while "Net H2O" represents the difference between water gain during storage and water loss during the specific heat determinations. "Scan Loss" represents the weight change during the 37 – 240 °C thermal scan, and "Total Loss" represents the sum of weight loss during specific heat determinations and thermal scan. "Total/Gain" represents the ratio (percent) of entire weight loss to water gain, and "Scan/Gain" likewise represents the ratio of weight loss during the DSC thermal scan to water gain. The latter two analyses were undertaken to explore any possible relationships between the amount of water gained and weight loss as a function of storage time.

Some assumptions were made during the formulation of the weight determinations. First, it was assumed that any weight change during the specific heat determinations would be due to water loss, presumably of the loosely-bound nature. This assumption was reinforced that the DSC chamber is constantly purged with low-humidity nitrogen gas and that temperature span of the specific heat determination (20 ° - 60 ° C) would not be sufficient to cause reasonable loss of any HEMA methacrylate components (BP 120 °C<sup>62</sup>) that may be present as well as other glass-ionomer components. The second assumption is that during the DSC thermal scan (37 ° - 240 °C) the majority of weight loss is due to water of the more firmly-bound nature. This assumption is albeit made with the knowledge that some polyacrylic acids used in resin-modified glass-ionomer restorative materials have a boiling point (~ 210-220 °C<sup>63</sup>) at the higher end of the thermal scan used in this evaluation. Accordingly, any material loss associated with an endothermic peak above 100 °C and below the polyacrylic acid boiling points should be assumed to be mostly due to water. Furthermore, the second assumption was reinforced with the results of pilot studies that revealed no endothermic peaks evident during the latter end of the DSC thermal scans. A third assumption made in the DSC weight change formulations was that any RMGI polymer formation would be stable during the temperature range of the DSC

thermal scan. This last supposition was established after pilot studies revealed that RMGI materials required temperatures in excess of 400 °C to degrade during DSC thermal scans.

The mean weight change during the thermal analysis for Vitremer is presented in Table 40.

Two-way ANOVA identified significant gain in water ( $p < 0.0001$ ) in the Vitremer samples as a function of storage time, but a difference was not noted ( $p = 0.891$ ) between the different sample thicknesses, as well as no interactions between the factors of time and thickness ( $p = 0.389$ ). The immediate samples were not included in any of the water gain analyses since these samples did not have the opportunity to gain water and could abnormally skew the statistical results. The results of the *post hoc* tests concerning Vitremer water gain can be seen in Table 41.

Table 40. Vitremer Mean Thermal Weight Change (% Wt)

	H2O Gain	SD	H2O Loss	SD	Net H2O	SD	Scan Loss	SD	Total Loss	SD	Total/H2O gain	SD	Scan/H2O Gain	SD
Immediate	2mm	0.00	1.76	0.44	-1.76	0.44	4.78	0.51	6.46	0.91	647.87	96.39	415.94	61.41
	3mm	0	0.96	0.18	-0.96	0.18	6.32	0.81	7.22	0.95	961.68	107.46	785.78	70.40
	4mm	0	0.67	0.14	-0.67	0.13	6.43	0.42	7.1	0.41	983.33	172.84	867.38	164.16
24 Hours	2mm	1.22	2.77	0.37	-1.55	0.33	5.11	0.57	7.75	0.89	372.76	45.54	266.06	44.75
	3mm	0.79	1.37	0.24	-0.58	0.28	5.85	0.71	7.53	0.63	366.69	7.78	285.48	13.15
	4mm	0.76	0.86	0.05	-0.10	0.08	6.45	0.52	7.26	0.47	818.08	80.07	722.63	69.35
One Week	2mm	2.37	2.47	0.22	-0.1	0.09	6.26	0.59	8.57	0.39	557.48	265.46	424.84	201.13
	3mm	2.56	2.03	0.25	0.53	0.15	7.25	0.35	9.14	0.46	364.60	18.54	298.46	29.20
	4mm	1.01	0.95	0.13	0.06	0.13	7.03	0.95	8.19	0.72	337.96	77.67	278.62	82.71
One Month	2mm	2.58	1.87	0.17	0.72	3.15	5.85	0.87	7.96	0.45	330.18	129.42	243.38	115.88
	3mm	2.79	1.80	0.40	0.99	0.33	7.69	1.15	9.87	0.46	275.18	97.03	206.20	91.58
	4mm	3.40	1.97	0.92	1.43	0.65	8.48	1.10	10.28	1.84	261.40	87.49	219.08	89.88
Three Months	2mm	4.29	3.38	0.94	0.92	0.98	8.94	0.98	11.51	2.1				
	3mm	5.08	3.18	1.03	1.9	1.25	9.02	1.96	11.9	2.33				
	4mm	5.47	2.46	1.74	3.02	0.98	10.38	0.42	12.46	1.68				

n = 5

Comparisons	p value
2 mm vs. 3 mm	0.913
2 mm vs. 4 mm	0.999
3 mm vs. 4 mm	0.921
24 Hours vs. 1 Week	<b>0.235</b>
24 Hours vs. 1 Month	<b>0.005</b>
24 Hours vs. 3 Months	<b>&lt;0.0001</b>
1 Week vs. 1 Month	0.393
1 Week vs. 3 Months	<b>&lt;0.0001</b>
1 Month vs. 3 Months	<b>0.002</b>
n = 15 Results shaded red are considered significant at a 95% confidence interval	

time increased. The results of the Scheffe *post hoc* analysis per sample thickness and storage time can be seen in Table 42.

Analysis of the net water retention during specific heat determination for the Vitremer samples as a function of sample thickness and storage time determined that the Vitremer samples retained significantly more during the specific heat determinations as storage time increased ( $p < 0.0001$ ) and as the samples increased in thickness ( $p = 0.001$ ) without an interaction in the factors of storage time and

specimen thickness ( $p = 0.456$ ). Itemized results of the *post hoc* analysis can be seen in Table

43.

Two-way ANOVA analysis of the Vitremer samples water loss during the specific heat determinations identified a significant difference ( $p < 0.0001$ ) in water loss between the samples for both factors storage time and sample thickness with an interaction noted ( $p = 0.038$ ) between the two factors. The 2 mm samples were noted to lose significantly more water than the other thicknesses and more water was lost as storage

Comparisons	p value
2 mm vs. 3 mm	<b>0.006</b>
2 mm vs. 4 mm	<b>&lt;0.0001</b>
3 mm vs. 4 mm	<b>0.014</b>
Immediate vs. 24 Hours	0.244
Immediate vs. 1 Week	0.069
Immediate vs. 1 Month	<b>0.047</b>
Immediate vs. 3 Months	<b>&lt;0.0001</b>
24 Hours vs. 1 Week	0.979
24 Hours vs. 1 Month	0.941
24 Hours vs. 3 Months	<b>&lt;0.0001</b>
1 Week vs. 1 Month	0.999
1 Week vs. 3 Months	<b>&lt;0.0001</b>
1 Month vs. 3 Months	<b>0.001</b>
n = 15 Results shaded red are considered significant at a 95% confidence interval	

<b>Table 43. Scheffe Multi Comparisons For Vitremer Net Water Retention During Specific Heat Determinations</b>	
<b>Comparisons</b>	<b>p value</b>
2 mm vs. 3 mm	<b>0.038</b>
2 mm vs. 4 mm	<b>0.001</b>
3 mm vs. 4 mm	0.401
Immediate vs. 24 Hours	0.885
Immediate vs. 1 Week	<b>0.018</b>
Immediate vs. 1 Month	<b>&lt;0.0001</b>
Immediate vs. 3 Months	<b>&lt;0.0001</b>
24 Hours vs. 1 Week	0.188
24 Hours vs. 1 Month	<b>0.001</b>
24 Hours vs. 3 Months	<b>&lt;0.0001</b>
1 Week vs. 1 Month	0.254
1 Week vs. 3 Months	<b>&lt;0.0001</b>
1 Month vs. 3 Months	0.130
n = 15 Results shaded red are considered significant at a 95% confidence interval	

Two-way ANOVA of Vitremer weight loss during the DSC thermal scan identified significant changes in weight as a function of thickness and storage time ( $p < 0.0001$ ), without an interaction between the two factors ( $p = 0.226$ ). The thicker samples were noted to exhibit more weight loss and increased weight loss was also noted with longer storage times. The results of the *post hoc* analysis can be seen in Table 44.

Analysis of the total weight loss (specific heat determination loss + thermal scan loss) identified a significant increase in weight loss as a function of storage time ( $p < 0.0001$ ) but did not identify a significant difference when

analyzed as per specimen thickness ( $p = 0.085$ ). Furthermore, no interaction between the factors was identified ( $p = 0.238$ ). The results of the multi comparison *post hoc* testing can be seen in Table 45.

<b>Table 44. Scheffe Multi Comparisons For Vitremer DSC Scan Weight Loss</b>	
<b>Comparisons</b>	<b>p value</b>
2 mm vs. 3 mm	<b>0.038</b>
2 mm vs. 4 mm	<b>0.001</b>
3 mm vs. 4 mm	0.401
Immediate vs. 24 Hours	0.885
Immediate vs. 1 Week	<b>0.018</b>
Immediate vs. 1 Month	<b>&lt;0.0001</b>
Immediate vs. 3 Months	<b>&lt;0.0001</b>
24 Hours vs. 1 Week	0.188
24 Hours vs. 1 Month	<b>0.001</b>
24 Hours vs. 3 Months	<b>&lt;0.0001</b>
1 Week vs. 1 Month	0.254
1 Week vs. 3 Months	<b>&lt;0.0001</b>
1 Month vs. 3 Months	0.130
n = 15 Results shaded red are considered significant at a 95% confidence interval	

<b>Table 45. Scheffe Multi Comparisons For Vitremer Total Weight Loss</b>	
<b>Comparisons</b>	<b>p value</b>
2 mm vs. 3 mm	0.124
2 mm vs. 4 mm	0.259
3 mm vs. 4 mm	0.925
Immediate vs. 24 Hours	0.736
Immediate vs. 1 Week	<b>0.005</b>
Immediate vs. 1 Month	<b>&lt;0.0001</b>
Immediate vs. 3 Months	<b>&lt;0.0001</b>
24 Hours vs. 1 Week	0.150
24 Hours vs. 1 Month	<b>0.004</b>
24 Hours vs. 3 Months	<b>&lt;0.0001</b>
1 Week vs. 1 Month	0.656
1 Week vs. 3 Months	<b>&lt;0.0001</b>
1 Month vs. 3 Months	<b>&lt;0.0001</b>
n = 15 Results shaded red are considered significant at a 95% confidence interval	

Two-way ANOVA analysis of the ratio (expressed as a percentage) of total weight loss to water gain of the Vitremer samples identified significant differences ( $p < 0.0001$ ) among both factors of specimen thickness and storage time with a significant interaction indicated between the two factors ( $p < 0.0001$ ). In summary, there were significant differences between the 2 mm and 4 mm specimens and all storage time periods demonstrated significant reduction in the ratio except between the one-week and one-month storage time. Results of the *post hoc* testing can be seen in Table 46.

Analysis of the ratio of the weight loss observed during the DSC thermal scan to water gain of the Vitremer samples indicated similar results, with significant differences found among the factors of storage time and thickness ( $p < 0.0001$ ) with a significant interaction between the two

factors ( $p < 0.0001$ ). Scheffe *post hoc* comparison results presented similar results as that seen for the total weight loss to water gain ratio evaluation and are posted in Table 47.

<b>Table 46. Scheffe Multi Comparisons For Vitremer Ratio of Total Weight Loss to Water Gain</b>	
Comparisons	p value
2 mm vs. 3 mm	0.925
2 mm vs. 4 mm	<b>0.004</b>
3 mm vs. 4 mm	<b>0.010</b>
24 Hours vs. 1 Week	<b>&lt;0.0001</b>
24 Hours vs. 1 Month	<b>&lt;0.0001</b>
24 Hours vs. 3 Months	<b>&lt;0.0001</b>
1 Week vs. 1 Month	0.236
1 Week vs. 3 Months	<b>&lt;0.0001</b>
1 Month vs. 3 Months	<b>0.033</b>
n = 15 Results shaded red are considered significant at a 95% confidence interval	

<b>Table 47. Scheffe Multi Comparisons For Vitremer Ratio of DSC Thermal Scan Weight Loss to Water Gain</b>	
Comparisons	p value
2 mm vs. 3 mm	0.218
2 mm vs. 4 mm	<b>&lt;0.0001</b>
3 mm vs. 4 mm	<b>&lt;0.0001</b>
24 Hours vs. 1 Week	<b>&lt;0.0001</b>
24 Hours vs. 1 Month	<b>&lt;0.0001</b>
24 Hours vs. 3 Months	<b>&lt;0.0001</b>
1 Week vs. 1 Month	0.161
1 Week vs. 3 Months	<b>&lt;0.0001</b>
1 Month vs. 3 Months	<b>0.033</b>
n = 15 Results shaded red are considered significant at a 95% confidence interval	

The mean weight change during the thermal analysis for Fuji II LC is presented in Table 48.

Two-way ANOVA analysis of Fuji II LC water gain (except the immediate groups) as a function of thickness and storage time, identified significant differences ( $p < 0.0001$ ) for both factors, with an interaction indicated between the two factors ( $p = 0.001$ ). Interesting, the 2 mm samples demonstrated more water gain than the thicker samples and although water gain increased as storage time increased, water gain was observed to peak at the one-week storage time.

Results of the *post hoc* testing can be seen in Table 49.

Table 48. Fuji II LC Mean Thermal Weight Change (%Wt)

	H2O Gain	SD	H2O Loss	SD	Net H2O	SD	Scan Loss	SD	Total Loss	SD	Total H2O Gain	SD	Scan/H2O Gain	SD
Immediate	2mm	0.00	0.70	0.12	-0.70	0.12	3.88	0.50	4.56	0.40				
	3mm	0.00	0.62	0.36	-0.62	0.36	4.45	0.16	5.04	0.29				
	4mm	0.00	0.32	0.06	-0.32	0.06	4.75	0.15	5.05	0.21				
24 Hours	2mm	3.46	3.04	0.37	0.43	0.41	5.17	0.28	8.38	1.14	245.77	38.34	153.78	30.35
	3mm	1.01	0.966	0.12	0.05	0.11	4.73	0.61	5.88	0.18	596.46	88.72	499.72	80.53
	4mm	1.04	0.85	0.09	0.19	0.11	5.05	0.22	5.85	0.19	576.00	84.76	493.20	79.32
One Week	2mm	4.94	3.57	1.35	1.37	0.23	5.98	0.17	9.33	1.31	205.38	29.28	130.97	36.36
	3mm	4.29	2.21	0.63	2.08	0.22	6.49	0.79	8.88	0.62	220.46	31.48	167.58	37.67
	4mm	3.71	1.79	0.96	1.92	0.32	6.64	0.22	7.91	1.05	244.35	37.64	195.83	48.78
One Month	2mm	4.14	2.87	1.17	1.27	0.25	5.92	0.34	8.61	0.86	223.25	31.28	152.89	40.66
	3mm	3.63	1.51	0.43	2.12	0.18	7.11	0.18	8.51	0.30	244.84	17.11	202.15	23.81
	4mm	3.22	1.04	0.14	2.18	0.07	7.11	0.11	8.08	0.21	259.10	4.45	226.88	5.75
Three Months	2mm	4.29	3.38	0.94	0.92	0.98	8.94	0.98	11.51	2.1	317.83	44.02	239.90	26.19
	3mm	5.08	3.18	1.03	1.9	1.25	9.02	1.96	11.9	2.33	302.09	10.65	261.45	11.27
	4mm	5.47	2.46	1.74	3.02	0.98	10.38	0.42	12.46	1.68	292.72	9.81	265.02	11.72

2 = 5

<b>Table 49. Scheffe Multi Comparisons For Fuji II LC Water Gain</b>	
<b>Comparisons</b>	<b>p value</b>
2 mm vs. 3 mm	0.002
2 mm vs. 4 mm	<0.0001
3 mm vs. 4 mm	0.584
24 Hours vs. 1 Week	<0.0001
24 Hours vs. 1 Month	<0.0001
24 Hours vs. 3 Months	0.115
1 Week vs. 1 Month	0.103
1 Week vs. 3 Months	<0.0001
1 Month vs. 3 Months	<0.0001
n = 15 Results shaded red are considered significant at a 95% confidence interval	

Analysis of the net water retention during specific heat determination of the Fuji II LC samples identified significant differences for both storage time and specimen thickness ( $p < 0.0001$ ) as well as an interaction between both factors ( $p < 0.0001$ ). *Post hoc* analysis identified significant differences for all thickness combinations except between the 3 mm and 4 mm samples and all storage time periods were significantly different except between the one-week and one-month storage times. The results of the multi comparison testing can be seen in Table 51.

Two-way ANOVA analysis of the Fuji II LC water loss during specific heat determination identified significant weight loss in the samples both when analyzed per thickness and storage time ( $p < 0.0001$ ) with an interaction between the two factors also identified ( $p = 0.012$ ). The results of the Scheffe multi comparison testing can be seen in Table 50.

<b>Table 50. Scheffe Multi Comparisons For Fuji II LC Water Loss During Specific Heat Determinations</b>	
<b>Comparisons</b>	<b>p value</b>
2 mm vs. 3 mm	<0.0001
2 mm vs. 4 mm	<0.0001
3 mm vs. 4 mm	0.150
Immediate vs. 24 Hours	<0.0001
Immediate vs. 1 Week	<0.0001
Immediate vs. 1 Month	<0.0001
Immediate vs. 3 Months	0.109
24 Hours vs. 1 Week	0.003
24 Hours vs. 1 Month	0.942
24 Hours vs. 3 Months	0.308
1 Week vs. 1 Month	0.030
1 Week vs. 3 Months	<0.0001
1 Month vs. 3 Months	0.061
n = 15 Results shaded red are considered significant at a 95% confidence interval	

<b>Table 51. Scheffe Multi Comparisons For Fuji II LC Net Water Retention During Specific Heat Determinations</b>	
<b>Comparisons</b>	<b>p value</b>
2 mm vs. 3 mm	<0.0001
2 mm vs. 4 mm	<0.0001
3 mm vs. 4 mm	0.129
Immediate vs. 24 Hours	<0.0001
Immediate vs. 1 Week	<0.0001
Immediate vs. 1 Month	<0.0001
Immediate vs. 3 Months	<0.0001
24 Hours vs. 1 Week	<0.0001
24 Hours vs. 1 Month	<0.0001
24 Hours vs. 3 Months	<0.0001
1 Week vs. 1 Month	0.962
1 Week vs. 3 Months	<0.0001
1 Month vs. 3 Months	<0.0001
n = 15 Results shaded red are considered significant at a 95% confidence interval	

Analysis of the Fuji II LC samples for weight loss during the DSC thermal scan identified significant differences for both storage time and specimen thickness ( $p < 0.0001$ ) as well as an interaction between both factors ( $p < 0.0001$ ). *Post hoc* analysis identified significant differences for all thickness combinations except between the 3 mm and 4 mm samples and all storage time periods were significantly different except between the one-week and one-month and the one-week and three-month storage times. The results of the multi comparison testing can be seen in Table 52. Analysis of the Fuji II LC samples concerning total weight loss (specific heat determination + DSC thermal scan) closely mirrored the results of the DSC thermal scan with significant differences identified ( $p < 0.0001$ ) for both storage time and

specimen thickness with an interaction noted between the two factors ( $p < 0.0001$ ). The results of the *post hoc* testing can be seen in Table 53.

<b>Table 52. Scheffe Multi Comparisons For Fuji II LC Weight Loss During DSC Thermal Scan</b>	
<b>Comparisons</b>	<b>p value</b>
2 mm vs. 3 mm	<0.0001
2 mm vs. 4 mm	<0.0001
3 mm vs. 4 mm	0.183
Immediate vs. 24 Hours	0.001
Immediate vs. 1 Week	<0.0001
Immediate vs. 1 Month	<0.0001
Immediate vs. 3 Months	<0.0001
24 Hours vs. 1 Week	<0.0001
24 Hours vs. 1 Month	<0.0001
24 Hours vs. 3 Months	<0.0001
1 Week vs. 1 Month	0.148
1 Week vs. 3 Months	0.881
1 Month vs. 3 Months	0.012
n = 15 Results shaded red are considered significant at a 95% confidence interval	

<b>Table 53. Scheffe Multi Comparisons For Fuji II LC Total Weight Loss</b>	
<b>Comparisons</b>	<b>p value</b>
2 mm vs. 3 mm	0.045
2 mm vs. 4 mm	<0.0001
3 mm vs. 4 mm	0.237
Immediate vs. 24 Hours	0.001
Immediate vs. 1 Week	<0.0001
Immediate vs. 1 Month	<0.0001
Immediate vs. 3 Months	<0.0001
24 Hours vs. 1 Week	<0.0001
24 Hours vs. 1 Month	<0.0001
24 Hours vs. 3 Months	0.164
1 Week vs. 1 Month	0.794
1 Week vs. 3 Months	<0.0001
1 Month vs. 3 Months	0.001
n = 15 Results shaded red are considered significant at a 95% confidence interval	

Two-way ANOVA analysis of the ratio (expressed as a percentage) of total weight loss to water gain of the Fuji II LC samples identified significant differences ( $p < 0.0001$ ) with respect to specimen thickness and storage time and a significant interaction indicated between the two factors ( $p < 0.0001$ ). There were significant differences between the all thickness pairs, except between the 3 mm and 4 mm specimens, and all storage time periods demonstrated significant reduction in the ratio except between the one-week and one-month storage time. Results of the *post hoc* testing can be seen in Table 54.

Analysis of the ratio of the weight loss observed during the DSC thermal scan to water gain of the Fuji II LC samples indicated similar results, with significant differences found among storage time and thickness ( $p < 0.0001$ ) with a significant interaction between the two factors ( $p < 0.0001$ ). Interestingly, for the 3 mm and 4 mm samples, the ratio demonstrated its highest

value at 24 hours, which then decreased at the one-week storage time. At this point, all three thicknesses of the samples demonstrated an increase in the ratio. Scheffe *post hoc* comparison results presented similar results as that seen for the total weight loss to water gain ratio evaluation, and the results are posted in Table 55.

Comparisons	p value
2 mm vs. 3 mm	<0.0001
2 mm vs. 4 mm	<0.0001
3 mm vs. 4 mm	0.987
24 Hours vs. 1 Week	<0.0001
24 Hours vs. 1 Month	<0.0001
24 Hours vs. 3 Months	<0.0001
1 Week vs. 1 Month	0.699
1 Week vs. 3 Months	<0.0001
1 Month vs. 3 Months	0.005
n = 15 Results shaded red are considered significant at a 95% confidence interval	

Comparisons	p value
2 mm vs. 3 mm	<0.0001
2 mm vs. 4 mm	<0.0001
3 mm vs. 4 mm	0.987
24 Hours vs. 1 Week	<0.0001
24 Hours vs. 1 Month	<0.0001
24 Hours vs. 3 Months	<0.0001
1 Week vs. 1 Month	0.335
1 Week vs. 3 Months	<0.0001
1 Month vs. 3 Months	0.004
n = 15 Results shaded red are considered significant at a 95% confidence interval	

The mean results of the Photac-Fil Quick thermal analysis weight changes can be seen in Table 56. Two-way ANOVA analysis of the Photac-Fil Quick samples for water gain (immediate groups excluded) identified a significant increase in weight as a factor of storage time ( $p < 0.0001$ ) but found no significant difference in weight gain as a factor of specimen thickness ( $p = 0.323$ ). There was no significant interaction between the two factors found ( $p = 0.106$ ). Overall results found that the samples demonstrated significant increase in water gain with increase in storage time, with the three-month samples displaying significantly more water uptake than the other samples. Results of the *post hoc* testing can be seen in Table 57.

Table 56. Photac-Fil Quick Mean Thermal Weight Change (%Wt)

	H2O Gain	H2O Loss	Net H2O	Scan Loss	Total Loss	Total/H2O Gain	Scan/H2O Gain	SD	SD
Immediate	2mm	0.00	0.16	4.33	5.26	0.30			
	3mm	0.00	0.04	4.31	4.79	1.11			
	4mm	0.00	0.05	5.64	5.94	0.17			
24 Hours	2mm	1.48	2.02	5.42	7.33	0.66	410.74	293.20	205.90
	3mm	2.15	1.64	7.24	8.76	0.71	363.12	112.12	106.24
	4mm	1.47	1.19	6.46	7.60	0.81	470.39	105.37	99.24
One Week	2mm	1.61	1.44	6.06	7.43	0.27	381.99	33.74	56.34
	3mm	1.66	0.96	6.52	7.41	0.19	398.90	41.40	41.52
	4mm	1.62	0.79	6.7	7.43	0.22	416.51	21.23	19.64
One Month	2mm	1.78	1.6	6.13	7.74	0.25	366.01	111.13	98.14
	3mm	1.93	0.95	6.88	7.76	0.22	359.02	11.05	10.54
	4mm	1.97	0.75	7.18	7.88	0.28	379.55	76.22	78.24
Three Months	2mm	2.54	1.86	6.41	8.16	0.47	256.55	31.92	24.91
	3mm	2.78	0.99	7.61	8.52	0.17	278.82	14.74	14.64
	4mm	3.64	0.91	8.05	8.91	0.17	299.44	158.59	140.56

n = 5

Comparisons	p value
2 mm vs. 3 mm	0.441
2 mm vs. 4 mm	0.663
3 mm vs. 4 mm	0.936
24 Hours vs. 1 Week	0.924
24 Hours vs. 1 Month	0.504
24 Hours vs. 3 Months	<0.0001
1 Week vs. 1 Month	0.189
1 Week vs. 3 Months	<0.0001
1 Month vs. 3 Months	0.001
n = 15 Results shaded red are considered significant at a 95% confidence interval	

loss appeared to peak at the 24-hour storage time and then appeared to lessen and become stable, at least for the 3 mm and 4 mm samples. Results of the Scheffe *post hoc* analysis are presented in Table 58.

Analysis of the net water retention of the Photac-Fil Quick samples during the specific heat determinations revealed significant differences for both sample thickness and storage time ( $p < 0.0001$ ) without an interaction between the two factors ( $p = 0.168$ ). Specifically the samples retained more water as sample thickness and storage

time increased. Results of the Scheffe multi comparison testing are presented in Table 59.

Analysis of Photac-Fil Quick water loss during the specific heat determinations indicated significant differences among sample thickness and storage time ( $p < 0.0001$ ) without an interaction between the two factors ( $p = 0.355$ ). The different sample thicknesses were all significantly different from each other, with the 2 mm samples displaying more water loss than the other two thicknesses ( $p < 0.013$ ). Considering sample storage time, water

Comparisons	p value
2 mm vs. 3 mm	<0.0001
2 mm vs. 4 mm	<0.0001
3 mm vs. 4 mm	0.013
Immediate vs. 24 Hours	<0.0001
Immediate vs. 1 Week	<0.0001
Immediate vs. 1 Month	<0.0001
Immediate vs. 3 Months	<0.0001
24 Hours vs. 1 Week	<0.0001
24 Hours vs. 1 Month	<0.0001
24 Hours vs. 3 Months	0.030
1 Week vs. 1 Month	0.998
1 Week vs. 3 Months	0.260
1 Month vs. 3 Months	0.548
n = 15 Results shaded red are considered significant at a 95% confidence interval	

Comparisons	p value
2 mm vs. 3 mm	<0.0001
2 mm vs. 4 mm	<0.0001
3 mm vs. 4 mm	0.413
Immediate vs. 24 Hours	0.001
Immediate vs. 1 Week	<0.0001
Immediate vs. 1 Month	<0.0001
Immediate vs. 3 Months	<0.0001
24 Hours vs. 1 Week	0.001
24 Hours vs. 1 Month	0.046
24 Hours vs. 3 Months	<0.0001
1 Week vs. 1 Month	0.707
1 Week vs. 3 Months	<0.0001
1 Month vs. 3 Months	<0.0001
n = 15 Results shaded red are considered significant at a 95% confidence interval	

Two-way ANOVA analysis of the Photac-Fil Quick samples for weight loss during the thermal DSC scan similarly to the total loss analysis identified significant differences in weight as a function of storage time ( $p < 0.0001$ ) and sample thickness ( $p = 0.0001$ ) with an interaction noted between the two factors ( $p < 0.0001$ ). In general, total weight loss increased as storage time increased and sample thickness increased. Results of the *post hoc* testing can be seen in Table 61.

Two-way ANOVA analysis of the Photac-Fil Quick samples for total weight loss during specific heat determinations and thermal DSC scan identified significant differences in weight as a function of storage time ( $p < 0.0001$ ) and sample thickness ( $p = 0.023$ ) with an interaction noted between the two factors ( $p < 0.0001$ ). In general, total weight loss increased as storage time increased and sample thickness increased. Results of the *post hoc* testing can be seen in Table 60.

Comparisons	p value
2 mm vs. 3 mm	<0.0001
2 mm vs. 4 mm	<0.0001
3 mm vs. 4 mm	0.413
Immediate vs. 24 Hours	0.001
Immediate vs. 1 Week	<0.0001
Immediate vs. 1 Month	<0.0001
Immediate vs. 3 Months	<0.0001
24 Hours vs. 1 Week	0.001
24 Hours vs. 1 Month	0.046
24 Hours vs. 3 Months	<0.0001
1 Week vs. 1 Month	0.707
1 Week vs. 3 Months	<0.0001
1 Month vs. 3 Months	<0.0001
n = 15 Results shaded red are considered significant at a 95% confidence interval	

Comparisons	p value
2 mm vs. 3 mm	<0.0001
2 mm vs. 4 mm	<0.0001
3 mm vs. 4 mm	0.413
Immediate vs. 24 Hours	0.001
Immediate vs. 1 Week	<0.0001
Immediate vs. 1 Month	<0.0001
Immediate vs. 3 Months	<0.0001
24 Hours vs. 1 Week	0.998
24 Hours vs. 1 Month	0.236
24 Hours vs. 3 Months	<0.0001
1 Week vs. 1 Month	0.385
1 Week vs. 3 Months	<0.0001
1 Month vs. 3 Months	0.006

n = 15  
Results shaded red are considered significant at a 95% confidence interval

Two-way ANOVA analysis of the ratio (expressed as a percentage) of total weight loss to water gain of the Photac-Fil Quick samples identified significant difference for weight change as a function of storage time ( $p < 0.0001$ ) but not for specimen thickness ( $p = 0.342$ ) without an identified interaction indicated between the two factors ( $p < 0.903$ ). There were significant differences noted between the 24-hour and three-month as well as between the one-week and three-month storage time periods. Results of the *post hoc* testing can be seen in Table 62.

Comparisons	p value
2 mm vs. 3 mm	0.366
2 mm vs. 4 mm	0.928
3 mm vs. 4 mm	0.582
24 Hours vs. 1 Week	0.613
24 Hours vs. 1 Month	0.199
24 Hours vs. 3 Months	<0.0001
1 Week vs. 1 Month	0.868
1 Week vs. 3 Months	0.020
1 Month vs. 3 Months	0.129

n = 15  
Results shaded red are considered significant at a 95% confidence interval

Analysis of the ratio of the weight loss observed during the DSC thermal scan to water gain of the Photac-Fil Quick samples indicated similar results, with significant differences found with storage time ( $p = 0.001$ ) but not with sample thickness ( $p = 0.310$ ). As with the analysis of total weight loss to water gain, a significant interaction between the two factors was not identified ( $p = 0.927$ ). The highest ratio was noted at the 24-hour storage time, at which point the ratio of scan loss to water gain was observed to decrease with storage time. Scheffe *post hoc* comparison results are presented in Table 63.

<b>Table 63. Scheffe Multi Comparisons Ratio For Photac-Fil Quick DSC Thermal Scan Weight Loss to Water Gain</b>	
<b>Comparisons</b>	<b>p value</b>
2 mm vs. 3 mm	0.992
2 mm vs. 4 mm	0.452
3 mm vs. 4 mm	0.382
24 Hours vs. 1 Week	0.976
24 Hours vs. 1 Month	0.607
24 Hours vs. 3 Months	<b>0.003</b>
1 Week vs. 1 Month	0.845
1 Week vs. 3 Months	<b>0.011</b>
1 Month vs. 3 Months	0.089
n = 15 Results shaded red are considered significant at a 95% confidence interval	

**CHAPTER FOUR:  
DISCUSSION**

In terms of setting chemistry, resin-modified glass-ionomer restorative materials are more complex than their conventional predecessors.<sup>3</sup> Although Andrzejewska *et al.*<sup>64</sup> reported that the addition of aqueous polyacids enhanced the light-induced polymerization of HEMA, the converse is not the same, as organic, photopolymerizable monomers alters the conventional acid-base setting reaction.<sup>3</sup> Anstice and Nicholson<sup>65</sup> reported that the addition of HEMA to a conventional restorative glass-ionomer restorative material resulted in a slower setting reaction with reduced compressive strength. The cause of this effect was assumed to be reduction of ionic reactions due to reduction of dielectric constant of HEMA,<sup>65</sup> conformational changes that result in a more tightly coiled thus less-reactive polyacrylic acid polymer,<sup>3</sup> and that the aqueous HEMA solution provides less solubility for the polyacrylic acids to enter solution and react.<sup>65</sup> Conventional clinical wisdom states that depth of cure is not important with resin-modified glass-ionomer restorative materials, since clinicians seem to assume that the conventional acid-base reaction will take place at deeper areas in which light penetration is insufficient to enable the polymerization of HEMA.<sup>3</sup> However, clinicians need to realize that these deeper unpolymerized areas represent an area in which the acid-base reaction is diluted with HEMA. Although some type of setting reaction may take place, it occurs at a much slower pace and results in a material with inferior physical properties.<sup>3,65</sup>

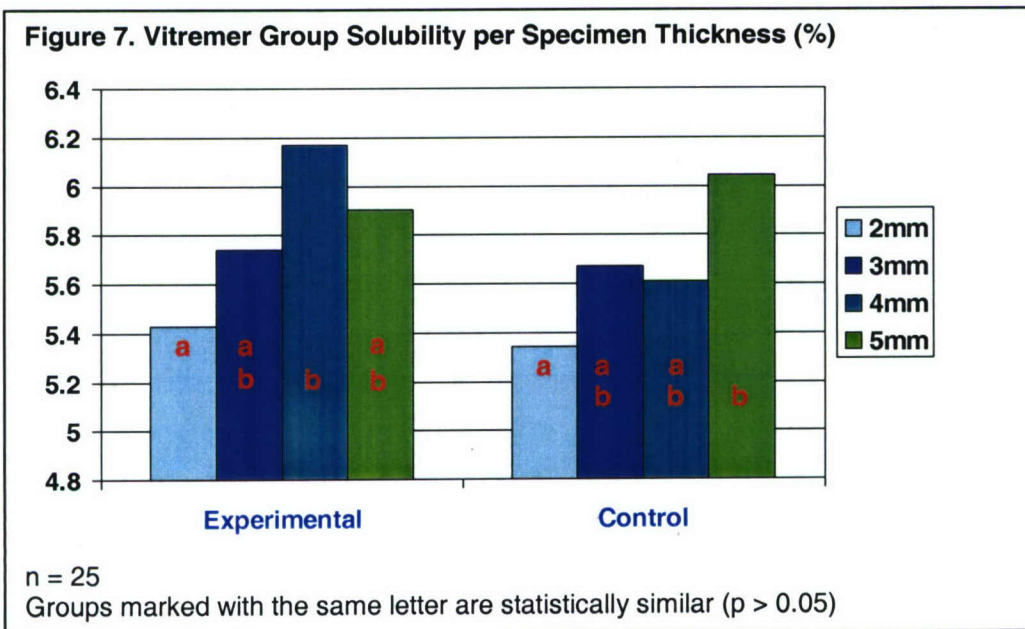
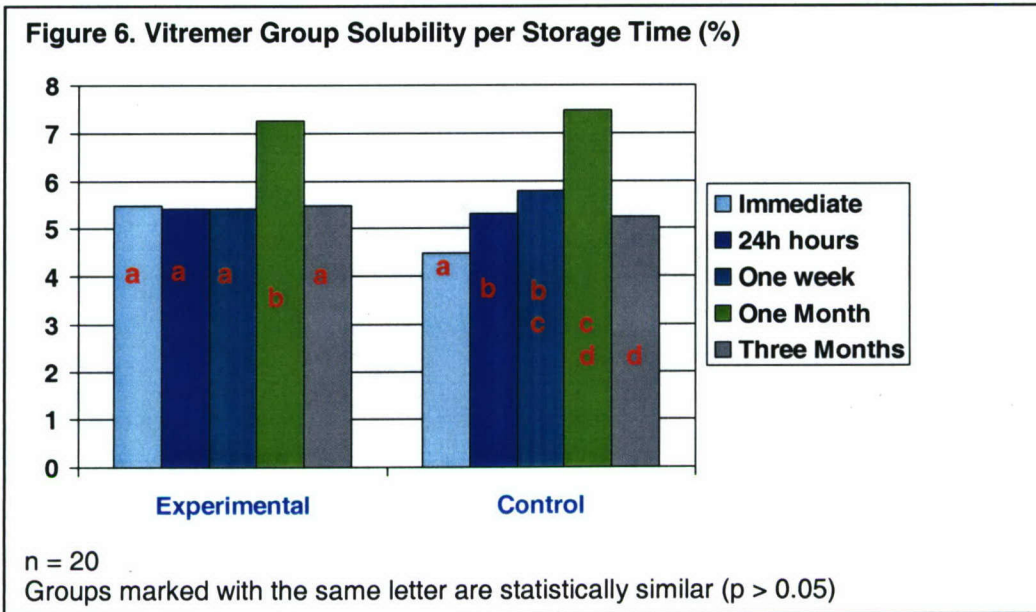
The overall aim of this research was to identify and possibly quantify any post-visible-light irradiation reactions that may occur in resin-modified glass-ionomer restorative materials in depths of two to five millimeters. Three different areas of investigation were undertaken: Solubility, Hardness, and Thermal Analysis.

**Solubility:** The solubility testing method was partly based on ANSI/ADA Specification No. 27: Resin-Based Filling Materials (1997).<sup>60</sup> Accordingly, the method utilized was designed to provide specimens of uniform surface area, thickness, equal exposure duration to moisture, and dehydration of the specimens until weight stability to the nearest 0.001 grams was observed. However, this evaluation differed from either the ANSI/ADA Specification No. 27 and/or clinical

conditions in three ways. The first variation is that in this investigation solubility was solely assessed as a function of percentage weight loss, whereas the ANSI/ADA specification is based on weight loss per calculated volume. This parameter was chosen in an attempt to establish a protocol that would allow expedient comparison of solubility, lessen material loss, as well as sample dehydration during extra handling required of volume measurements. Although the chosen thesis parameter, being based on weight alone, could be criticized for lacking the precision of the ANSI/ADA specification, the parameter was envisioned to allow expedient comparative solubility analysis.

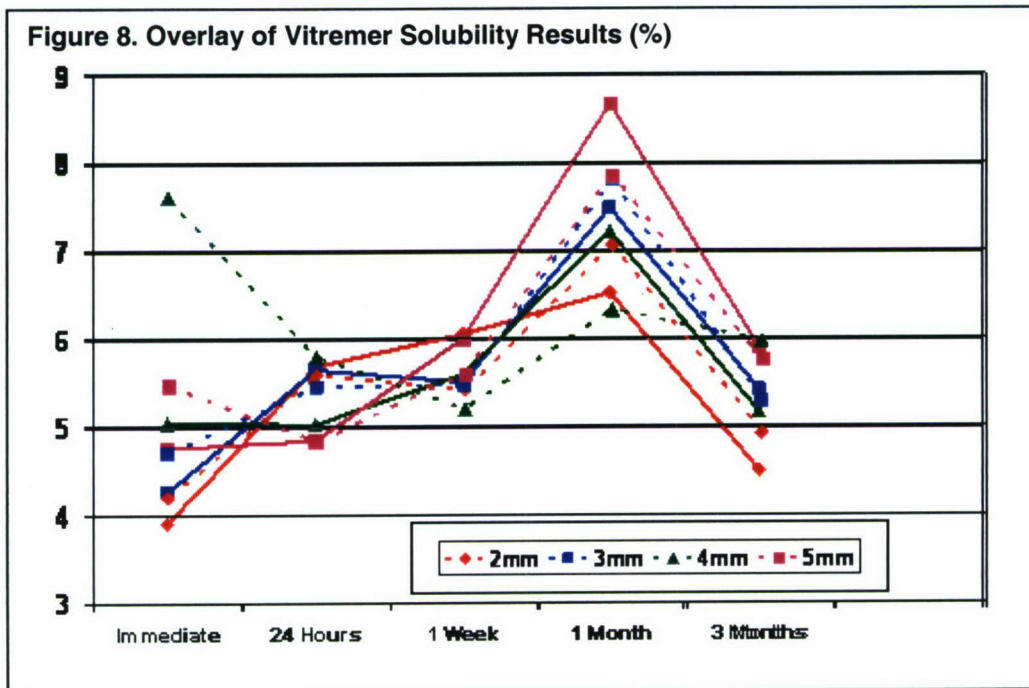
The second variation is that this method involved specimens of different photopolymerization protocols with four different thicknesses per group. The "experimental" group represents a photopolymerization method that mirrors clinical placement; that is, the specimens are light activated as per manufacturer recommendations from the top surface of the specimen cylinder. This thesis "control" group involved both the specimen top and bottom surface photoactivation. Although the control group represents a clinically unrealistic situation, the control samples were designed to allow possible comparison of material solubility behavior and kinetics between the two polymerization schemes.

The third area in which this evaluation differed is that a protective varnish or resin coating was not applied to the polymerized samples. Although originally touted to be less susceptible than conventional glass-ionomer materials to the effects of early moisture contamination and later dehydration, resin-modified glass-ionomer restorative materials were found to also require a surface protecting agent.<sup>10,11,66,67</sup> Surface protectants were not applied to the specimens during this investigation as it was felt that the surface coatings could reduce the experiment sensitivity to solubility differences that could exist due to the different curing regimens.

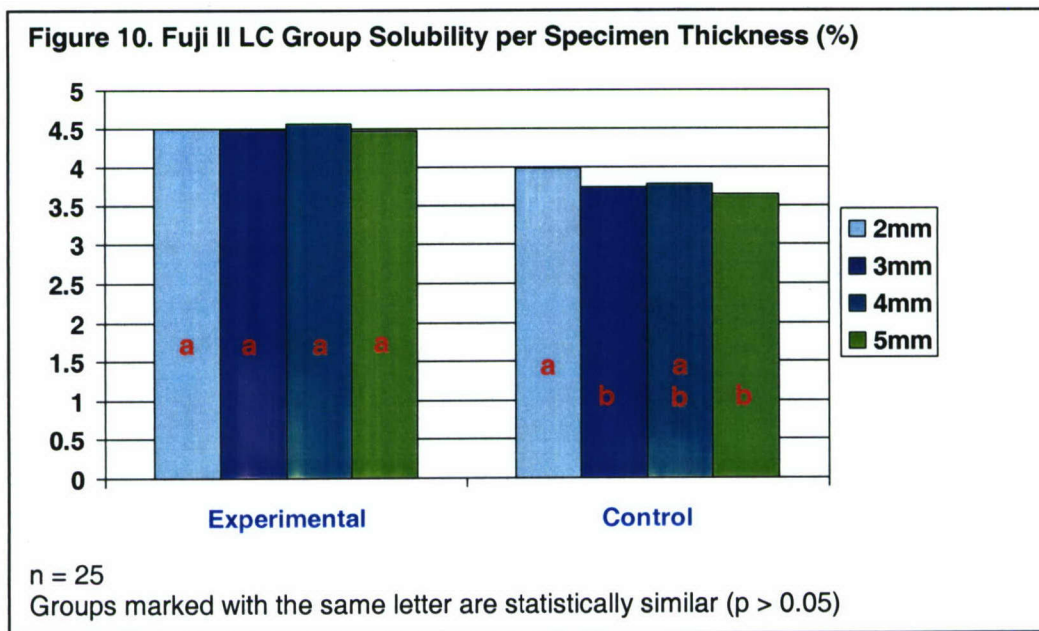
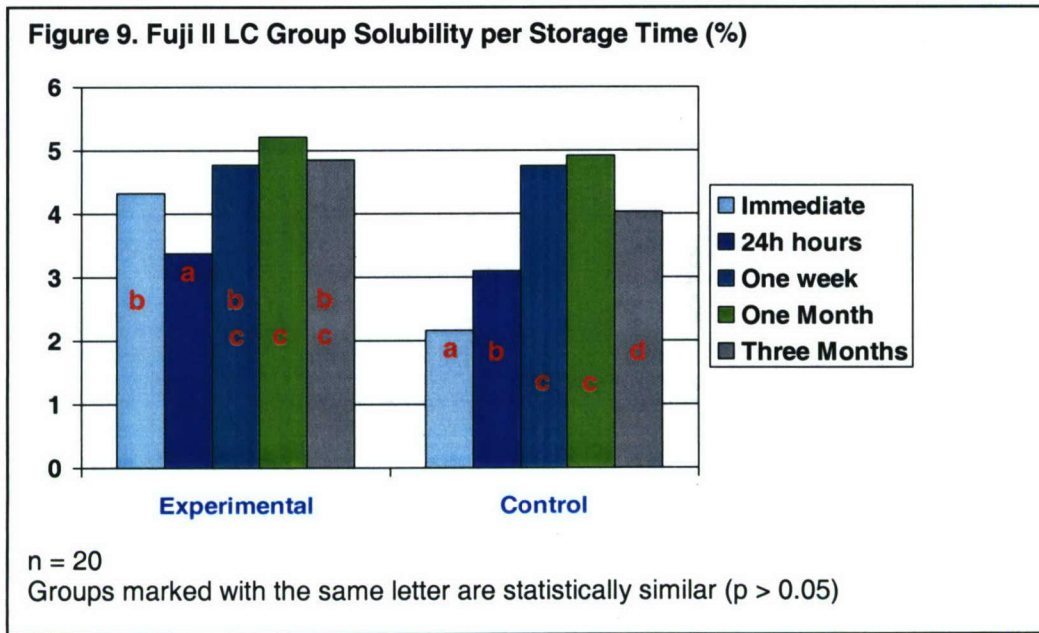


Graphical results for the multivariate analysis of the Vitremer solubility groups as a function of curing mode, and storage time can be seen in Figure 6. The experimental groups exhibited similar solubility at all storage times except for the one month time period. The control groups exhibited increasing solubility with the increase in storage time which appeared to peak at one month and then decrease. The results for multivariate Vitremer solubility for both curing modes as a function of thickness can be seen in Figure 7.

Comparative solubility trends between the two Vitremer groups are compared with the results graphically superimposed in Figure 8. The experimental samples are represented by the dotted lines while the control samples are depicted with the solid lines. It can be readily observed that solubility over time between the two curing modes exhibits a similar trend, as independent of each thickness by curing mode pair only identified four instances of significant difference in solubility.



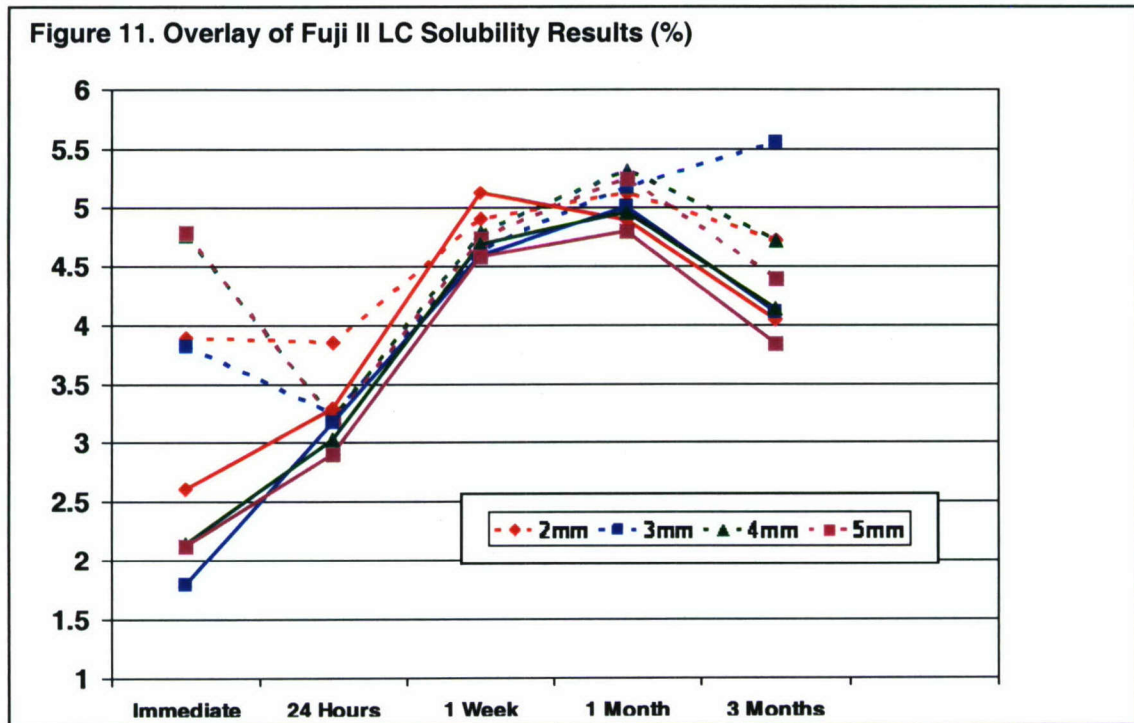
Graphical results for the multivariate analysis of the Fuji II LC solubility groups as a function of curing mode and storage time can be seen in Figure 9. The Fuji II LC experimental groups exhibited statistically less solubility at 24 hours but increased solubility as storage time progressed. The control samples likewise exhibited a significant increase in solubility as storage time progressed, which likewise to the Vitremer samples, appears to peak at one month storage.



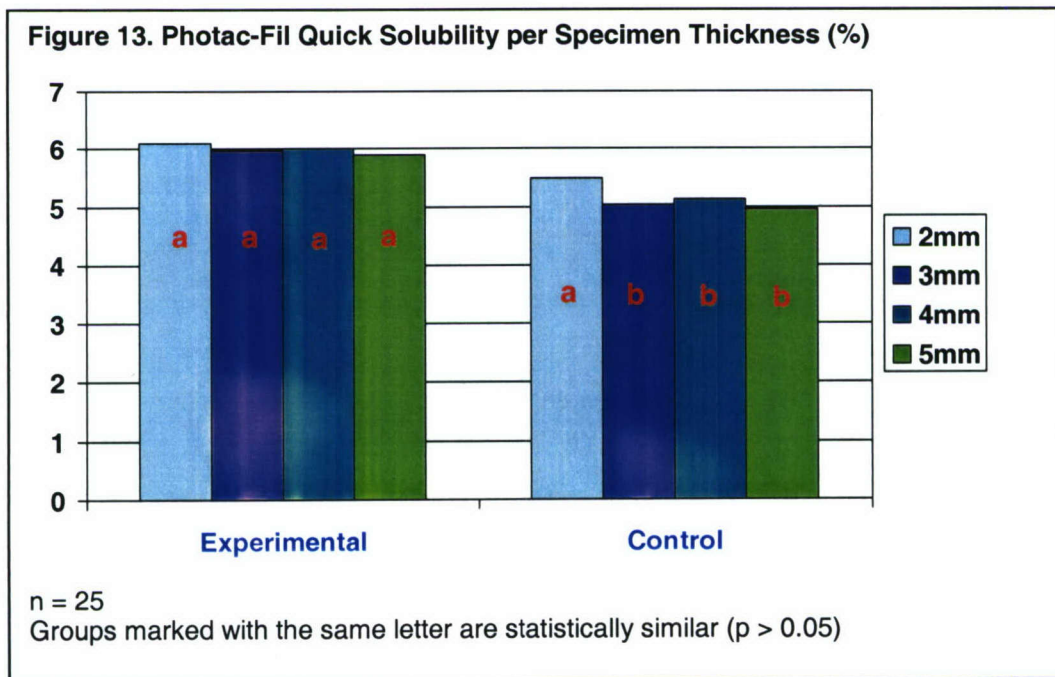
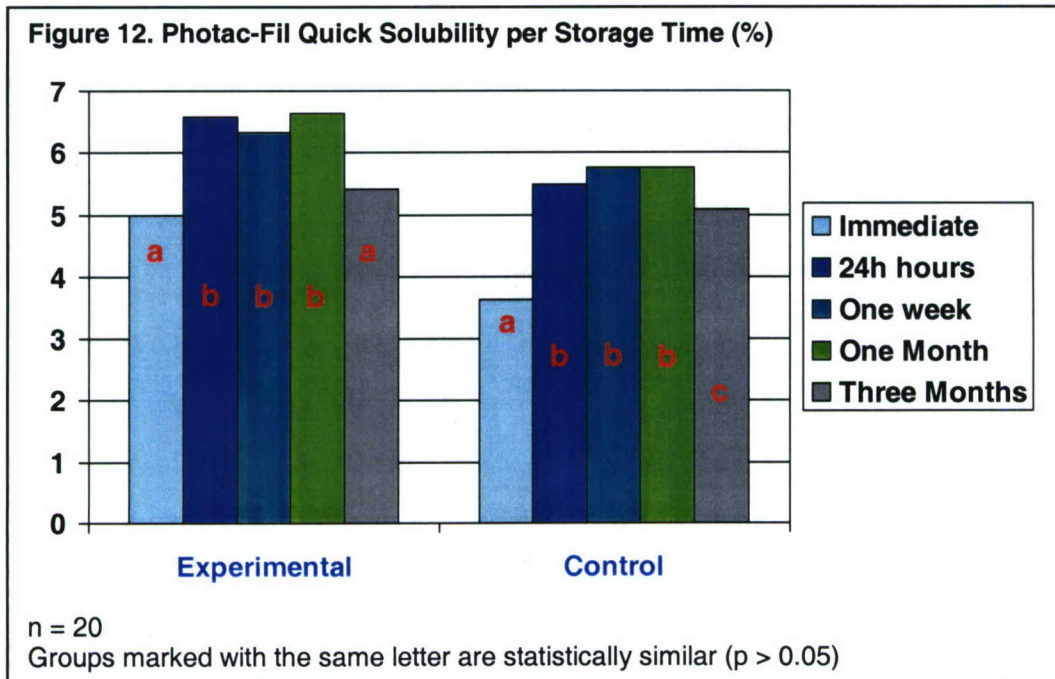
Graphical results for the multivariate analysis of the Fuji II LC solubility groups as a function of curing mode and specimen thickness can be seen in Figure 10. Interestingly, the experimental groups exhibited similar solubility regardless of sample thickness while the control groups were observed to demonstrate decreased solubility as the sample increased in thickness.

An overlay of the Fuji II LC control and experimental solubility results is depicted in Figure 11. The experimental results are annotated with dotted lines and the control results are represented

by solid lines. Independent t-test analysis of each curing mode thickness pair at the same storage time identified that the control group for the immediate, three-month, and all but the 3 mm samples of the 24-hour group exhibited significantly less solubility than the experimental samples. Similar to the Vitremer samples, the overall solubility trend of increasing solubility with increased storage time with solubility peaking at one month is evident.

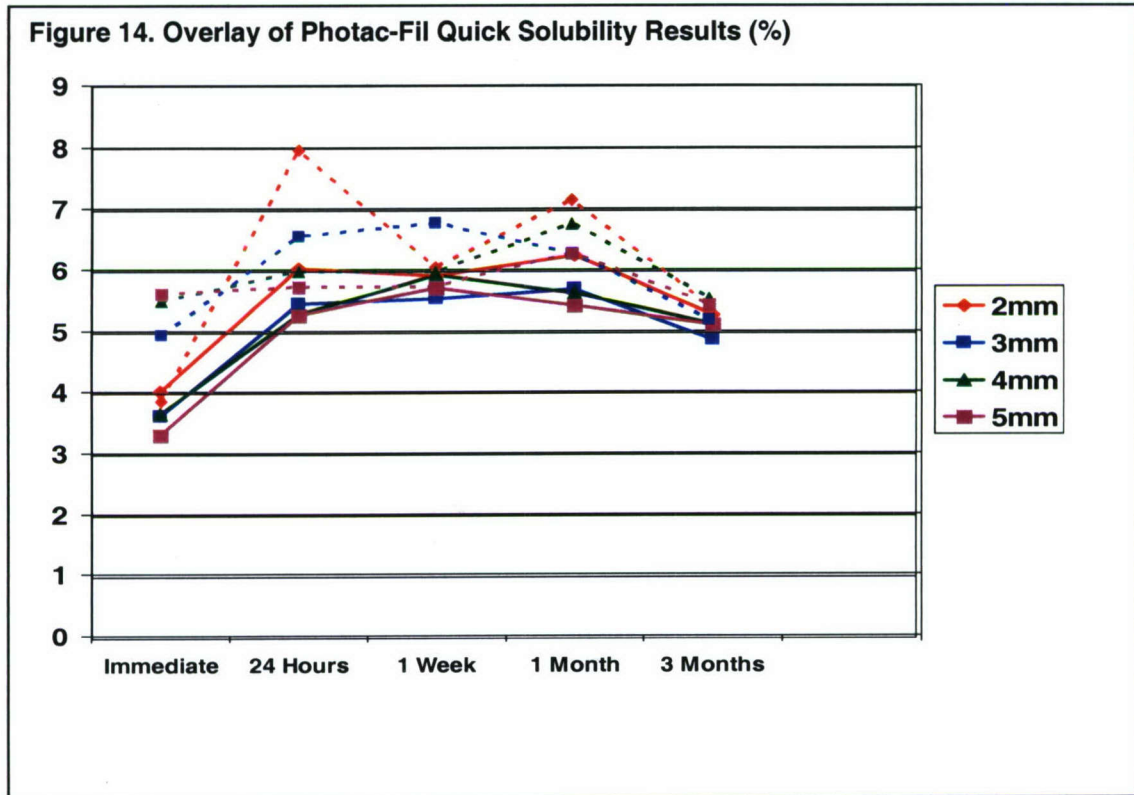


Graphical results for the multivariate analysis of the Photac-Fil Quick solubility groups as a function of curing mode and storage time can be seen in Figure 12. With both curing modes there was a significant increase in solubility with increasing storage time that exhibits a significant decrease after one month of storage. When considered per specimen thickness (Figure 13), the Photac-Fil Quick experimental specimens, similar to that seen of Fuji II LC, do not differ significantly in solubility. Also similar to Fuji II LC, the Photac-Fil Quick control samples exhibit significantly less solubility with increased sample thickness, with the 2 mm specimens displaying significantly more solubility than the other thicknesses.



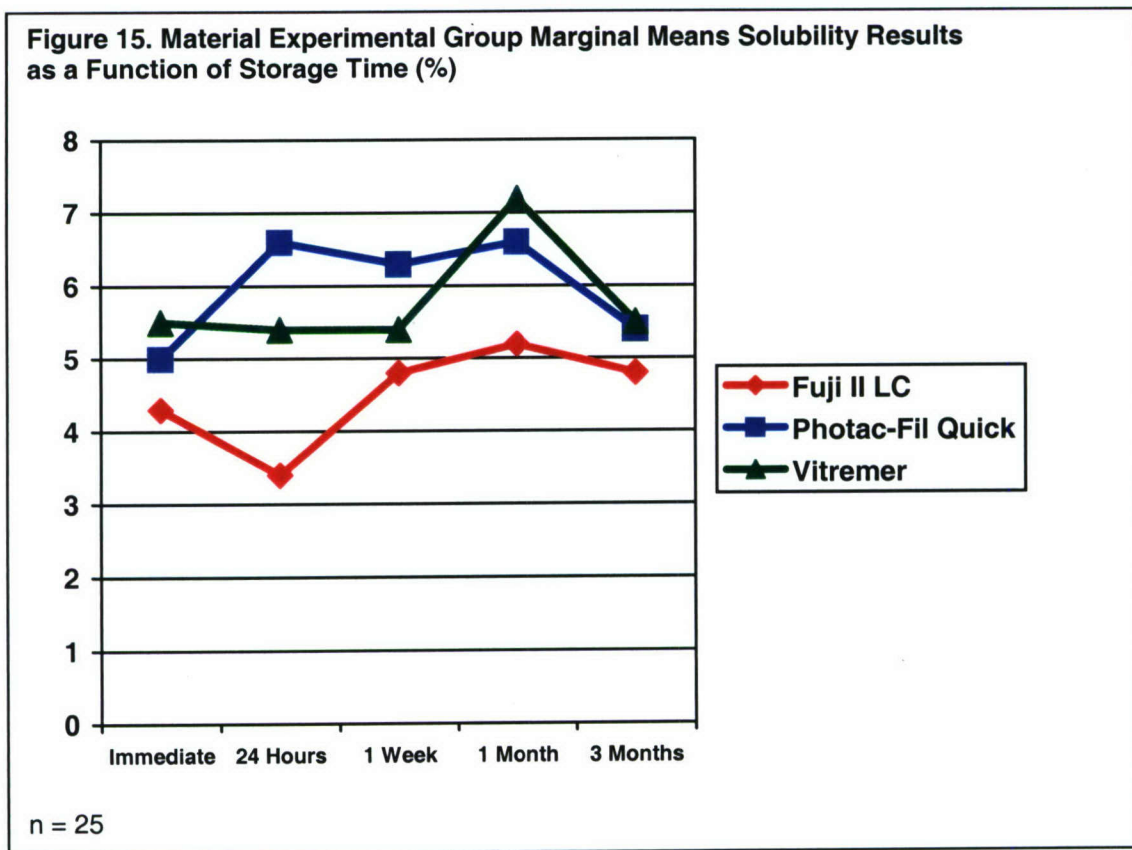
Photac-Fil Quick combined control and experimental solubility results are graphically depicted in Figure 14, with the dashed lines depicting the experimental samples and the solid lines annotating the control samples. Independent t-test analysis of each curing mode thickness pair at the same storage time identified that the control group samples exhibited significantly less

solubility overall than the experimental samples, except for the three-month storage time at which all exhibited similar solubility. Similar to Vitremer and Fuji II LC, the solubility of Photac-Fil Quick exhibits an increasing trend of solubility that decreases after one month of storage.



The marginal means of each material as a function of storage time are depicted in Figure 15. The experimental group is depicted as this curing mode is representative of clinical conditions. It was not the purpose of this thesis to compare the performance of each material: any such contrast is accomplished only to observe overall material trends under similar conditions. All three materials displayed a trend of increasing solubility with increase of storage time that peaked at the one-month storage interval. This solubility behavior was not totally expected, as it could be assumed that solubility would decrease as the RMGI matrix matured with increasing time. Glass-ionomer materials have been reported to exhibit continued matrix maturity with time,<sup>3</sup> and the exact time intervals involved with RMGI maturity have not been fully revealed. Sidhu *et al.*<sup>68</sup> elucidated some information concerning the matrix maturity of RMGI materials,

and found that Fuji II LC, Photac-Fil Quick, and Vitremer did not exhibit matrix maturity at three months, as evidenced by all materials being susceptible to dehydration effects. At six months, Fuji II LC exhibited resistance to dehydration suggesting matrix maturity, and it required 12 months for Vitremer and Photac-Fil Quick to reach the same level.<sup>68</sup> It can be inferred that the decrease in solubility noted at three months for each of these materials is associated with the matrix maturity process; perhaps this solubility behavior provides evidence that the resin-modified glass-ionomer materials are susceptible to the effects of dehydration for up to one month. However, further evaluation is required for further storage time periods before more definitive comparisons should be attempted.



For the three materials, it is interesting to also note that the trend within each material is that the solubility between the different curing methods was not overwhelmingly significantly distinct. The experimental curing method (visible light activation at the top surface) simulates the clinical situation. The control curing method (visible light activation at the top and bottom surfaces) was designed to allow possible comparison of solubility dynamics between the clinical and a more

thoroughly-cured RMGI sample. It was expected that the additional curing of the bottom surfaces afforded to the control samples would effect almost uniformly less-soluble samples, as compared to the experimental group. Review of Tables 1, 2, and 3 will show the t-test results between individual specimens of the same thickness and storage time, and will demonstrate individual instances of non-difference between samples as per curing mode.

The lack of uniform difference between curing modes of the RMGI materials might be explained by the resin content of the RMGI materials. RMGI have been reported to be composed of approximately 4.5 – 6 percent resin in the set product.<sup>10</sup> Although the presence of resin may purportedly improve some physical properties of glass ionomer materials, perhaps the amount of resin present is in insufficient quantity to affect solubility behavior. Accordingly, the solubility behavior of the RMGI materials may be more dictated by the conventional, acid-base components of the hybrid material.

Another unexpected finding under the conditions of this study was the lack of solubility differences between the different depths of samples. Additional one-way ANOVA of the Vitremer samples as a factor of thickness did not find a significant difference in solubility for the experimental samples ( $p = 0.141$ ) as well as the control samples ( $p = 0.243$ ). Analysis of Fuji II LC samples did not identify a significant difference in solubility within the experimental samples ( $p = 0.986$ ) or the control samples ( $p = 0.732$ ). Likewise, analysis of Photac-Fil Quick samples did not find a significant difference among the experimental samples ( $p = 0.912$ ) nor the control specimens ( $p = 0.179$ ). Although experimental conditions were followed as precisely as possible, solubility testing did result in some groups yielding variant standard deviations. However, it is thought that the wide standard deviations observed would not affect the overall results reported in this evaluation.

One explanation that may have resulted in the lack of solubility difference findings of this study could be due to the kinetics of water penetration into the samples. Water diffusion into most

dental materials follows Fick's First Law of Diffusion, which follows that for disc specimens (where edge effects can be ignored) the following equation applies:

$$M_t / M_\infty = 2(Dt/\pi l^2)^{1/2}$$

where

$M_t$  = the mass up take at time  $t$  (seconds)

$M_\infty$  = is the equilibrium uptake

$l$  = the thickness of the specimen

$D$  = the diffusion coefficient.<sup>69</sup>

Nicholson<sup>70</sup> reported the water absorption of two resin-modified glass-ionomer restorative materials (Vitremer and Baseline VLC [no longer manufactured]) and found that, based on solution used, the two materials exhibited absorption behavior that followed Fick's First Law for only an initial period of time. Nicholson identified that curing duration effected a dependent action on the diffusion coefficient, in that longer visible light polymerization times had an inverse effect on the diffusion coefficient. Nicholson reasoned that the longer curing duration polymerized more previously-soluble materials into a more insoluble state. Furthermore, an increase in the degree of polymerization would reduce the ease in which water molecules could potentially diffuse through the structure.<sup>70</sup> Although as water diffusion rate into the resin-modified glass-ionomer materials declined with increasing time, Nicholson reported that it still required a total of ten days to reach equilibrium with a 2.8-millimeter thick disc of Vitremer.<sup>70</sup>

Nicholson's work was reinforced by two reports by Jevnikar *et al.*<sup>71,72</sup> using micro-magnetic resonance imaging techniques. In their first report,<sup>71</sup> the authors compared water infiltration into both conventional and resin-modified glass ionomer restorative materials for up to 192 hours and reported that in the first 24 hours water diffused 0.72 mm into the conventional material and 0.33 mm into resin-modified glass ionomer material. The conventional glass-ionomer materials required 96 hours for full water equilibrium, however; the resin-modified glass-ionomer material required 192 hours, which led the authors to conclude that resin-modified glass-ionomer restorative materials are more impervious to water infiltration than their conventional

counterparts.<sup>71</sup> In their second report, Jevnikar *et al.*<sup>72</sup> investigated the effect of surface coatings on water migration into resin-modified glass-ionomer restorative materials using similar techniques as in their previous report and further demonstrated that water diffusion into these materials are limited for the first 24 hours.

This information from Nicholson<sup>70</sup> and Jevnikar *et al.*<sup>71,72</sup> may provide insight pertaining to why a profound expected difference was not observed in solubility between the control and experimental groups during this evaluation. Accordingly, since only a 24-hour water exposure time was used for solubility determination, the water diffusion rate into the respective materials represented only near-surface solubility behaviors. Hence, the solubility results were limited by the rate of water diffusion into the thicker materials and did not represent the solubility behavior of the entire sample. Future solubility evaluations involving resin-modified glass-ionomer restorative materials should include increased water exposure time to equilibrium conditions.

Insight into the behavior of increasing solubility over the first month could be provided by the lower-kinetic reactions that continue with glass-ionomer materials. It has been reported that with conventional glass-ionomer materials both compressive and flexural strengths decline after a few months of water storage.<sup>73,74</sup> Although these changes were first thought to be due to hydrolytic instability,<sup>73,74</sup> it was reported later by Nicholson and Abiden that these changes occurred even with anhydrous storage in oil.<sup>75</sup> It is thought that the observed strength degradation is due to increased material brittleness resulting from the continued slow reactions that lead to higher polymer cross-link density within the glass-ionomer material.<sup>3</sup> These continued reactions in addition could create internal stresses of such magnitude that stress release is afforded by the creation of internal defects that communicate to the surface. Although this remains conjecture, such communications could allow additional increase of surface area exposed to water and result with increased solubility. If the reactions were to cease after a certain period of time, no further stresses would be generated and solubility at that point would either plateau or decline. Decline could be possible if the proposed surface alterations could be healed, as resin-modified glass-ionomer restorative materials have been

reported to self-heal cracks upon exposure to water.<sup>67,76</sup> Nevertheless, the solubility results provides strong evidence that the continuing polyalkenoate reaction can be susceptible to solution effects for up to one month after fabrication.

### **Microhardness**

The use of hardness to observe the setting and curing behavior of resin-modified glass-ionomer materials has been investigated,<sup>59,76-83</sup> as the change in hardness may reflect a material's state of cure and possibly demonstrate the continuation of a setting reaction.<sup>81</sup> Xie *et al.*<sup>82</sup> evaluated the physical properties of glass-ionomer materials that included Knoop hardness after seven days storage and found that as a whole, the resin-modified glass-ionomer materials exhibited lower Knoop hardness numbers than the conventional materials.

Swift *et al.*<sup>59</sup> reported the depth of cure of different resin-modified glass ionomer materials using Knoop Hardness for up to seven days. These researchers evaluated the depth of cure of Fuji II LC, Photac-Fil, Vitremer, and two compomers (Geristore and Variglass) for seven days with each material evaluated in depths up to nine millimeters. Reported results stated that all materials could only be analyzed at depths five millimeters and less, as depths greater than five millimeters were too soft to obtain KHN readings. All of the resin-modified glass-ionomer materials (except Photac-Fil) exhibited an increase in hardness at all depths over the seven-day storage time. Interestingly, at the end of seven days Fuji II LC was reported to have a higher KHN at the 5 mm depth than the top surface, as with Vitremer when evaluated at one day.<sup>59</sup> Their results contrasted with the findings of this thesis, that the bottom hardness did not achieve the same KHN of that seen of the top surfaces. Although they reported that all of the resin-modified glass-ionomer products exhibited satisfactory depth of cure at five millimeters, it was still recommended that these products be placed in thicknesses of three millimeters or less.<sup>59</sup>

Yap<sup>78</sup> compared Vickers hardness of different glass-ionomer, composite, and compomer restorative materials for up to six months. In this report, Fuji II LC and Photac-Fil demonstrated

significantly greater hardness at 24 hours than at six months, which was contrasted by Vitremer that initially demonstrated lower hardness but demonstrated increasing hardness with storage time and was comparable in hardness to Fuji II LC and Photac-Fil at the six-month evaluation period.<sup>78</sup> The findings of this thesis found similar results with Vitremer whose top-surface KHN increased over a period of time, but this study contrasted in that Photac-Fil Quick top-surface KHN was demonstrated to increase to a maximum hardness at one month. Fuji II LC top-surface hardness was found to maintain a steady value over the evaluation period.

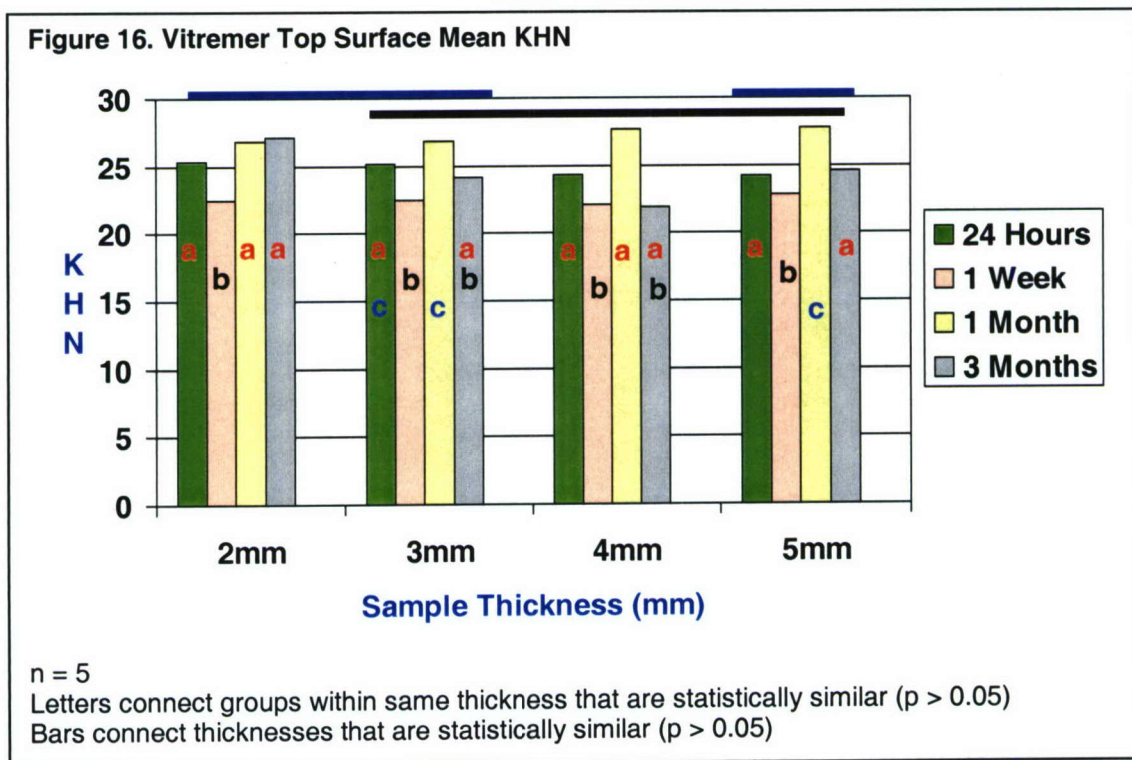
Gladys *et al.*<sup>76</sup> reported Vickers hardness determinations of Fuji II LC (both encapsulated and hand mixed), Vitremer, and Photac-Fil as the part of an extensive evaluation of restorative material physical property determinations. These investigators reported that the Vickers hardness of the three materials were somewhat similar, with Fuji II LC exhibiting slightly more hardness values than Vitremer, which in turn demonstrated slightly more hardness values than Photac-Fil.<sup>76</sup> In this thesis study, Vitremer was found to exhibit mean top-surface KHN values slightly more than Fuji II LC, which in turn demonstrated higher values than Photac-Fil Quick.

Ellakura *et al.*<sup>79</sup> compared the surface microhardness of resin-modified and conventional glass-ionomer materials as a function of time and water exposure. These researchers followed Vickers microhardness at 1, 7, 15, 30, 90, 180, and 365 days of Fuji II LC, Photac-Fil, and Vitremer as well as Ketac-Fil, Ketac-Molar, and Ketac-Silver. Results found that the resin-modified materials all demonstrated significantly lower microhardness than some of the conventional glass-ionomer materials (Ketac-Fil and Ketac-Molar).<sup>79</sup> Among the resin-modified materials, all materials demonstrated lower hardness at the 24-hour time period but then demonstrated thereafter an increase in hardness. However, Photac-Fil hardness peaked at 15 days while the hardness of Vitremer and Fuji II LC peaked at 60 days. After this time period, the surface hardness of the materials decreased in various amounts up to one year.<sup>79</sup> Results of this thesis corroborated with their results in that most of the RMGI materials demonstrated an

increase in top-surfaced KHN but differed in that materials demonstrated (except Fuji II LC) maximum hardness at three months.

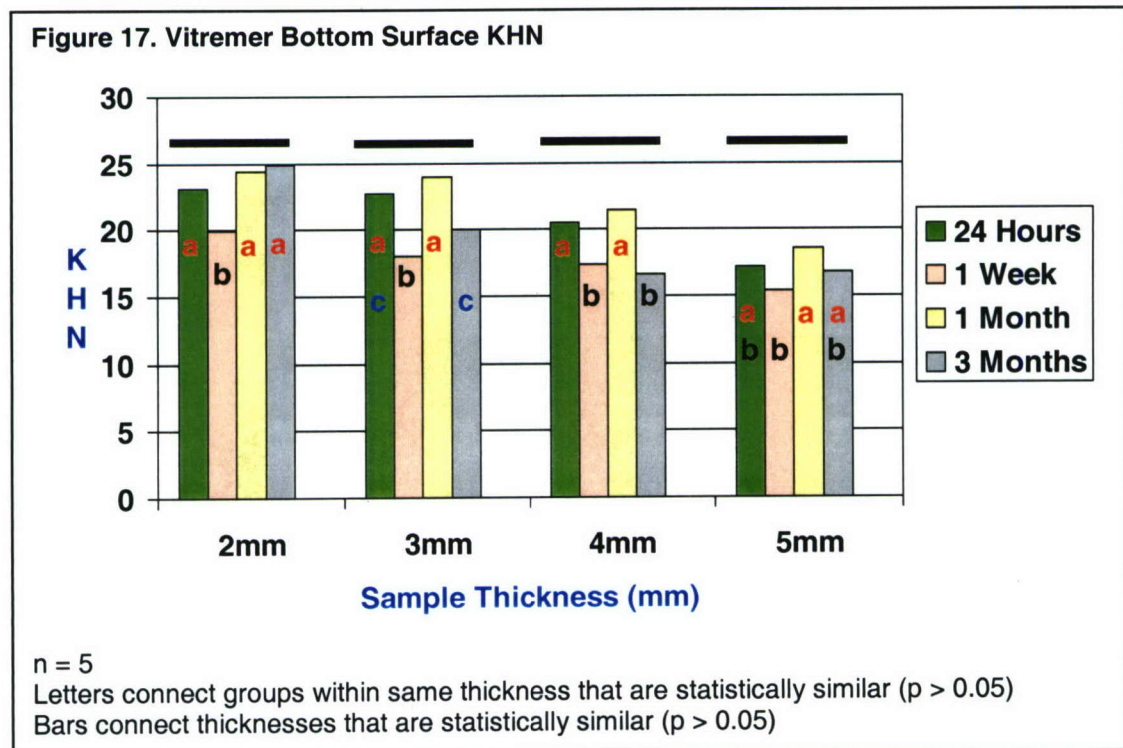
Kanchanasavita *et al.*<sup>83</sup> evaluated the surface hardness of two restorative (Fuji II LC and Vitremer) and two liner resin-modified glass-ionomer materials for up to one year with samples stored both in distilled water and artificial saliva. In this report, both of the restorative materials stored in distilled water reached maximum hardness at 24 hours, and it was reported that the hardness of Fuji II LC and Vitremer were statistically similar. The restorative materials maintained their surface hardness for the duration of the evaluation. It is interesting to note that storage in artificial saliva had a detrimental affect on the maintenance of surface hardness for all of the materials evaluated.<sup>83</sup> As with the study by Ellakura *et al.*,<sup>79</sup> results of this thesis differed in that the materials evaluated reached a maximum KHN value at a later period in time.

The top surface hardness of the Vitremer samples over the storage periods are depicted

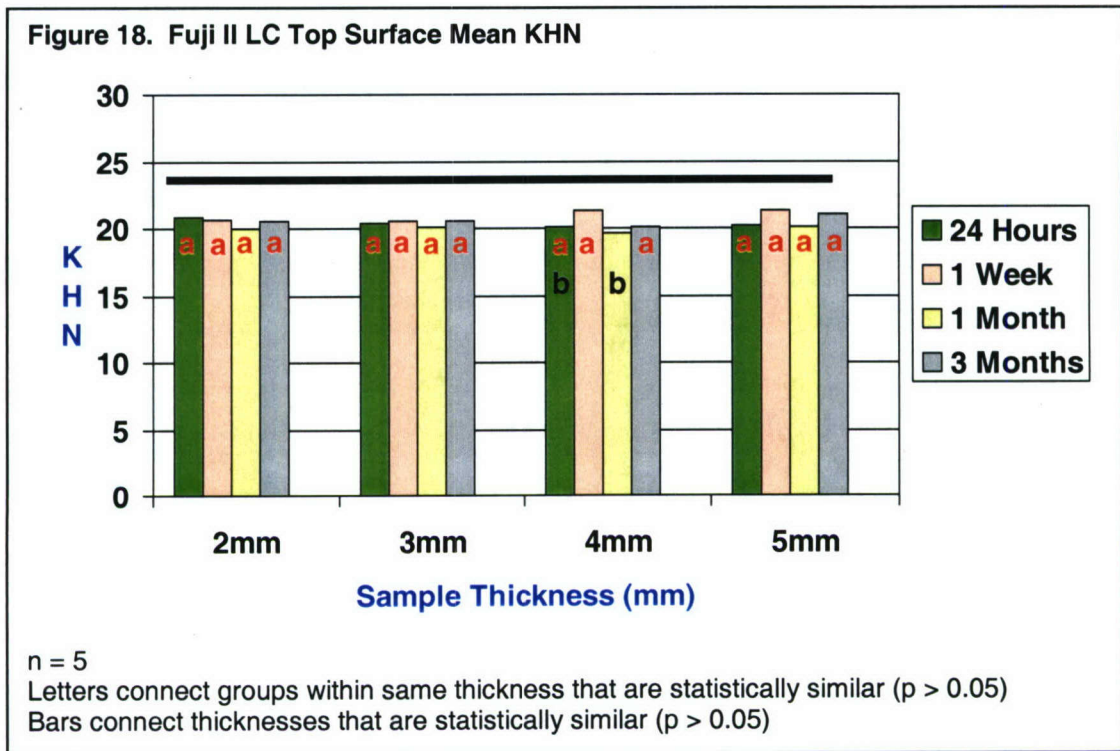


graphically in Figure 16. Within each thickness, the top surface KHN of the Vitremer samples underwent a significant decrease in KHN at one week, which was followed by a significant

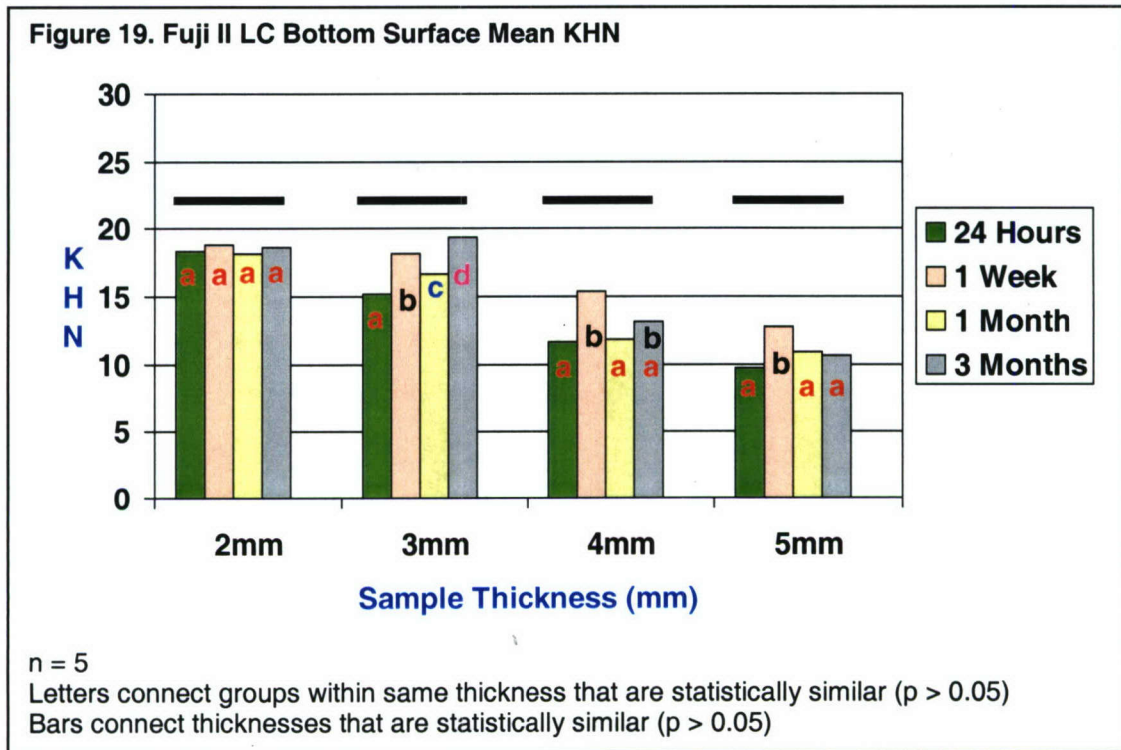
increase in hardness at the one-month storage period. At three months, the top surfaces of all of the specimens were similar in hardness to that seen at 24 hours. Analysis of the Vitremer bottom surface KHN over the storage time periods are depicted in Figure 17. Similar to the top surface, the bottom surfaces of all the thicknesses demonstrated a significant decrease in hardness at one week, but all then demonstrated an increase in hardness at one month that was similar to 24 hours. All thicknesses except the 4 mm group exhibited bottom surface hardness at the three-month storage period that was statistically similar to that seen at 24 hours. All of the thickness groups demonstrated significant differences in hardness, with the 2 mm group demonstrating the highest KHN that progressively decreased to the 5 mm group, which had the lowest mean KHN.



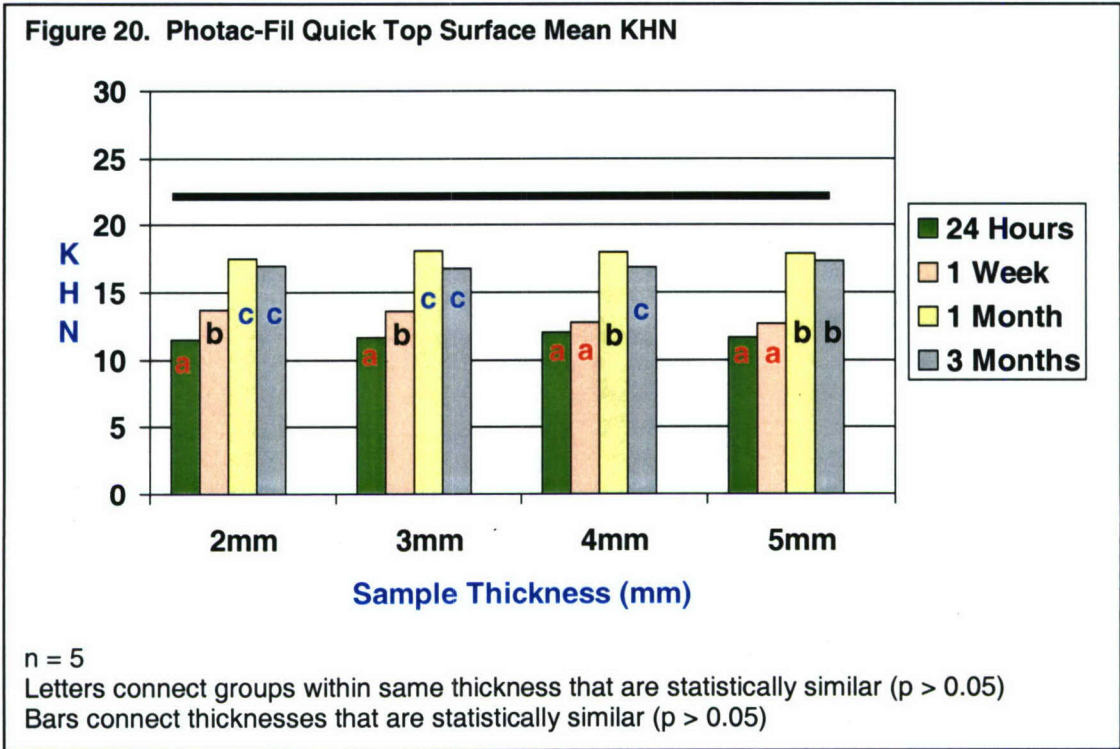
The Fuji II LC top surface mean KHN segregated by sample thickness are depicted in Figure 18. The top surfaced displayed overall stability in hardness over the storage period, except for the 4 mm samples which demonstrated a significant decrease in hardness at one month. However, recovery of hardness was noted at three months. There was no difference in top surface KHN found between the different thicknesses over the storage time.



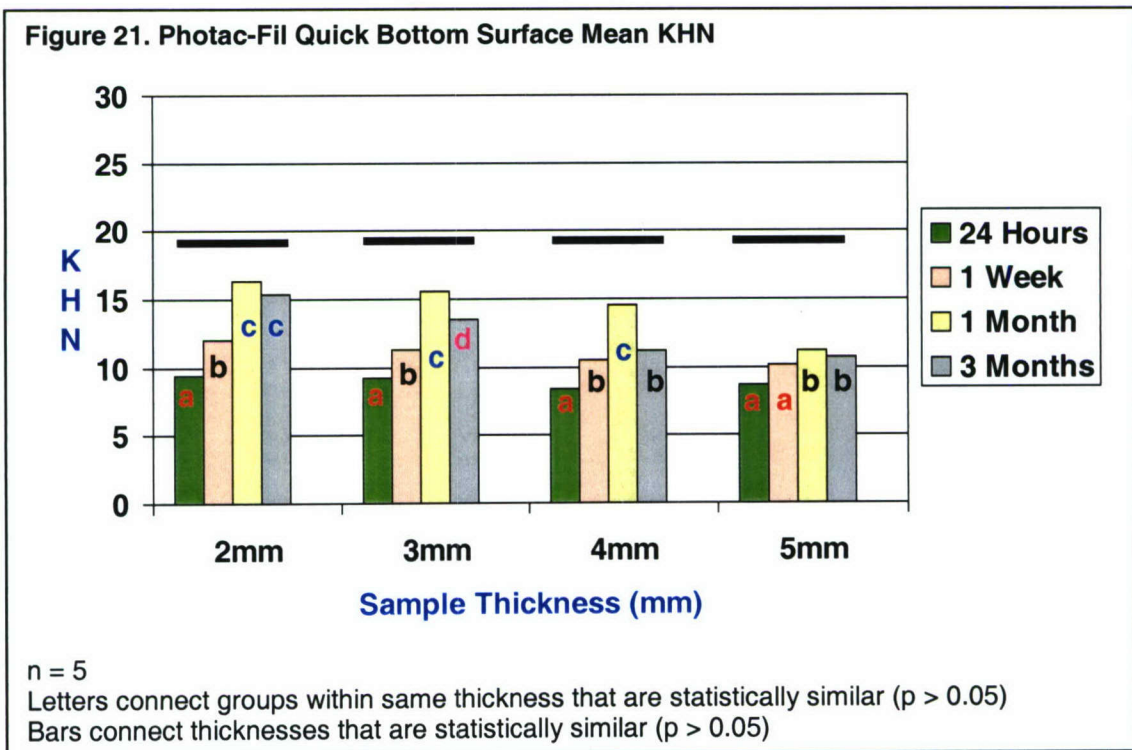
Similar analysis of the Fuji II LC bottom surface hardness by thickness can be observed in Figure 19. The bottom surfaces of the 2 mm samples remain stable, whereas the 3 mm samples undergo a significant increase in hardness at each observation period throughout the storage period. The 4 mm samples display a significant increase in hardness at the one-week time, but the hardness decreases significantly at one-month and then regains hardness to the one-week level at three months. The 5 mm samples also demonstrate a significant hardness increase at one week, but then decreases to the initial 24-hour level. Two-way ANOVA identified that all of the thicknesses demonstrated significant difference in hardness; as the thickness increased the magnitude of the bottom surface hardness decreased.



The Photac-Fil Quick top surface mean KHN are depicted in Figure 20. All of the top surfaces demonstrated progressive significant increases in KHN throughout the storage period, most notably between the 24-hour, one-week, and one-month storage periods for the 2 mm and 3 mm thicknesses; between one-week, one-month, and three-months storage for the 4 mm samples; and between the one-week and one-month storage for the 5 mm samples. Two-way ANOVA did not find a significant difference between the mean hardness of any of the top surfaces over the three-month storage period ( $p = 0.825$ )



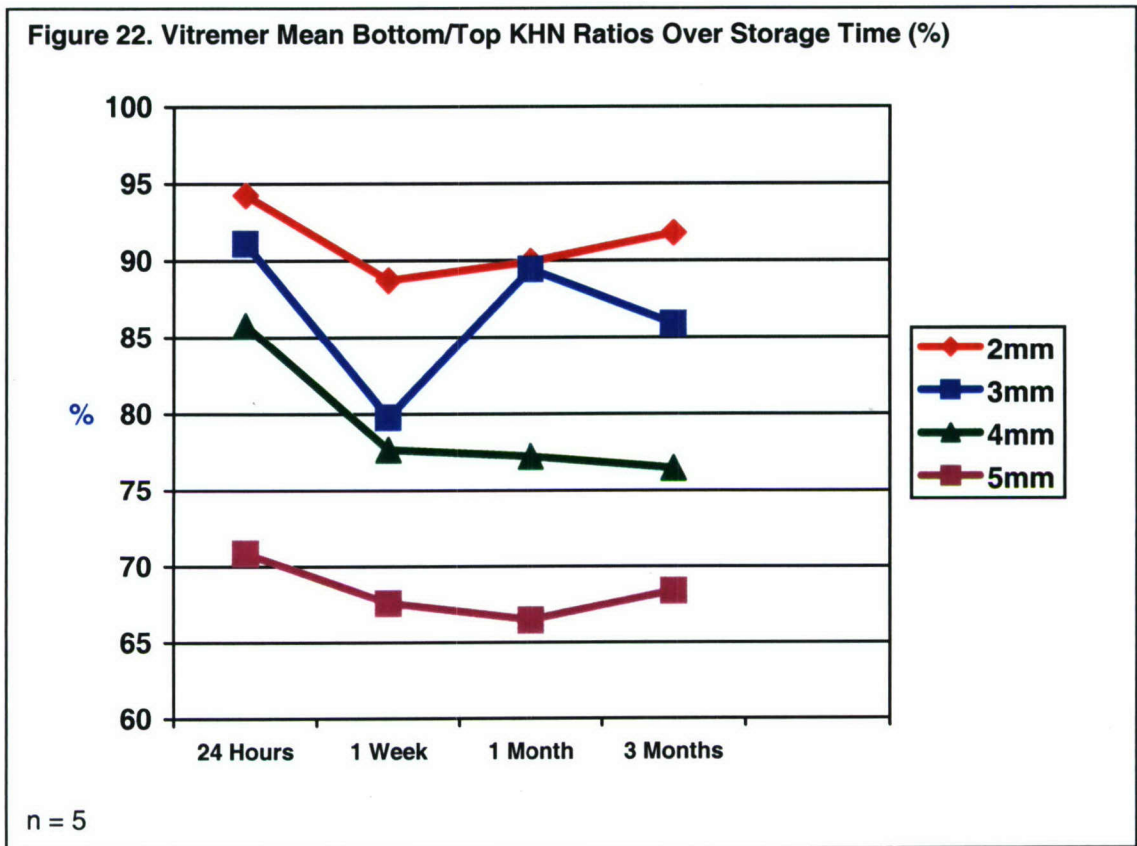
The Photac-Fil Quick bottom surface mean KHN segregated by sample thickness are depicted in Figure 21.



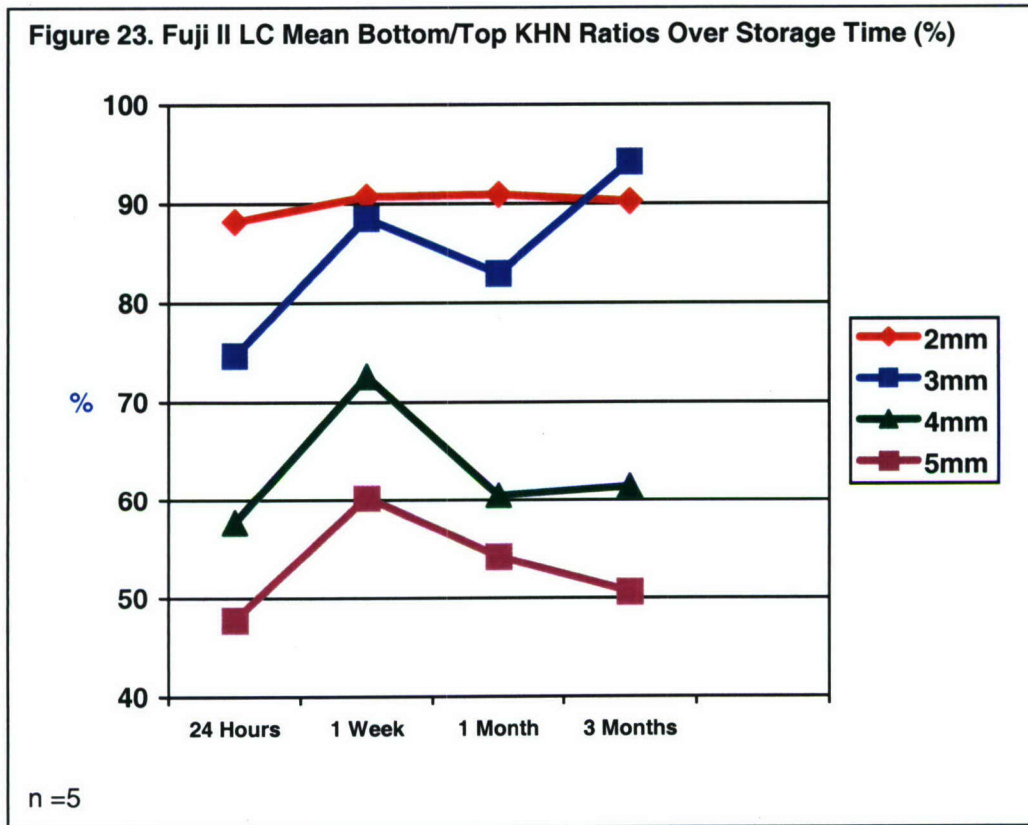
Almost mirroring the KHN results of the top surface, all of the bottom surfaces of the various thicknesses exhibit progressive and significant increase in hardness up to one-month point and then demonstrate a hardness decrease, though not always significant. Furthermore, two-way ANOVA found significant differences between the thicknesses, with KHN decreasing as the thickness increased.

The use of surface hardness in the determination of composite resin restorative material depth of cure has largely utilized Knoop hardness, which has been reported to correlate well with methacrylate degree of conversion determined with FTIR as well as other material physical properties.<sup>84,85</sup> Furthermore, the comparison of the top- and bottom surface Knoop hardness ratios have been used as a method for the determination of adequate visible-light-curing resin polymerization, with a bottom/top ratio of at least 0.80 suggesting an adequate cure.<sup>86-88</sup> Prior published research has not explored the use of a similar ratio suggesting adequacy of cure with resin-modified glass-ionomer materials. Analysis of the KHN bottom/top ratios of the resin-modified glass-ionomer materials was investigated to identify any possible trends that could be associated with these materials.

Vitremer samples of all thicknesses demonstrated a diminishing trend of the bottom/top ratio (Figure 22) from 24 hours to one week after which the 2 mm and 3 mm samples experienced some increase of the ratio, nearly coinciding at one month. The 2 mm samples did not experience a significant change ( $p = 0.195$ ) during the storage period whereas the 3 mm group demonstrated a significant loss ( $p < 0.0001$ ) at one week but regained at one month to be significantly similar to the 2 mm samples ( $p = 0.829$ ). The 4 mm and 5 mm samples, although displaying a decrease in the bottom/top ratio, did not experience a significant loss ( $p = 0.206$ ,  $0.500$ , respectively). At the end of the three-month storage period, none of the KHN bottom/top ratios were statistically similar ( $p < 0.0001$ ).



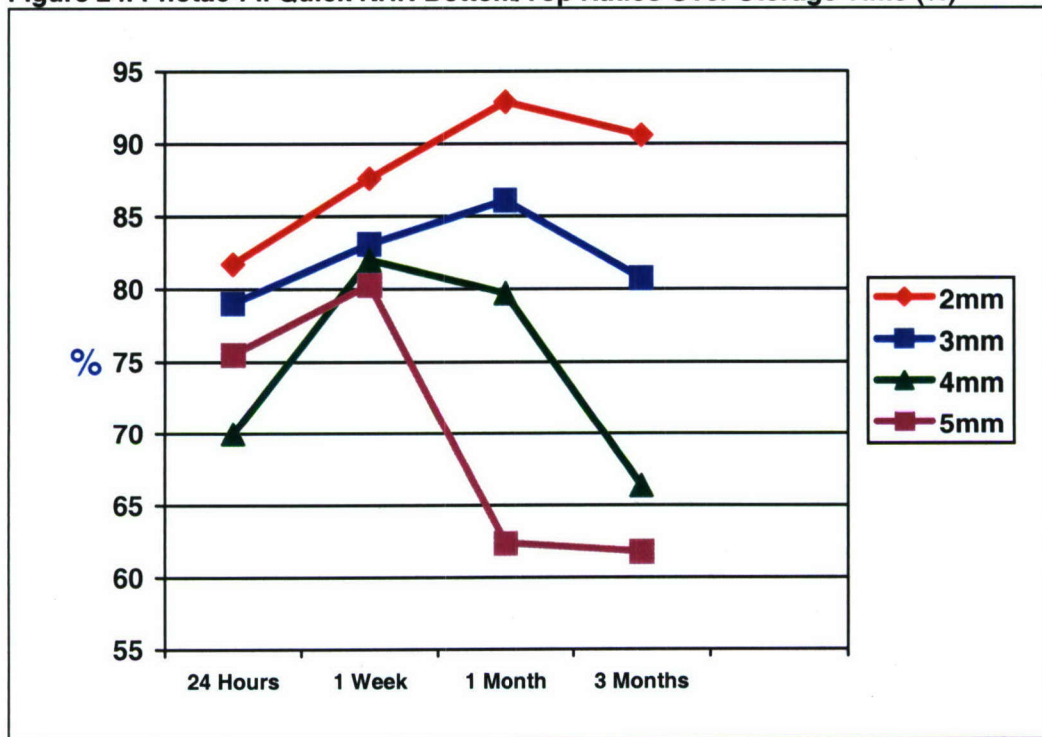
Graphical depiction of the Fuji II LC bottom/top KHN ratio over time per thickness and storage time can be observed in Figure 23. The 2 mm samples displayed a stable ratio throughout the storage period, whereas the 3 mm samples displayed significant increases of the KHN ratio throughout the observation time ( $p < 0.0001$ ). The 3 mm samples at one week displayed a mean KHN ratio that was statistically similar to the 2 mm samples ( $p = 0.357$ ). Furthermore, the three-month KHN ratio for the 3 mm samples interestingly also increased to the level that was statistically similar ( $p = 0.233$ ) to that of the 2 mm samples. The 4 mm samples demonstrated a significant increase at one week ( $p = 0.002$ ) that was followed by an insignificant decline at one and three months. The 5 mm samples similarly demonstrated a significant KHN ratio increase at one week ( $p = 0.002$ ) that was also followed by a diminishing of the ratio that was found to be similar to the ratio that presented at 24 hours.



At the end of the three-month storage period the 2 mm and 3 mm samples had similar KHN bottom/top ratios but were statistically greater than the 4 mm and 5 mm samples ( $p < 0.0001$ ).

The Photac-Fil Quick bottom/top KHN ratios are presented in Figure 24. Interestingly, the ratio of the 2 mm and 3 mm samples are statistically similar ( $p = 0.304$ ) which is maintained until one month. All the thicknesses demonstrate a trend for increase in the KHN ratio at one week, after which the 2 mm and 3 mm samples continue to increase until the one month time period. The 4 mm samples decline after one week whereas the 5 mm samples demonstrate a significant decline ( $p = 0.021$ ) in the KHN ratio after one week. At one month and at three months, the 4 mm and 5 mm samples continue on a downward trend. At the end of the three-month period, the Photac-Fil Quick different thicknesses, similar to Vitremer, are not statistically similar ( $p < 0.0001$ ).

**Figure 24. Photac-Fil Quick KHN Bottom/Top Ratios Over Storage Time (%)**



n = 5

The results of this study corroborate the findings of earlier studies. Similar to Yap,<sup>78</sup> Ellakuria *et al.*,<sup>79</sup> and Kanchanasita *et al.*<sup>83</sup> the RMGI materials used in this evaluation demonstrated a variation in top surface KHN with storage time. However, where this study mainly differs from the previous studies is the time in which the KHN variation occurs. Yap reported that Fuji II LC and Photac-Fil Quick demonstrated the highest top-surface Vickers hardness at 24 hours while Vitremer had significantly higher hardness at 6 months.<sup>78</sup> Ellakuria *et al.* reported that Photac-Fil Quick demonstrated its maximum hardness at 15 days whereas Fuji II LC and Vitremer increased in hardness to maximum levels at two months.<sup>79</sup> Kanchanasita *et al.* reported that Fuji II LC, Photac-Fil Quick, and Vitremer all exhibited maximum hardness at 24 hours.<sup>83</sup> In contrast to these reports, the findings of this study did demonstrate an increase in top KHN numbers, but the maximum hardness for both Vitremer and Photac-Fil Quick were observed to occur at one month. Also, contrary to earlier reports, Fuji II LC did not demonstrate a significant change in top surface KHN over the evaluation period, although an increasing trend was noted to occur at one week for some thicknesses. It should be noticed that all earlier studies involving

hardness of RMGI materials mainly involved analysis of development of just top-surface hardness. Only this report and the study published by Swift *et al.*<sup>59</sup> involved analysis of RMGI bottom surface hardness.

The overall results of the hardness testing of the resin-modified glass-ionomer restorative materials provide some evidence of a continuing setting reaction and reinforces the concept that the addition of resin does not totally inhibit the potential for the polyalkenoate reaction to continue. Young<sup>25</sup> reported in a FTIR study of one-millimeter-thick, resin-modified glass-ionomer products that approximately 97 percent of the methacrylate reaction was complete after 150 seconds. Accordingly, this FTIR study provides emphasis that any continuing setting reactions in the upper regions of RMGI materials after this time are predominately the acid-base polyalkenoate setting reaction. The deeper regions are similarly assumed to predominately possess the polyalkenoate acid-base reaction, as all materials were observed to demonstrate an increase in bottom-surface hardness in varying degrees over the course of this study.

Both Vitremer and Photac-Fil Quick demonstrated a peak in bottom-surface KHN at one month, whereas Fuji II LC bottom-surface KHN appeared to be at its maximum (except for the 3 mm bottom surface) at one week. Thereafter, the bottom surface KHN of all the materials demonstrated a decrease; however the hardness was not observed to fall (except for the Vitremer 4 mm samples) significantly below the hardness exhibited at 24 hours. These findings do reinforce the concept that a lower-kinetic reaction does take place in the deeper regions of the resin-modified glass-ionomer materials. However, the decrease in hardness values after a certain time indicates, especially in the 4 mm and 5 mm samples, that the process reaches an endpoint.

Whereas the Vitremer and Fuji II LC top surface KHN remained stable, the top surface KHN of the Photac-Fil Quick samples demonstrated an increase of hardness with time that approximately mirrored the development of KHN in the bottom surfaces. The development of

hardness in the top surface of the 2 mm Photac specimens displayed significant correlations ( $\alpha = 0.01$ ) with the development of hardness in the bottom surfaces of the 3 mm (Pearson's 0.945,  $p < 0.0001$ ), 4 mm samples (Pearson's 0.816,  $p < 0.0001$ ) and 5 mm samples (Pearson's 0.686,  $p = 0.001$ ). These correlations provide evidence that the setting reaction that enables the hardness development is possibly similar, as the bottom and top hardness of the Photac-Fil Quick samples appears to be developed by the same kinetics.

In spite of these signs of continued reactions, none of the materials developed a bottom surface KHN in the thicker samples (4 mm and 5 mm) that approximated the hardness observed in the 2 mm thick samples. This is made most evident in the examination of the KHN bottom/top ratios over the storage periods. Except for Vitremer, the ratios do reflect initial signs of a continued setting reaction in the 4 mm and 5 mm samples, but the trend is reversed at one week for both Fuji II LC and Photac-Fil Quick.

Using the ratio of the bottom KHN to the top KHN of the materials allows some interpretation of the overall effect of the development of KHN of the resin-modified glass-ionomer materials. As this ratio has been utilized extensively in the study of resin composites,<sup>84-88</sup> it has not been reported previously involving resin-modified glass-ionomer materials. Fuji II LC and Vitremer presented stable KHN ratios for the 2 mm samples over the storage time whereas Photac-Fil Quick demonstrated a progressive improvement in KHN ratio as time progressed up to the one-month storage period, after which a decrease was observed. The Photac-Fil Quick 3 mm KHN ratio mirrored the increase in KHN ratio of the 2 mm samples, although the values were significantly less. For Vitremer and Fuji II LC, the 3 mm KHN ratios overall increase with time, reaching statistical equivalence to the 2 mm groups briefly at one month for Vitremer and at one week and 3 months for Fuji II LC.

Both Photac-Fil Quick and Fuji II LC display the same trends in KHN bottom/top surface ratios of the 4 mm and 5 mm samples, demonstrating an increase in mean KHN ratios up to one week

of storage which drops afterwards. This similarity in hardness ratio behavior may suggest that these may be similar in composition and post-VLC setting reaction behavior in the deeper regions of the materials.

The results of KHN ratio with the Vitremer samples were somewhat surprising in nature. Vitremer is said to possess, in addition to a VLC and acid-base cures, a “dark cure” that is propagated by a reduction-oxidation reaction.<sup>59</sup> Although some have classified this as a “tricure” curing mechanism, some authors<sup>59</sup> take exception to this nomenclature, stating that the setting mechanism obtained by this method is the same obtained with photoactivation in which polymerization is initiated with a different method. Nevertheless, in deeper regions of Vitremer where light activation is insufficient to enable photoactivation, the combination of the additional “dark cure” and the acid-base polyalkenoate reaction would be expected to result in a hardness increase with longer storage time. Although an increase in hardness was observed in the bottom surfaces of the 4 mm and 5 mm Vitremer samples, the hardness that developed was not of sufficient magnitude to positively affect the KHN ratio. Accordingly, the ratio decreased from 24 hours to one week and remained relatively stable after that point.

Correlation analysis of Vitremer KHN ratios and solubility results did not find a correlation between KHN ratios and experimental solubility ( $p = 0.505$ ). Correlation analysis between Fuji II LC experimental solubility results and KHN ratio results identified a correlation (Pearson's 0.318,  $p = 0.004$ ) as well as with Photac-Fil Quick (Pearson's 0.245,  $p = 0.028$ ). Although some correlations were reported using this set of data between the development of KHN ratios and experimental solubility, it should be remembered that the Pearson's correlation is considered to be liberal, tending to overestimate the true reliability between the data.<sup>89</sup> This is reinforced by that linear regression identified no strong reliability between sets of variables for both Fuji II LC and Photac-Fil Quick ( $R^2 = 0.101, 0.06$ , respectively).

The KHN ratio for the 4 mm and 5 mm thicknesses in all materials evaluated were observed to demonstrate a decreasing trend with an increase in storage time. This decrease was noted between 24 hours and one week for Vitremer, and the decreasing trend initiated after one week for Fuji II LC and Photac-Fil Quick. One explanation into this decreasing trend could possibly be afforded due to interruption of any potential continuing reactions due to water infiltration. Resin-modified glass-ionomer materials have been demonstrated to absorb water by both Fickian linear and non-linear diffusion behavior that required longer periods of time to reach equilibrium than conventional glass-ionomer materials.<sup>70-72</sup> It has been reported that RMGI materials of two to three millimeters thickness required up to eight<sup>71</sup> to ten days<sup>70</sup> for water infiltration to reach full equilibrium, and the decrease in KHN at or about this same time for the RMGI materials observed in this study could be due to water infiltration that dissolves and/or plasticizes either unreacted components or any matrix that may have formed.

In spite of evidence of a continuing setting reaction within the deeper regions of the resin-modified glass-ionomer materials, there is ample evidence to suggest that any reaction that may proceed in thicknesses greater than 3 mm is insufficient to make up for the amount of cure observed in 2 mm thicknesses. Using the KHN ratio as a guide, only the 3 mm Fuji II LC samples evidenced equivalence to the 2 mm samples at three months, and although Vitremer 3 mm KHN ratio samples were statistically similar to the 2 mm group at one month, the ratio was observed to decrease thereafter. It is only speculative at this time to assume that the KHN bottom/top ratio is a valid method in the analysis of resin-modified glass-ionomer depth of cure, and further research is needed in this area.

## Thermal Analysis

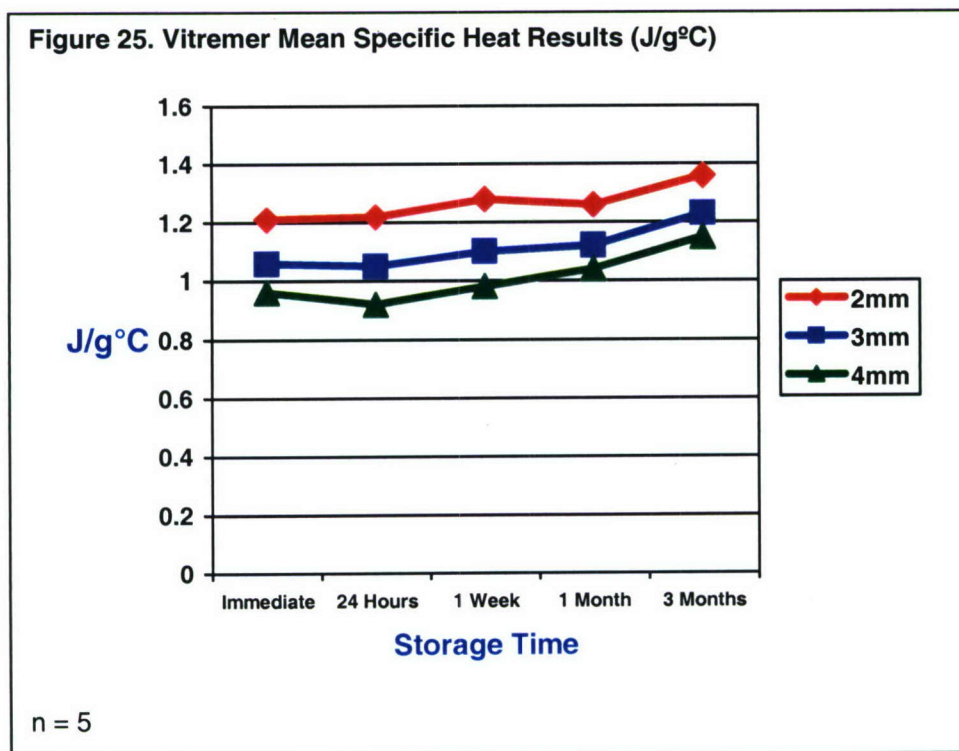
The process of measuring the amount of heat involved in a chemical or physical change is known as calorimetry.<sup>90</sup> Using calorimetry the resin-modified glass-ionomer materials were analyzed as per specific heat capacity, thermal scan enthalpy, thermal scan temperature peak, and weight changes during calorimetry.

## Specific Heat

The specific heat capacity of a material (often referred to as the “specific heat”, or “heat capacity”) is a measure of the amount of energy required to raise the temperature of one gram (or one mole) of the material by one degree Kelvin.<sup>90,91</sup> The specific heat of a given quantity of matter generally describes a property of the entire quantity of the substance.<sup>90</sup> The specific heat capacity of a substance can be measured from the sample mass and the difference in the heat flow rates determined during a programmed temperature sequence consisting of an isothermal period, followed by a rise in temperature, and then finally another isothermal period. Frequently this is also performed using a standard reference material for calibration.<sup>92</sup> Using a DSC there are usually four methods of specific heat capacity determination: Direct method, Steady State, Sapphire Method, and Alternating DSC (ADSC).<sup>91</sup> The Direct Method is based on the dynamic method of specific heat and is calculated by dividing the heat flow by the heating rate and sample mass. The Direct Method can be accurate to within  $\pm 5\%$  and requires the shortest measurement time.<sup>91</sup> The Steady State is similar in computation as the Direct Method but subjects the sample to a periodic heating and cooling cycle and has an accuracy rate similar to the Direct Method.<sup>91</sup> The ADSC method varies the temperature sinusoidally as a function of time which is superimposed on the average heating rate. The ADSC method is slightly more accurate than the Direct and Steady State, but requires long measurement times. The most accurate specific heat capacity determination, known as the sapphire method, calibrates the thermal signals of a substance against a three-sapphire-disc calibration standard.<sup>91</sup> Due to software limitations with the DSC unit available for this research, the Direct Method for specific heat capacity was used during this evaluation.

The specific heat determinations for this evaluation followed a similar protocol reported by Khalil and Atkins.<sup>61</sup> These investigators scanned a weighed sample of glass-ionomer product between 20 °C and 60 °C at a rate of 10 °C per minute and reported the observed specific heat at 37 °C. The evaluation in this thesis followed a similar protocol but recorded the specific heat as the mean of specific heat determination values at 5 °C intervals above the latent period over the thermal scan. As the specific heat capacity of a material is also dependent on the temperature recorded<sup>90,92</sup> it was felt that a mean of these values over a small thermal range would be representative. Under their protocol, Khalil and Atkins reported the specific heat capacity of Fuji II LC light cured to be 0.972 J/g°C and cured under dark conditions to be 1.267 J/g°C.<sup>61</sup> The results for the Fuji II LC immediate samples under the present evaluation were found to be very similar to that reported by Khalil and Atkins.

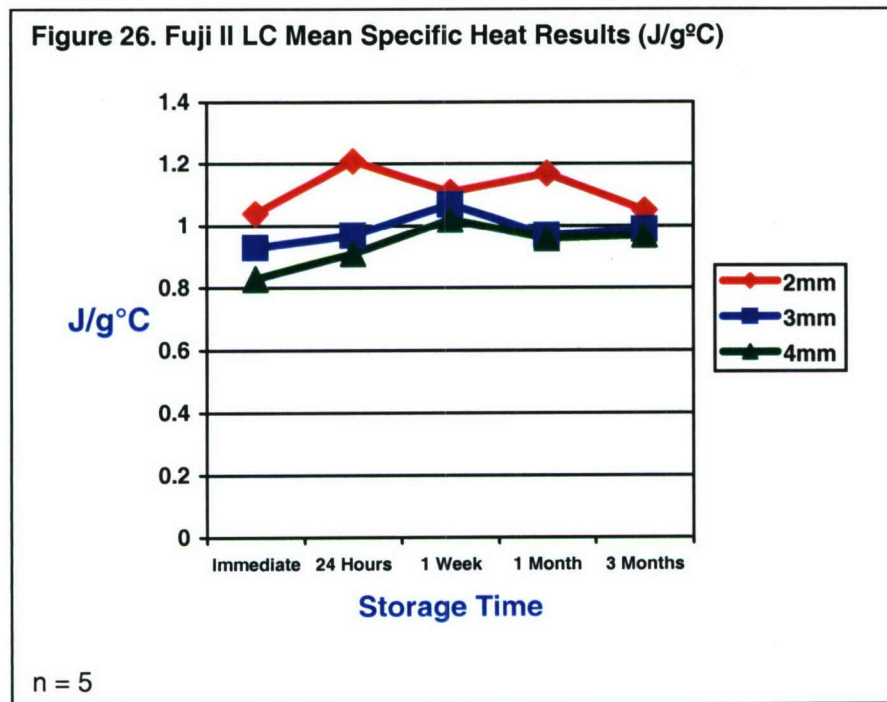
The results of specific heat analysis of the Vitremer samples can be seen in Figure 25.



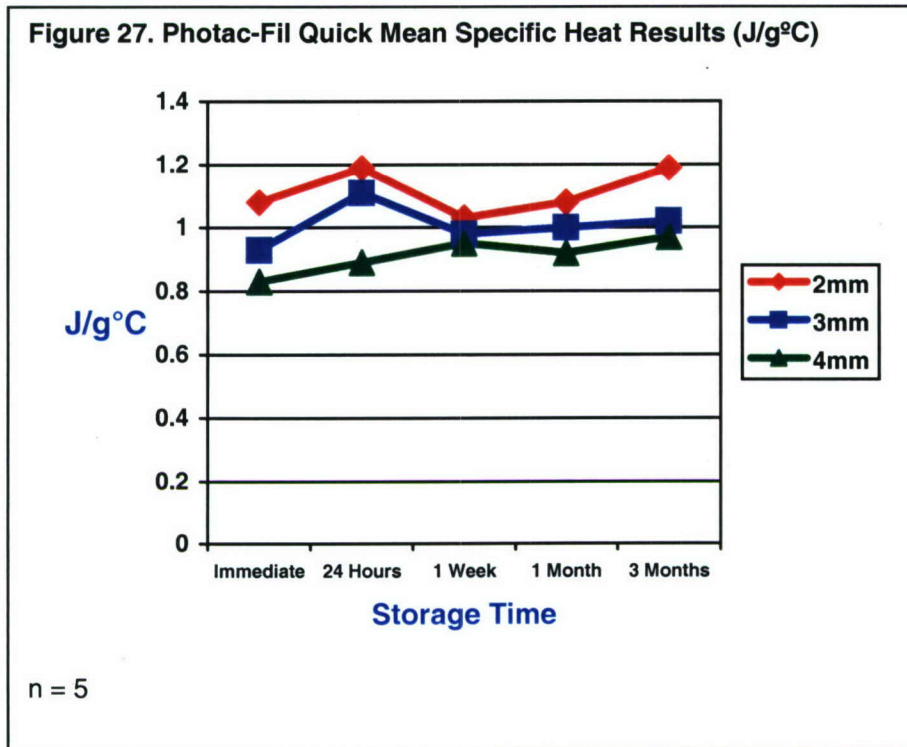
All Vitremer samples were observed to increase significantly in specific heat as time progressed. At the end of three-months, there was no significant difference in specific heat

between the 2 mm and 3 mm samples ( $p = 0.100$ ) and between the 3 mm and 4 mm samples ( $p = 0.323$ ). However, there was a significant difference found between the 2 mm and 4 mm samples ( $p = 0.007$ ).

The specific heat results for Fuji II LC can be seen in Figure 26. Similar to that seen of Vitremer, the Fuji II LC samples demonstrated an overall increase in specific heat with storage time. At one week storage, there were significant differences found between the 2 mm and the other thicknesses ( $p < 0.005$ ) but not between the 3 mm and the 4 mm samples ( $p = 0.182$ ). This relationship continued until at three months, where there were no significant differences found between any of the thicknesses ( $p = 0.451$ ).



The results of the Photac-Fil Quick specific heat can be seen in Figure 27.



As with the other two materials, Photac-Fil Quick demonstrated a generalized increase in specific heat over the storage time. At 24 hours, there was no difference noted between the 2 mm and 3 mm samples ( $p = 0.08$ ) with differences noted between the 3 mm and 4 mm thicknesses ( $p < 0.001$ ), while at one week specific heat values were not significantly different ( $p = 0.056$ ). With passage of time the Photac-Fil Quick 2 mm samples increased in specific heat to demonstrate a significant difference with the 4 mm thickness ( $p = 0.019$ ) while there remained no difference between the 2 mm and 3 mm ( $p = 0.265$ ) or between the 3 mm and 4 mm ( $p = 0.297$ ). At three months, the 3 mm and 4 mm samples maintained similar specific heat ( $p = 0.070$ ) but the specific heat of the 2 mm samples was significantly increased compared to the 3 mm and 4 mm thicknesses ( $p < 0.0001$ ).

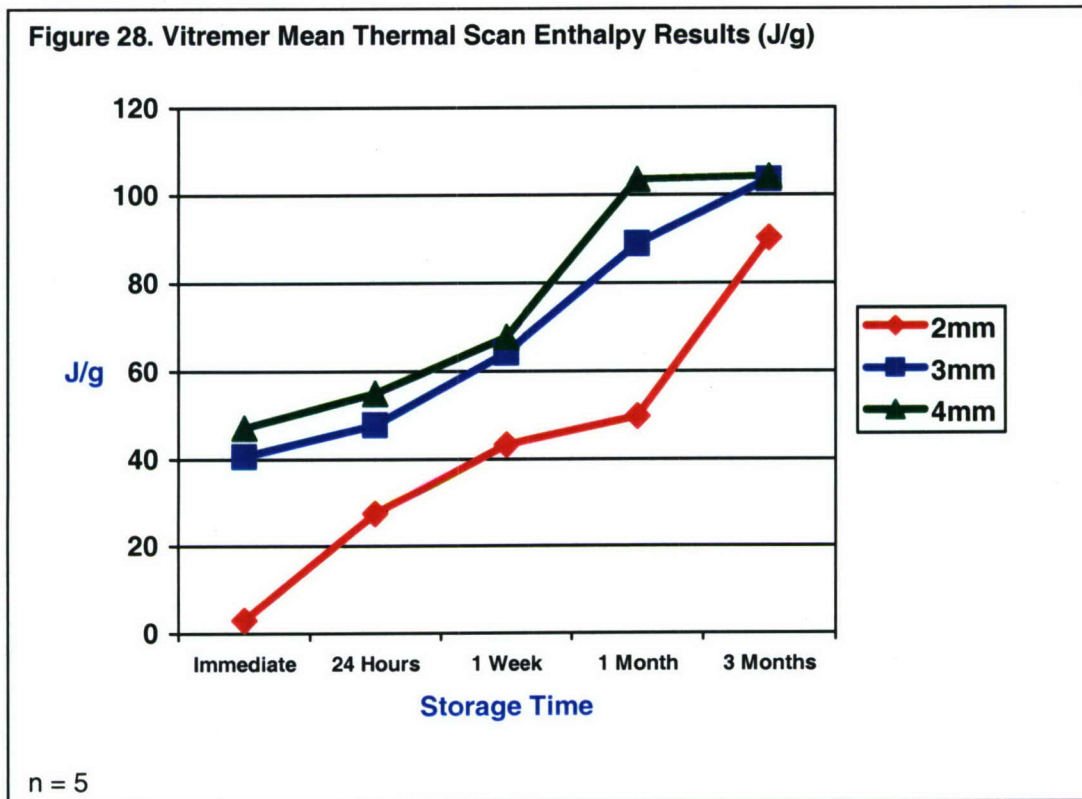
Comparison of the specific heat results of all three materials demonstrate an increase in specific heat with increased time which suggests a change in the respective materials. At the end of the storage time all three materials did not exhibit a significant difference in the specific heats between the 2 mm and 3 mm samples as well as between the 3 mm and 4 mm samples. Except for Fuji II LC, the samples did maintain a significant difference between the 2 mm and 4

mm samples. However, the results with Fuji II LC samples need to be interpreted with caution, as the 2 mm group demonstrated wide variation.

### **Thermal Scan**

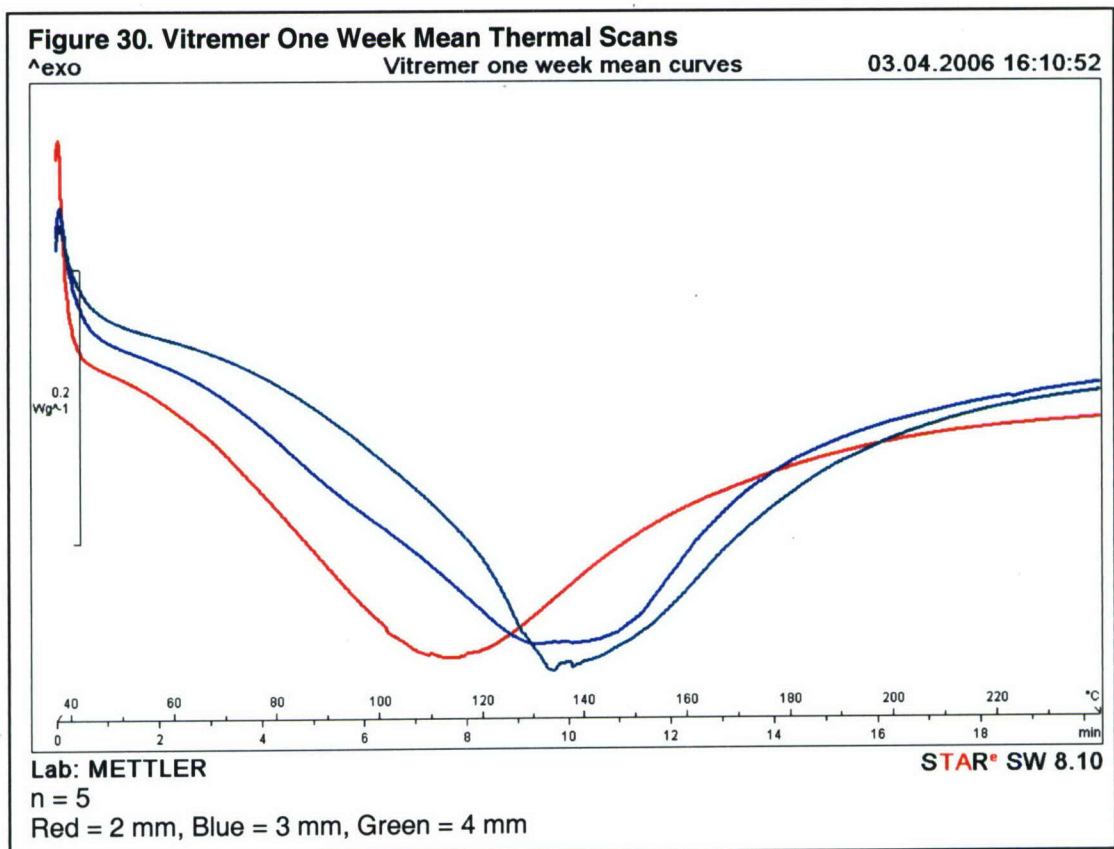
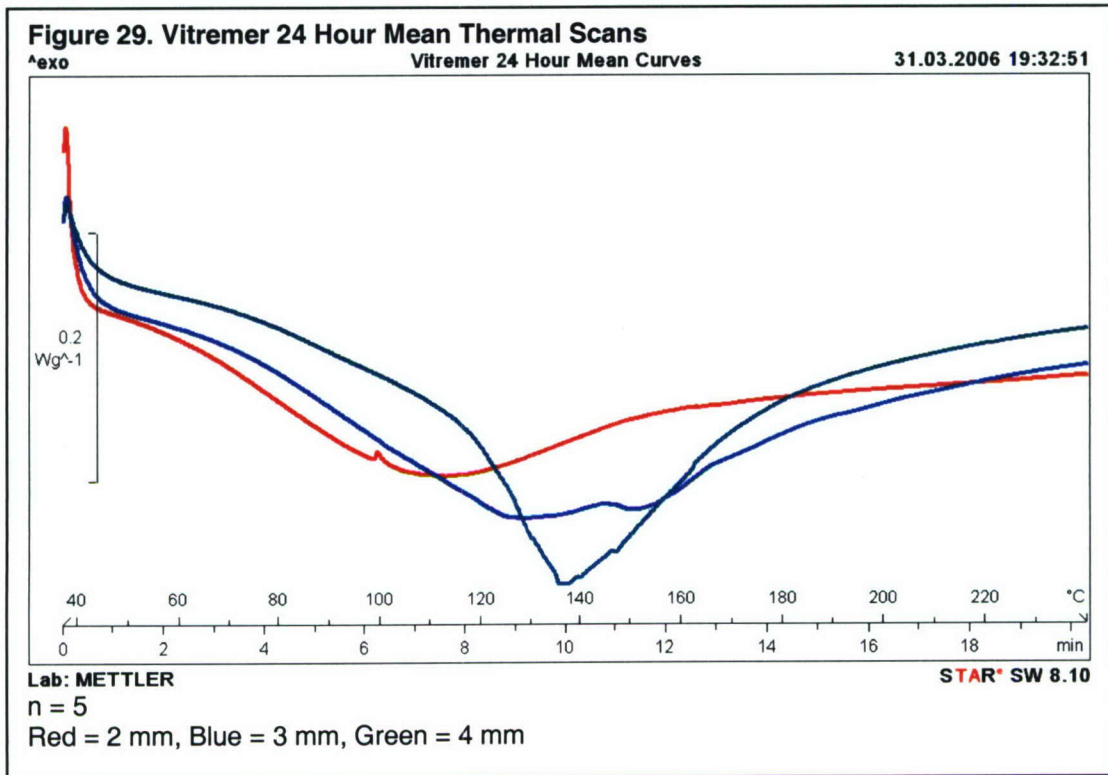
The differential scanning calorimetry (DSC) thermal scan method employed during this evaluation followed the same protocol as Khalil and Atkins.<sup>61</sup> Accordingly, after the specific heat determination the samples were weighed and then submitted to a thermal scan of 37 °C to 240 °C at a rate of 10 °C per minute. A reverse scan from 240 °C to 37 °C was not accomplished as pilot studies with all three materials did not reveal any results. Results of the thermal scan are reported as both thermal peak temperature, i.e. the temperature at the minimum of the endothermic peak, and total enthalpy of the peak. This was accomplished by software integration, with all samples normalized for sample size. For graphical and analysis simplicity, total enthalpy is presented as a positive number, although the peaks were endothermic, meaning the value was really negative.

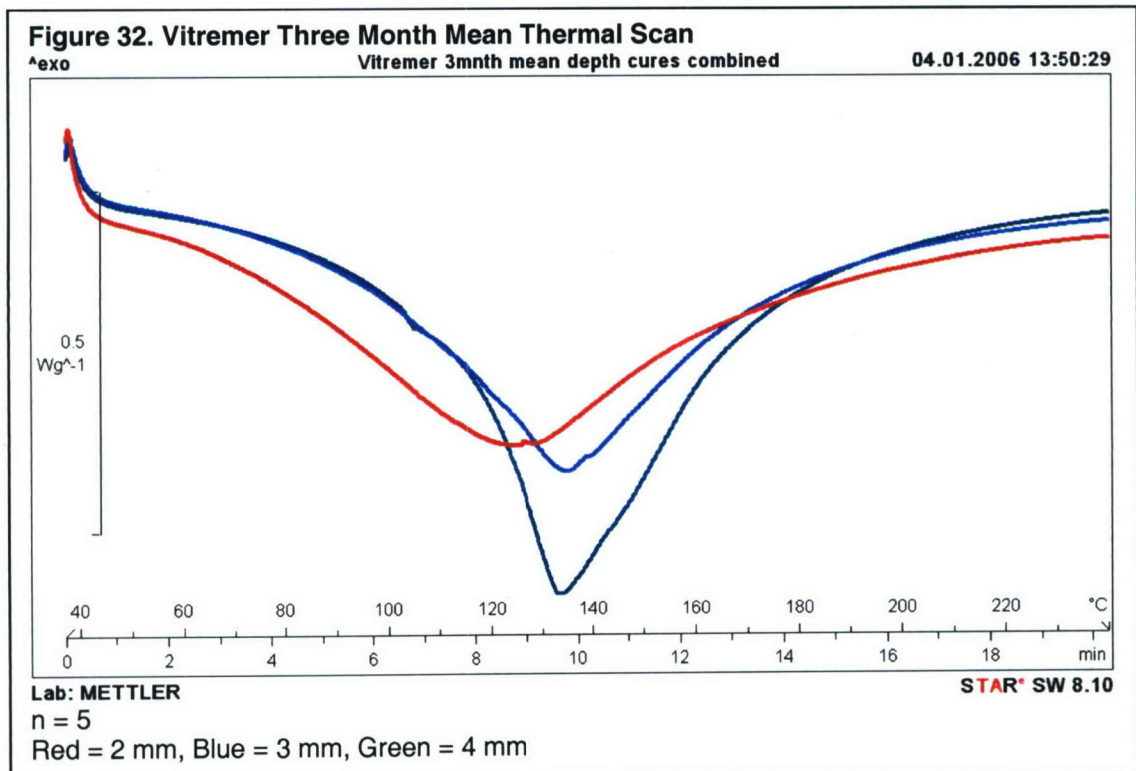
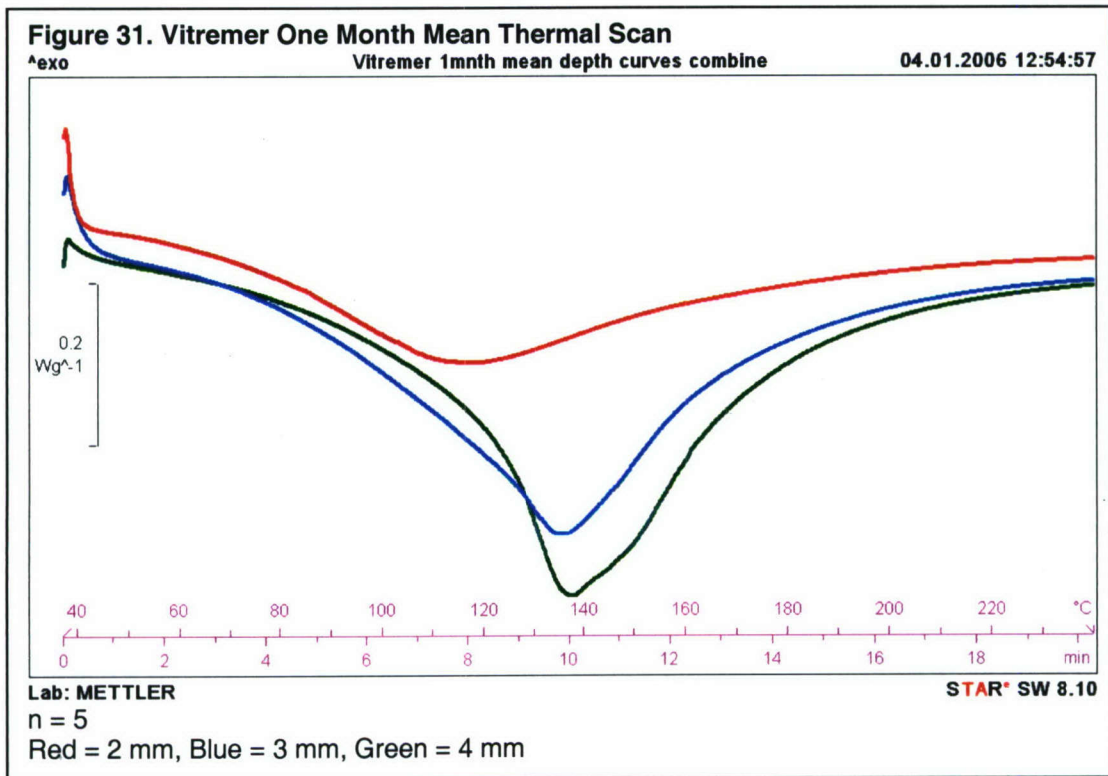
Graphic results for the Vitremer samples thermal scan is presented in Figure 28.



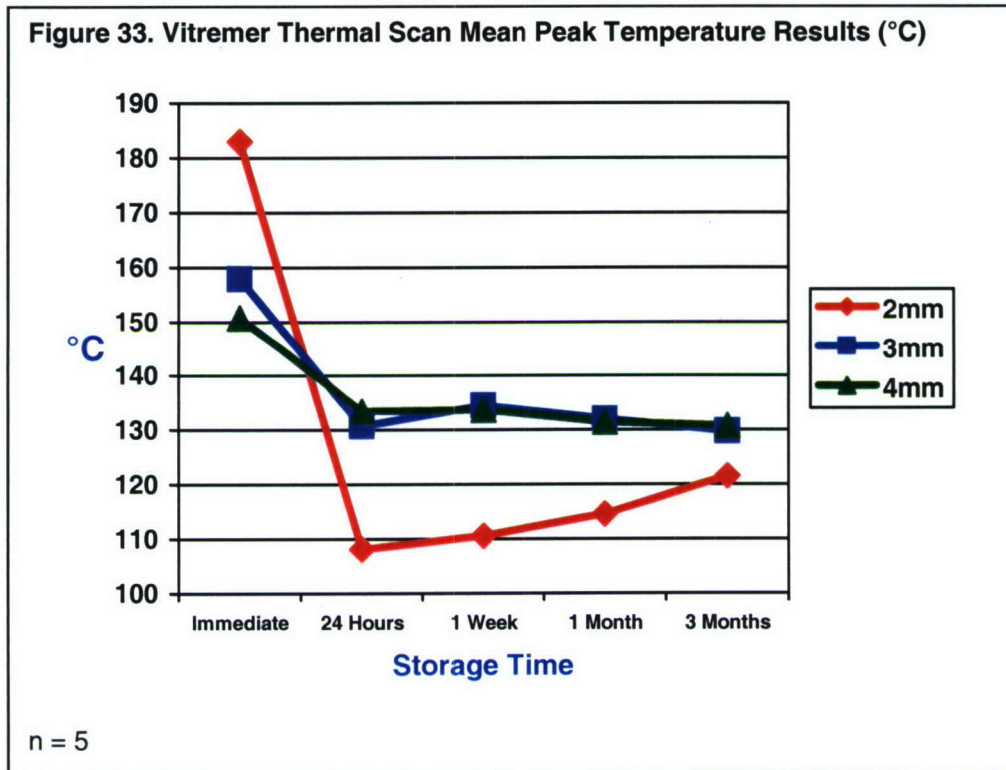
As storage time progressed all samples demonstrated an increase in thermal enthalpy that was associated with the thermal peak. One-way ANOVA of the results at each storage time revealed that there was no significant difference for enthalpy findings between the 3 mm and 4 mm samples throughout the time period. The 2 mm samples were significantly different than the 3 mm and 4 mm samples at all time periods ( $p < 0.004$ ) except for at three months, where there was no significant difference noted between all three thicknesses ( $p = 0.665$ ).

Representative images of the Vitremer thermal scans can be seen in Figures 29 – 32. It can be observed as the materials mature the individual peaks evolve from broad, ill-defined endothermic curves into more uniform, symmetrical curves whose peak temperatures can be readily defined. This thermal behavior is consistent with materials that are becoming more uniform. As will be discussed next, it can also be observed that the thermal peak temperatures display a trend towards migrating to a common value.





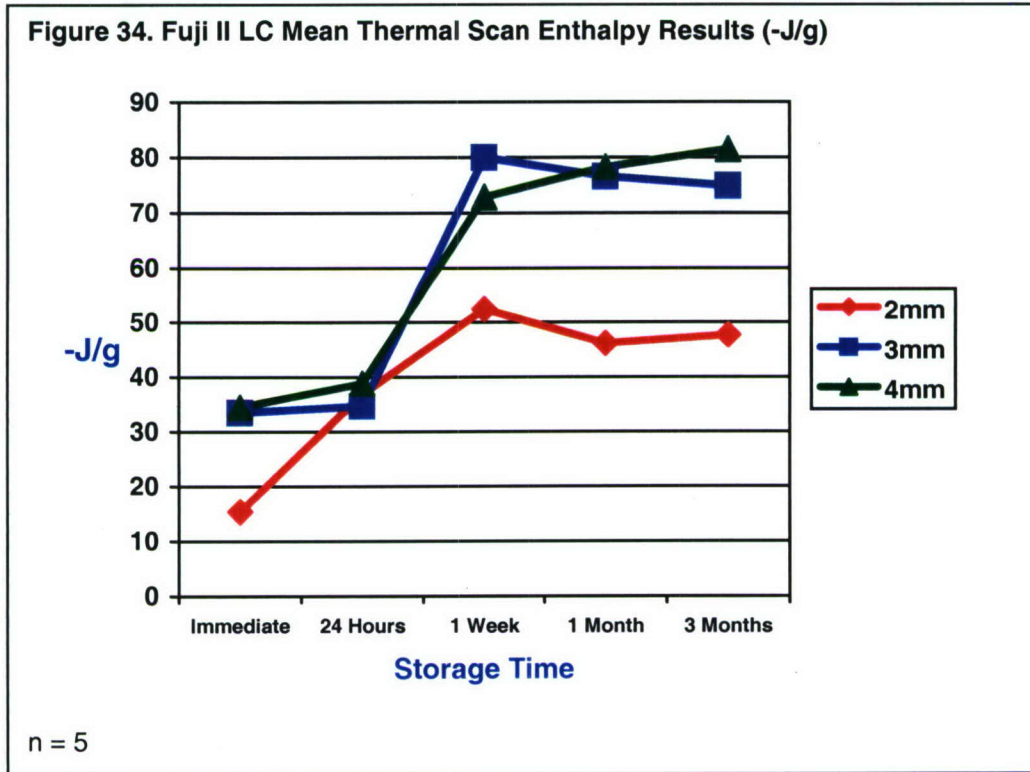
The analysis of the thermal peak temperatures for the Vitremer samples can be seen in Figure 33.



The mean thermal peak temperature of the 3 mm and 4 mm samples were statistically similar throughout the evaluation ( $p > 0.272$ ). However, the immediate 2 mm samples demonstrated a significantly higher thermal peak temperature than the 3 mm and 4 mm ( $p < 0.0001$ ) immediately after fabrication and significantly reduced than the other thicknesses at 24 hours ( $p < 0.0001$ ). As time progressed the 2 mm samples demonstrated a rising trend that tended to approach the thermal peak temperatures of the 3 mm and 4 mm samples. However, at three months the 2 mm samples still maintained a significant difference ( $p < 0.012$ ).

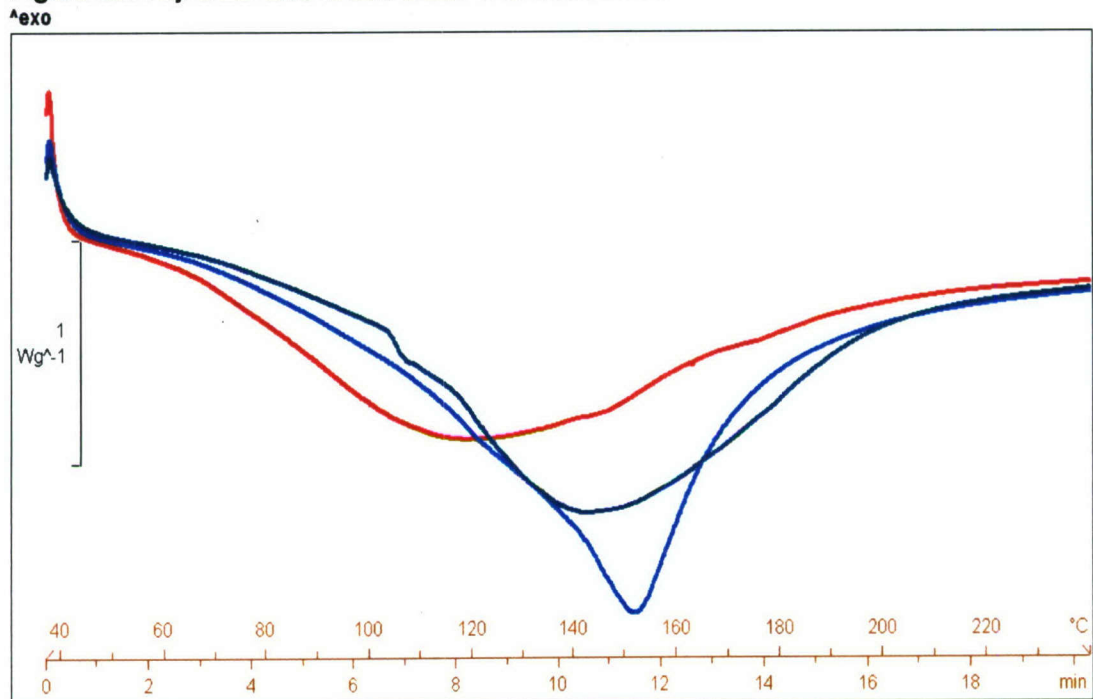
The mean enthalpy values of the Fuji II LC thermal scans are depicted in Figure 34. All samples demonstrated a significant increase in enthalpy as storage time progressed ( $p < 0.0001$ ) with all samples demonstrating the most increase between fabrication and one week. After one week, there was no difference in mean thermal scan enthalpy between the remaining

storage time intervals ( $p > 0.187$ ). Significant differences were found between the enthalpy requirements of the 2 mm and the other samples ( $p = 0.002$ ) but no difference in enthalpy was noted between the 3 mm and 4 mm samples ( $p = 0.975$ ).



Representative thermal scans of representative Fuji II LC samples are depicted in Figures 35 and 36. As with the Vitremer, the Fuji II LC samples display some increase in uniformity with aging and the migration of the thermal peaks towards a common value.

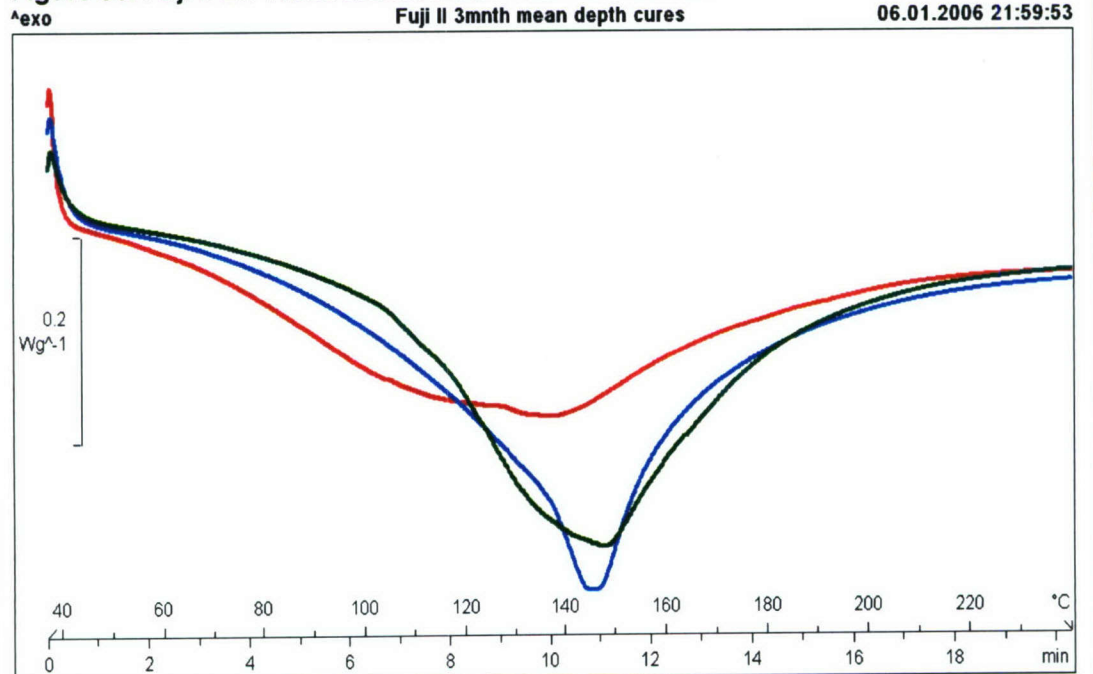
**Figure 35. Fuji II LC One Week Mean Thermal Scans**



Lab: METTLER  
 n = 5  
 Red = 2 mm, Blue = 3 mm, Green = 4 mm

STAR<sup>®</sup> SW 8.10

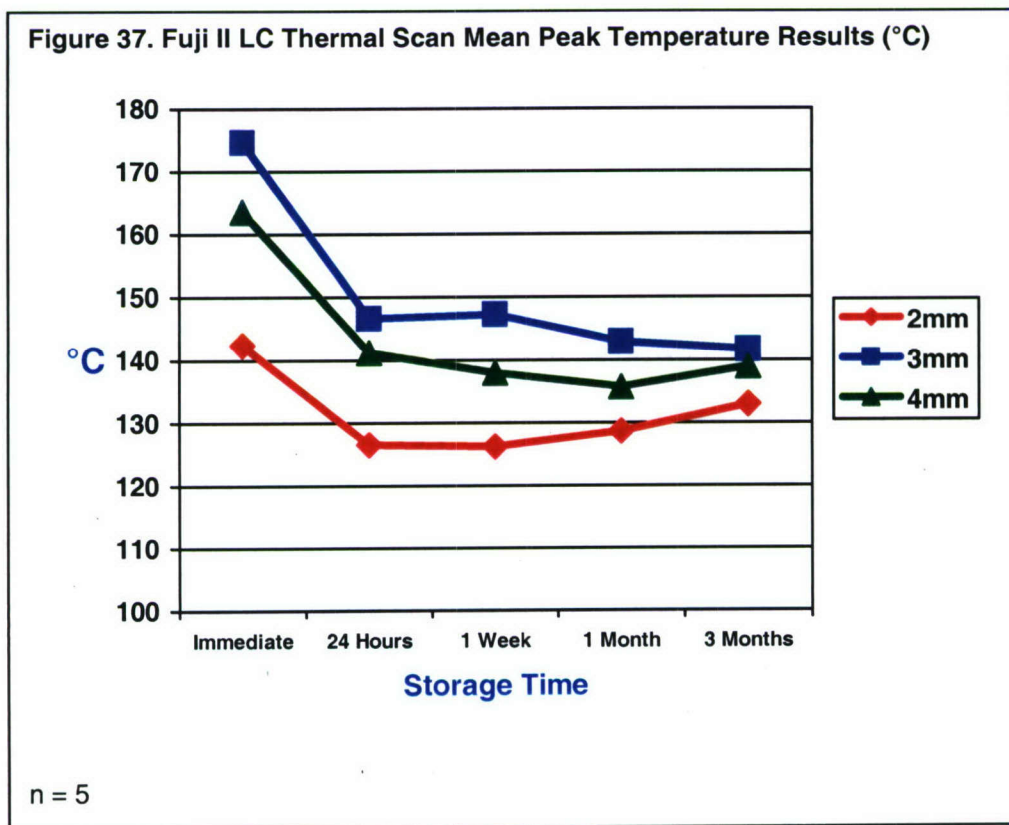
**Figure 36. Fuji II LC Three Month Mean Thermal Curves**



Lab: METTLER  
 n = 5  
 Red = 2 mm, Blue = 3 mm, Green = 4 mm

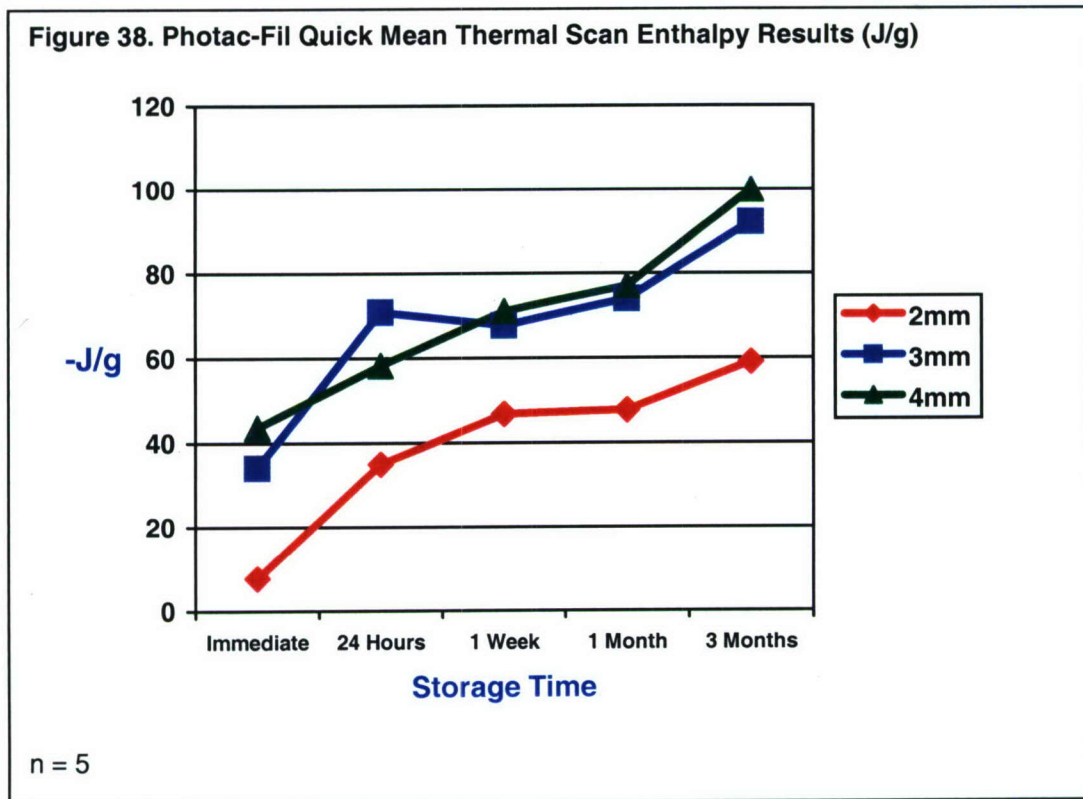
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The mean thermal peak temperatures of the Fuji II LC samples are depicted in Figure 37. With this material, the 3 mm depth samples displayed the highest mean thermal peak temperatures; the 2 mm samples the lowest temperature, while the 4 mm samples an intermediary temperature between the two extremes. The immediate Fuji II LC thermal peak temperatures were not significantly disparate ( $p = 0.301$ ) as well as at 24 hours ( $p = 0.053$ ). At one week, the 2 mm and 3 mm samples were significantly different ( $p = 0.003$ ) which was maintained at one month ( $p = 0.004$ ). At three months, the mean thermal peak temperatures of the different thicknesses were merging and were statistically similar ( $p = 0.116$ ).



All of the Photac-Fil Quick samples (Figure 38) demonstrated a significant increase in thermal scan enthalpy requirements as storage time increased ( $p < 0.0001$ ). The thermal scans of the samples demonstrated a significant increase between fabrication and 24 hours ( $p = 0.001$ ) after which the loss stabilized with no significance between groups until one month ( $p > 0.431$ ).

Although the samples demonstrated an increasing trend after one month, there was no difference noted between the one-month and three-month samples ( $p = 0.079$ ). Throughout the storage period the 2 mm samples required significantly less enthalpy than the other thicknesses ( $p < 0.0001$ ) while no difference was noted between the 3 mm and 4 mm samples ( $p = 0.926$ ).



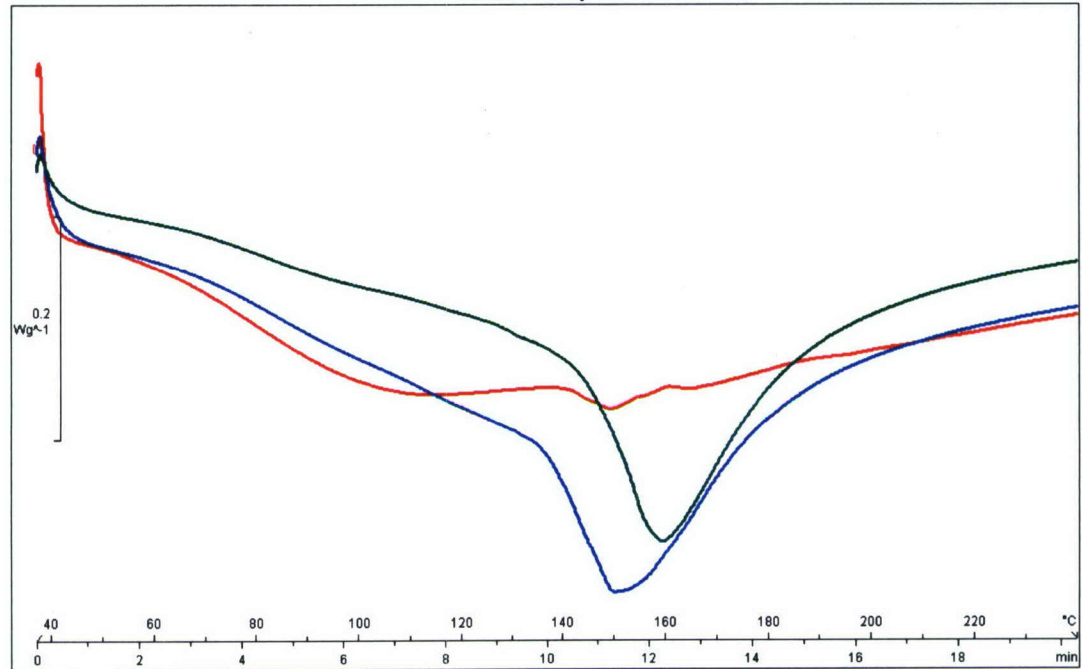
Representative thermal scans of Photac-Fil Quick can be seen in Figures 39 – 42. In contrast with the other two materials, the 3 mm and 4 mm Photac-Fil Quick samples displayed uniform endothermic peaks from the outset whose peaks became more focused with maturity. The 2 mm Photac-Fil Quick endothermic peak was nondescript at 24 hours but gained uniformity as time progressed and the peak temperature was also observed to shift towards that observed by the other two thicknesses.

**Figure 39. Photac-Fil Quick 24 Hour Mean Thermal Scans**

<sup>^</sup>exo

Photac 24hr Mean Depth cure curves

29.03.2006 16:19:32



Lab: METTLER

n = 5

Red = 2 mm, Blue = 3 mm, Green = 4 mm

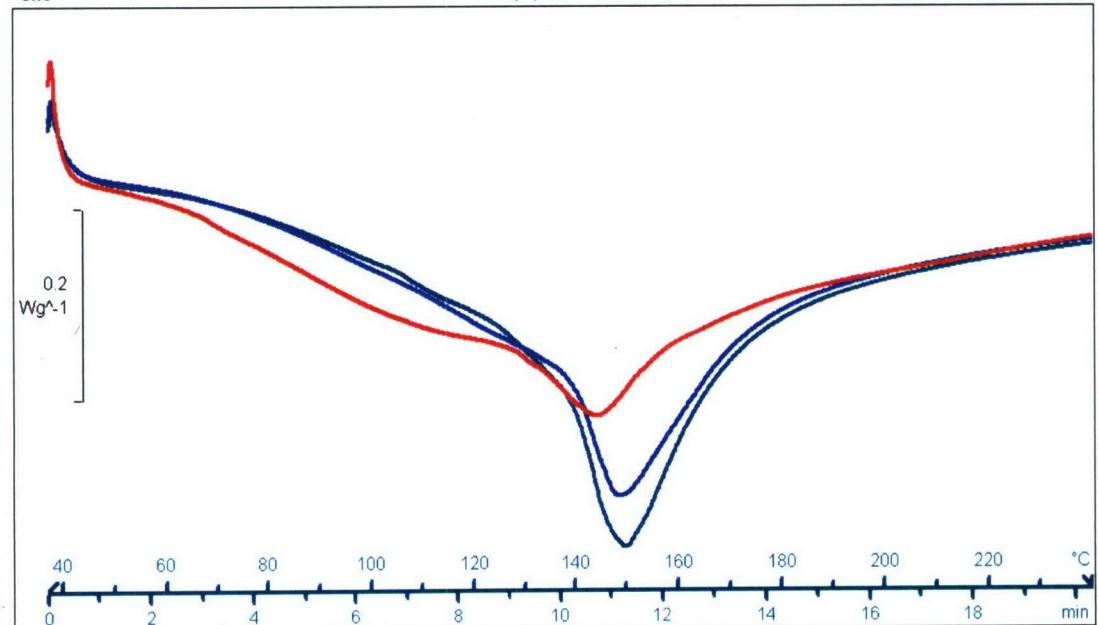
STAR® SW 8.10

**Figure 40. Photac-Fil Quick One Week Mean Thermal Scans**

<sup>^</sup>exo

Photac 1 wk 2,3,4 mm mean curves

28.12.2005 19:40:31



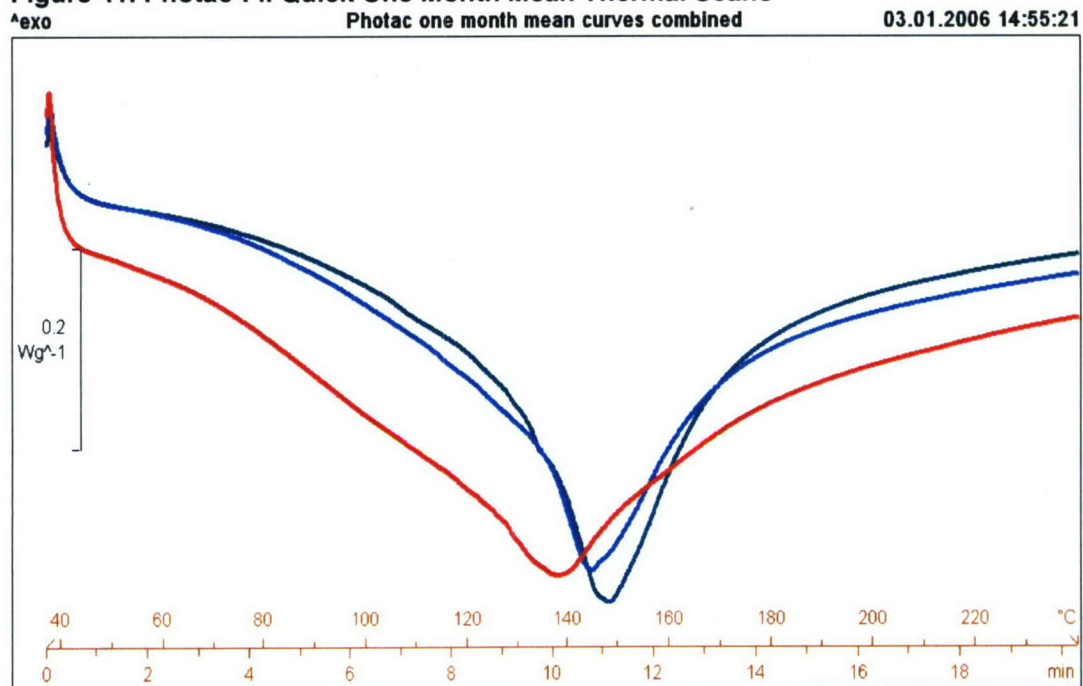
Lab: METTLER

n = 5

Red = 2 mm, Blue = 3 mm, Green = 4 mm

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Figure 41. Photac-Fil Quick One Month Mean Thermal Scans



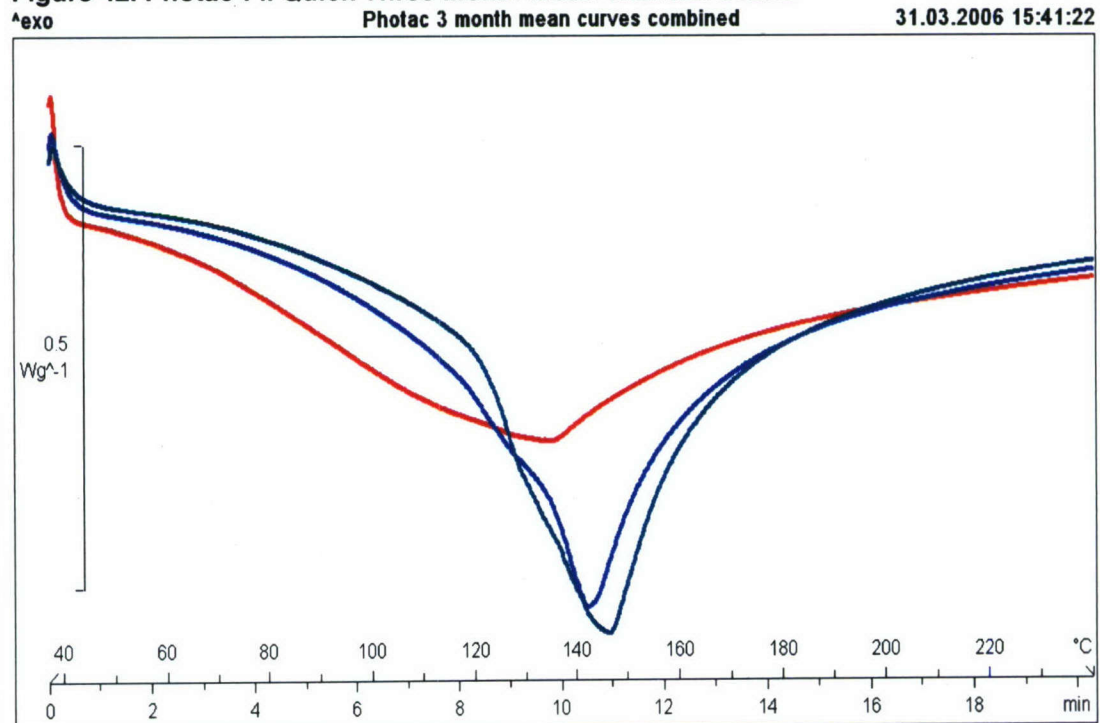
Lab: METTLER

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n = 5

Red = 2 mm. Blue = 3 mm. Green = 4 mm

Figure 42. Photac-Fil Quick Three Month Mean Thermal Scans



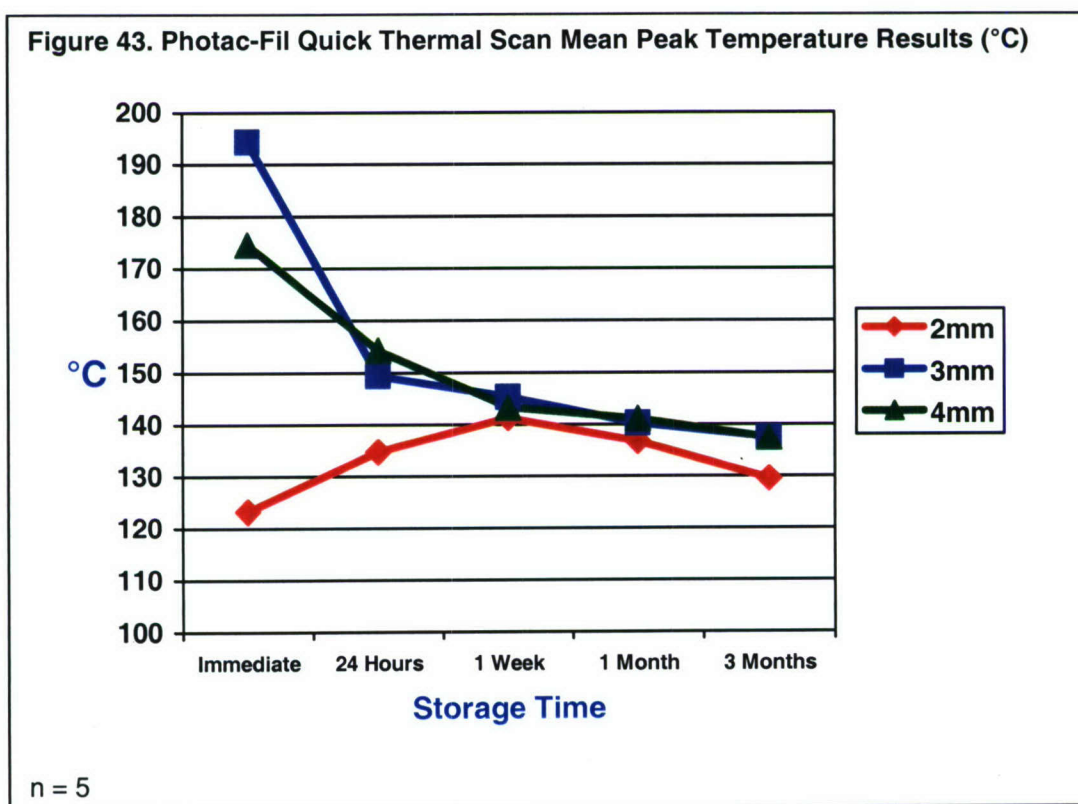
Lab: METTLER

STAR<sup>®</sup> SW 8.10

n = 5

Red = 2 mm, Blue = 3 mm, Green = 4 mm

The mean thermal peak temperatures of the Photac-Fil Quick samples are depicted in Figure 43. Similar to Fuji II LC, the 3 mm samples demonstrated the highest thermal peak temperature with the 2 mm samples the lowest. The 4 mm samples maintained a thermal peak temperature that was intermediary to the other thicknesses. The 2 mm samples were significantly lower than the 3 mm samples ( $p = 0.007$ ) as well as the 4 mm samples ( $p = 0.047$ ) but the 3 mm and 4 mm groups were statistically similar ( $p = 0.569$ ). As with the other two materials, all three thicknesses of the Photac-Fil Quick samples demonstrated a merging trend of the peak temperatures with the passage of time. At 24 hours there was no difference between the samples ( $p = 0.121$ ), as well as at one week ( $p = 0.151$ ). However, at one month the merging trend was disrupted by a significant difference between the 2 mm and the other thicknesses ( $p < 0.033$ ) which continued at three months ( $p = 0.002$ ).



All three resin-modified glass-ionomer restorative materials demonstrated increasing thermal requirements for the DSC thermal scan with storage time, although all achieved such displaying distinct thermal behavior. Vitremer samples displayed an increasing rate throughout the

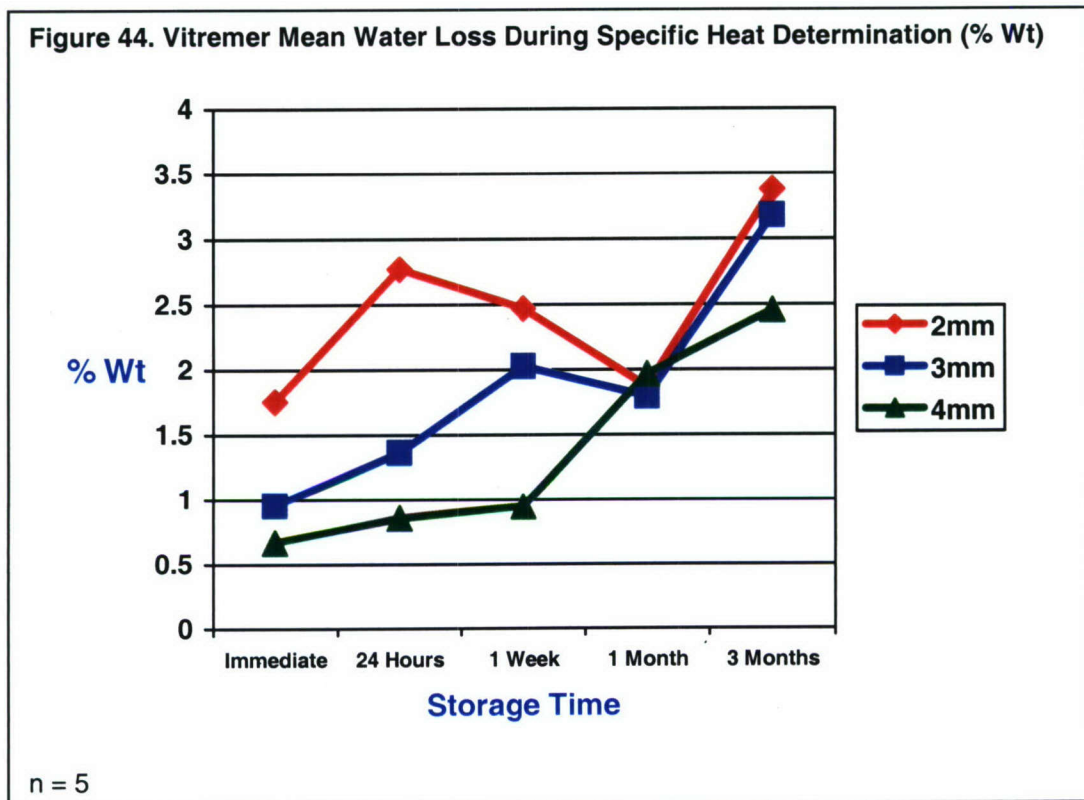
evaluation while Fuji II LC demonstrated a rise in thermal requirements at one week that essentially reached a plateau for the remainder of the observation time. Photac-Fil Quick reached a similar plateau at one week, which was maintained at one month but then evidenced an increasing trend for thermal requirements at one month. Collectively the data indicates different thermal behavior for all of the materials with increased storage time, which is evidence that all of the materials are exhibiting change in composition. The individual thermal behavior of these materials will demand more attention and evaluation: it remains to be determined if the early plateau reached by Fuji II LC is evidence of the formation of a mature and/or stable composition. As glass-ionomer materials are known to require considerable time to reach maturity, only longer periods of observation will be able definitively demonstrate this behavior by thermal means.

The peak temperature of the DSC thermal peak provides additional information concerning these RMGI materials. The peak temperature of a thermal measurement during DSC can provide material composition characteristics almost in the same manner as glass transition temperatures and melting points. It is interesting that all three of the resin-modified glass-ionomer materials demonstrated similar behavior in regards to thermal peak temperatures during the thermal scans. Each material demonstrated, especially with the 3 mm and 4 mm samples, higher mean thermal peak temperatures immediately after fabrication that slowly lessened with storage time. Moreover, as storage time increased, the temperatures also displayed a trend of merging towards the same range of temperatures, to the point that at intermediary times there was no significance between the peak temperatures of the Photac-Fil Quick samples, while at three months there was no significant difference between the mean thermal peak temperatures of the Fuji II LC samples. The merging of the mean peak temperature values provides additional evidence of material compositional change with the resin-modified glass-ionomer materials. Furthermore, as the peak temperatures approximate each other it suggests that the composition of each respective material is becoming more similar.

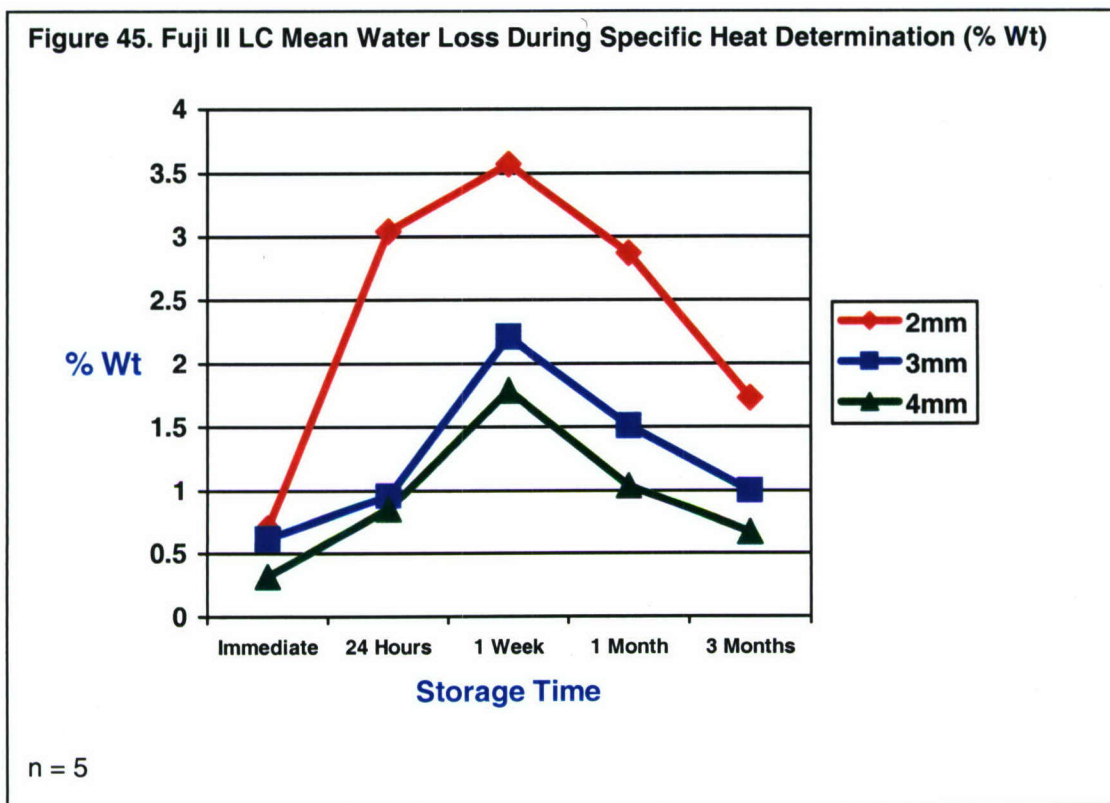
The RMGI materials were all evaluated for the different weight changes during all phases of thermal analysis, as investigation into these weight changes could provide information concerning the water uptake, ratio of loosely bound to firmly bound water, as well as possible polymer development in these materials.

Not surprisingly, all of the materials were observed to significantly increase in weight as storage time progressed. Any weight gain during storage in the  $98 \pm 2$  percent humidity conditions was assumed to be due to water uptake. As with conventional glass-ionomer materials, RMGIs have been documented to absorb water, as water uptake is essential for the continuation of the polyalkenoate reaction.<sup>3,21,93</sup> Furthermore, all three materials were also noted to experience significant weight loss during the specific heat determinations. Any weight loss observed during the specific heat determinations was assumed to be predominately due to water loss, presumably of the loosely bound nature. This assumption is founded on the short time duration of the specific heat determination scans (20 minutes) and the narrow temperature range involved ( $20\text{ }^{\circ}\text{C}$  to  $60\text{ }^{\circ}\text{C}$ ) that was decidedly below the boiling point of both water and HEMA.

An interesting finding regarding the weight loss during the specific heat determinations (presumed to be loosely-bound water) among the three materials is that each material demonstrated different behavior in the nature of the loosely-bound water loss. The Vitremer (Figure 44) 2 mm and 3 mm samples lost significantly more water at three months than at the onset ( $p < 0.0001$ ) while the 4 mm samples demonstrated a similar trend towards increased water loss, but yet it was not significant. The 2 mm samples demonstrated a trend for decrease in water loss after 24 hours that continued until one month, with the 3 mm samples displaying similar behavior after one week. At one month there was no significant difference in water loss between all thicknesses, and although the 2 mm and 3 mm samples displayed a greater amount of water loss compared to the 4 mm samples at three months, no significant difference remained among the groups ( $p = 0.357$ ).

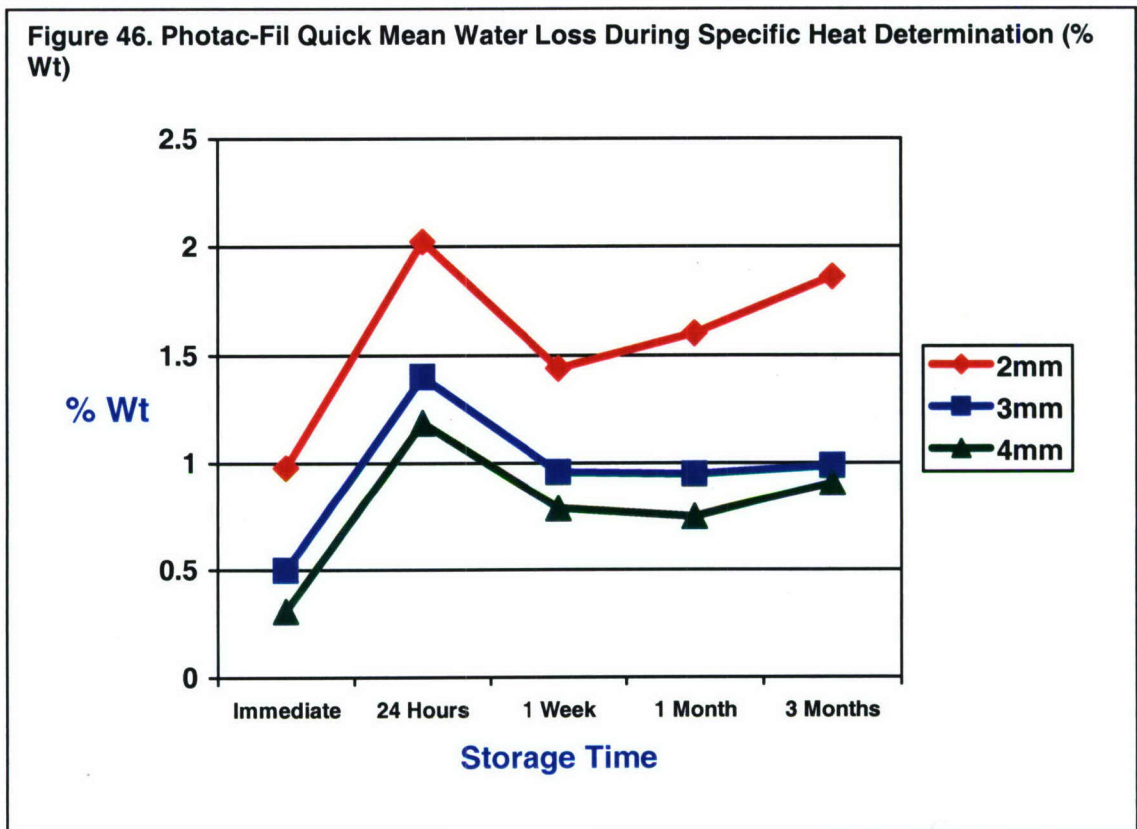


The Fuji II LC samples (Figure 45) also demonstrated an increasing trend of water loss during the specific heat determinations with storage time but did so in a manner different than Vitremer.



At the end of the three months, each thickness of Fuji II LC samples did not experience a significant difference in water loss compared to the water loss with the immediate groups ( $p > 0.437$ ). However, during the storage time all three thicknesses experienced a significant increase in water loss ( $p < 0.001$ ) that reached a maximum at one week and then declined. Except for the immediate groups, the Fuji II LC 2 mm samples lost significantly more water than the 3 mm and 4 mm groups ( $p < 0.0001$ ), while the latter two groups were not significantly different ( $p = 0.459$ ).

The water loss behavior during the specific heat determinations for the Photac-Fil Quick samples is displayed in Figure 46.

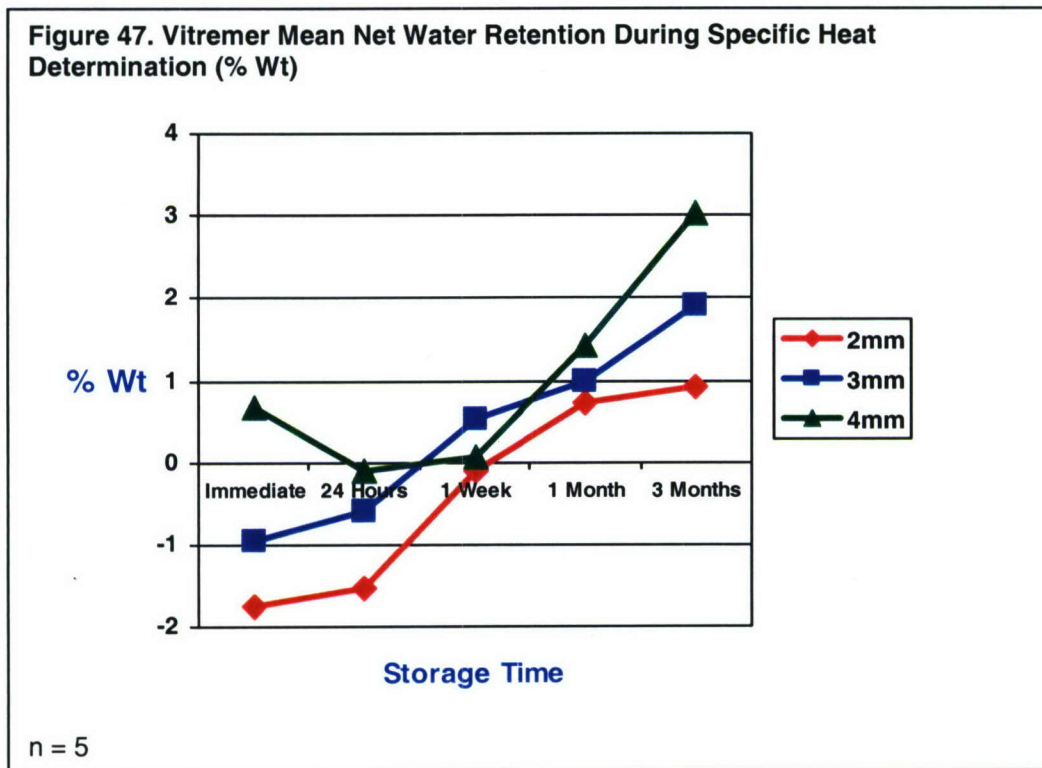


The Photac-Fil Quick samples displayed an increase in water loss with time similar to Fuji II LC except that the maximum water loss peaked at the 24-hour storage time. After one week the 2 mm samples continued on an increased trend for water loss while the other thicknesses maintained relatively stable. One-way ANOVA identified that over the total storage time the 2 mm Photac-Fil Quick samples lost significantly more water during the specific heat determinations ( $p < 0.0001$ ) compared to the 3 mm and 4 mm samples which were statistically similar ( $p = 0.219$ ). Within the Photac-Fil Quick groups the 2 mm and 4 mm samples lost significantly more water at three months compared to the immediate samples ( $p < 0.002$ ), while the 3 mm samples maintained statistical similarity ( $p = 0.054$ ). However, all thicknesses demonstrated a significant increase in water loss at the 24-hour peak as that experienced by the immediate groups.

The difference between the weight gain during storage (water uptake) and weight loss during the specific heat determinations (loosely held water loss) results in the net retention of water,

and provides some insight into the development of the more firmly bound water associated with the maturation of the polyalkenoate hydrogel matrix.

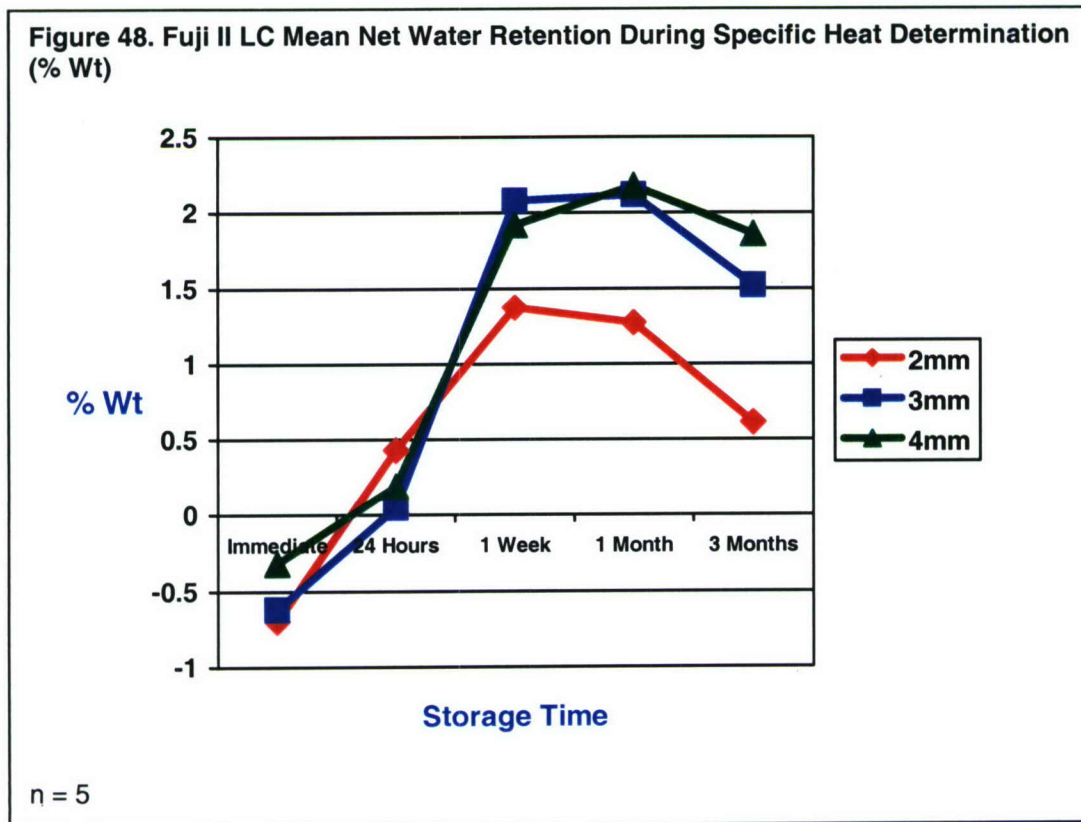
All three materials demonstrated a significant change in the net water retention during the specific heat determination for the storage times evaluated. The results of all thicknesses of the



Vitremer samples are graphically depicted in Figure 47. Two-way ANOVA identified that the Vitremer samples demonstrated a significant increase in net water retention both per thickness and storage time ( $p < 0.0001$ ). One-way ANOVA for net water retention between the thicknesses found no significant difference between the 2 mm and 3 mm samples ( $p = 0.241$ ) but identified significantly more net water retention between the 4 mm and the 2 mm samples ( $p = 0.043$ ). Although the 2 mm samples gained weight during storage time, Scheffe *post hoc* analysis did not identify any significant change in net water retention due to large standard deviations among the sample means. A significant change was identified within the 3 mm samples ( $p < 0.0001$ ), with significant net retention of water increasing at all storage times except between the immediate and 24 hour samples. A significant change was also noted

within the 4 mm samples ( $p < 0.0001$ ), with significant gains identified between storage times after one week. The data indicates that at approximately one week the Vitremer samples began to show evidence of some water retention within the material.

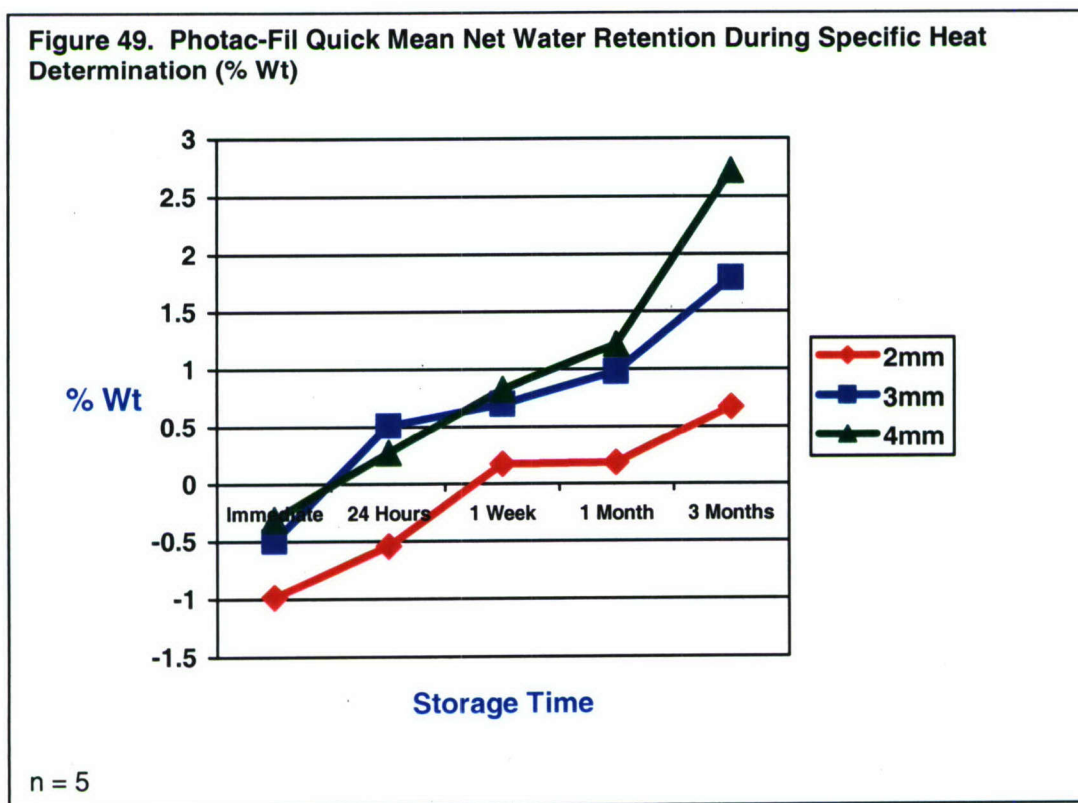
The mean net water retention results during the specific heat determination results for the Fuji II LC samples can be observed in Figure 48.



Two-way ANOVA identified significant changes in net water retention during specific heat determinations for the Fuji II LC samples for both thickness and storage time ( $p < 0.0001$ ). All the thicknesses demonstrated an increasing trend for increased water retention with storage time that appeared to peak at one week or one month. Within the individual thicknesses, although the samples demonstrated a significant gain in water retention up to at least one week that was followed with a decrease at three months, the 2 mm samples still maintained a significant gain in water retention at three months as compared to the immediate group ( $p < 0.0001$ ). All of the thicknesses displayed statistical similarity in net water retention immediately

after fabrication and at 24 hours, but at one week the 3 mm and 4 mm samples displayed significantly greater net water retention than the 2 mm specimens that was maintained up to three months ( $p < 0.001$ ). The Fuji II LC samples demonstrated net water retention at approximately 24 hours that was earlier than that seen by the Vitremer samples.

The mean net water retention results during the specific heat determination results for the Photac-Fil Quick samples can be observed in Figure 49.



The Photac-Fil Quick samples displayed net water retention behavior during the specific heat determinations similar to that evidenced by the Vitremer samples. All samples demonstrated a significant increase in net water retention at three months ( $p < 0.0001$ ) as compared to after immediate fabrication while the 3 mm and 4 mm thicknesses were found to exhibit significantly more water retention than the 2 mm samples ( $p < 0.006$ ). The 3 mm and 4 mm Photac-Fil Quick samples exhibited net water retention starting at 24 hours while the 2 mm samples required one week.

Both Vitremer and Photac-Fil Quick displayed similar behavior regarding net water retention during the specific heat determinations. Fuji II LC demonstrated a different behavior marked by a trend of decreasing net water retention after a significant gain at one week. It is not known at this time if this trend would continue, but further analysis is planned to follow this material's behavior. It is this author's contention that this net water retention analysis provides some evidence of early mature hydrogel formation in these RMGI materials. Using this criterion, based on the conditions of this evaluation it appears that it requires one week for evidence of firmly-bound water in the matrix of both Vitremer and Photac-Fil Quick whereas evidence of the same with Fuji II LC is apparent at 24 hours.

In comparing the water loss and water retention behavior of the three RMGI materials, all materials displayed increasing water loss that was somewhat offset by increasing amounts of water retention as time progressed. It should also be noted that the thinner samples, especially the 2 mm thickness, appeared to demonstrate more water loss and less net water retention than the 3 mm or 4 mm samples. This behavior may be explained by the consideration that all of these samples were enclosed in aluminum calorimetry crucibles in which the RMGI materials displayed only one open surface to the calorimeter environment. With all three thicknesses having roughly the same surface area exposed, the thicker specimens would be expected to retain more water due to the time requirement for diffusion to take place.

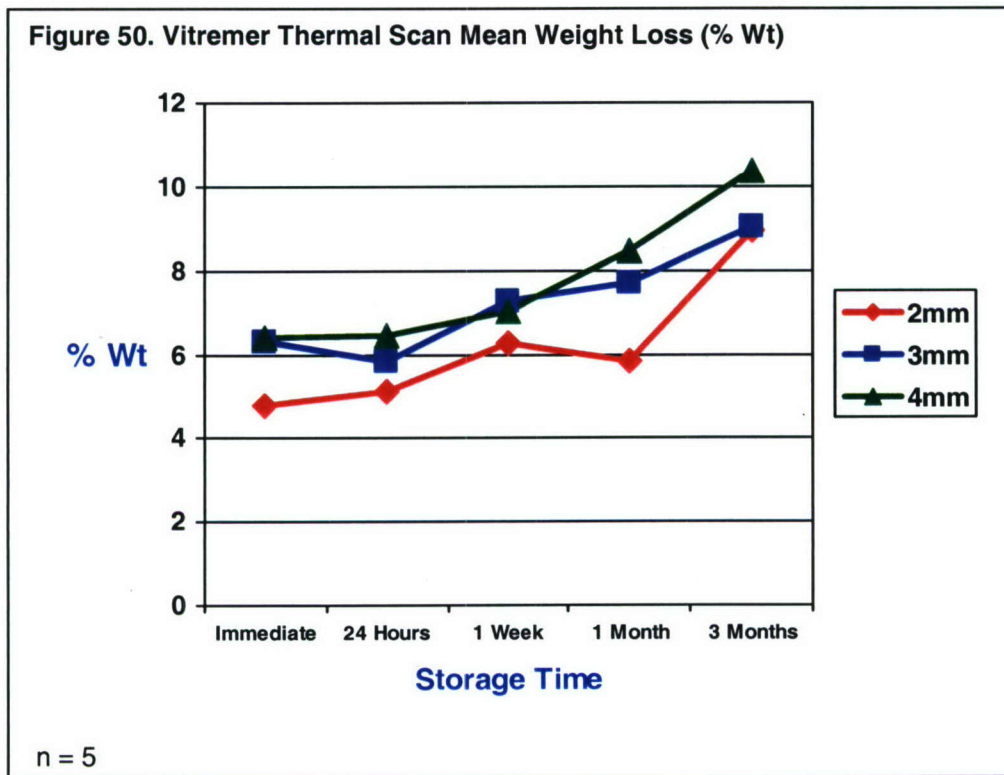
Vitremer gave evidence of an interaction of water loss/net water retention behavior with a possible correlation between the two factors (Pearson's 0.316,  $p = 0.006$ ) but this was discovered to be a weak correlation as linear regression did not identify any significant relationship ( $R^2 = 0.10$ ). Moreover, the same behavior was seen with Fuji II LC (Pearson's 0.301,  $p = 0.009$ ;  $R^2 = 0.091$ ) but no such correlation was identified with Photac-Fil Quick ( $p = 0.450$ ). It appears evident that there is no significant relationship between the water loss behavior and the amount of net water retained during the specific heat determinations. Certainly a relationship can be established between the amount of water gained during storage

and net water retention for all three materials using linear regression (Vitremer,  $R^2 = 0.800$  ; Fuji II LC,  $R^2 = 0.629$  ; Photac-Fil Quick,  $R^2 = 0.747$ ) but this certainly begs the rationalization: water must be gained during the storage periods to be able for the water to be retained during the specific heat determinations.

The effect of net water content on the development of specific heat capacity must be considered, as mature glass-ionomer materials are postulated to contain up to five percent unbound water and anywhere from 18 to 28 percent bound water.<sup>93</sup> Water has a reported specific heat capacity of  $4.186 \text{ J/g}^\circ\text{C}^{90}$  and hence, more water content within a material could possibly affect its specific heat value. When analyzing any possible relationship between Vitremer water retention behavior and specific heat values, linear regression did not identify any strong relationships between net water retention ( $R^2 = 0.014$ ) or water gain during storage ( $R^2 = 0.184$ ). Similar results were found for Fuji II LC (net water retention,  $R^2 = 0.042$ ; water gain,  $R^2 = 0.370$ ) or Photac-Fil Quick (water gain,  $R^2 = 0.0707$ ; net water retention,  $R^2 = 0.011$ ). Interestingly, there appeared to be a stronger relationship between water loss during the specific heat determinations and specific heat values (Vitremer  $R^2 = 0.540$ ; Fuji II LC  $R^2 = 0.576$ ; Photac-Fil Quick  $R^2 = 0.547$ ). The significance of these findings remains obscure at this time.

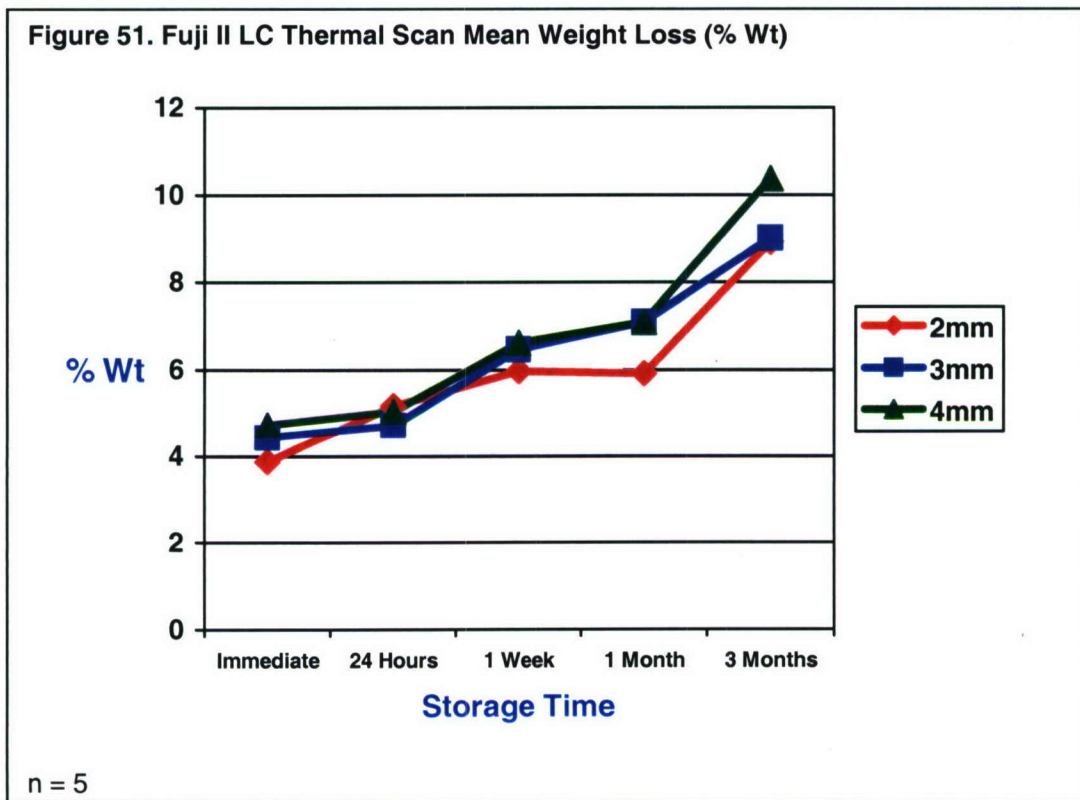
The resin-modified glass-ionomer materials were also analyzed for weight loss during the DSC thermal scan for identification of trends. In addition, the total weight loss during the specific heat determinations and the thermal scan was evaluated for similar reasons and these weight losses were compared to water gain during storage.

The Vitremer thermal scan weight loss data is depicted in Figure 50.

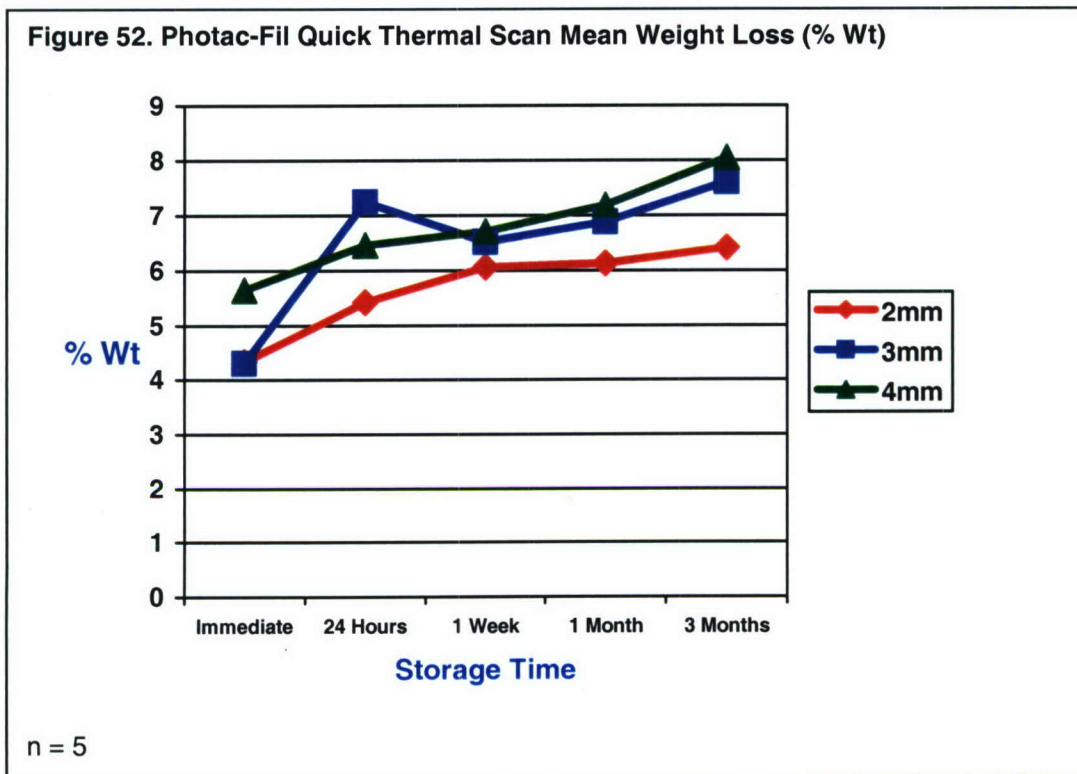


All thicknesses experienced significantly more weight loss during the thermal scan with increased storage time ( $p < 0.0001$ ), with each thickness roughly displaying the same trend of weight loss. The 3 mm and 4 mm samples displayed parallel increasing weight loss behavior with increased storage time, but the 2 mm samples developed a decrease from one week to one month which then became almost identical to the 3 mm trend at three months. The 2 mm samples demonstrated significantly less weight loss during that thermal scan than the 4 mm samples ( $p = 0.006$ ) while all other thicknesses were similar in weight loss.

The Fuji II LC thermal scan weight losses are posted in Figure 51. Considering total weight loss over the storage time, the Fuji II LC samples demonstrated a significant increase in weight loss ( $p < 0.0001$ ). When evaluated between the sample thicknesses, the 4 mm groups demonstrated significantly more weight loss ( $p = 0.037$ ) than the 2 mm samples, while no statistical difference was identified between the 2 mm and 3 mm as well as between the 3 mm and 4 mm samples ( $p > 0.153$ ).



The results for the Photac-Fil Quick thermal scan weight loss can be seen in Figure 52.



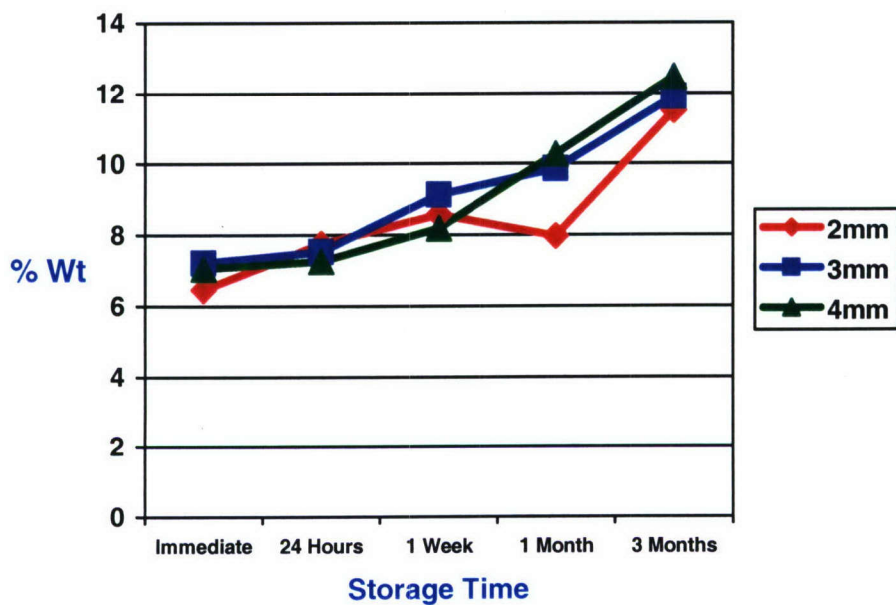
The Photac-Fil Quick samples demonstrated a significantly greater weight loss at the end of the three month storage period as compared to the onset ( $p < 0.0001$ ) with a significant difference in loss identified between the 2 mm and 3 mm samples ( $p = 0.017$ ) and between the 2 mm and 4 mm samples ( $p = 0.001$ ), but not between the 3 mm and 4 mm samples ( $p = 0.577$ ).

All three RMGI materials displayed similar weight loss behavior during the DSC thermal process, demonstrating a significant increase in weight loss as storage time progressed. Interesting, review of the data will show that the 2 mm material samples between one week and one month either show a trend of either weight gain or at least a lessening in the rate of weight loss, but this trend is reversed after one month. As compared to the specific heat determination weight loss, it can be observed that the 2 mm thicknesses display in all materials significantly less weight loss than the 4 mm samples. This trend is the reverse from that observed during the specific heat determinations: a possible explanation can be afforded due to difference in thermal energy provided between the two methods and the development of more firmly-bound water as the RMGI polyalkenoate matrix matures. Accordingly, the enthalpy developed by the

thermal scan is much greater than that provided by specific heat determination and this increased energy could provide the impetus necessary to overcome some of the diffusion barriers that hinders the loss of loosely-bound water during the specific heat determinations. Furthermore, the 4 mm thicknesses could also be susceptible to more weight loss during the thermal scan due to loosely-bound water not removed during the specific heat determinations and the development of bound water as the polyalkenoate matrix matures. Based on some of the evidence provided by hardness testing, the deeper layers do not have the same degree of setting as the upper layers and the polyalkenoate reactions in the deeper layers have either been severely hampered or plasticized by the influx of water during storage. Hence, the polyalkenoate matrix in the deeper regions does not attain the level of maturity required to resist the forces of desiccation and is more prone to water loss.

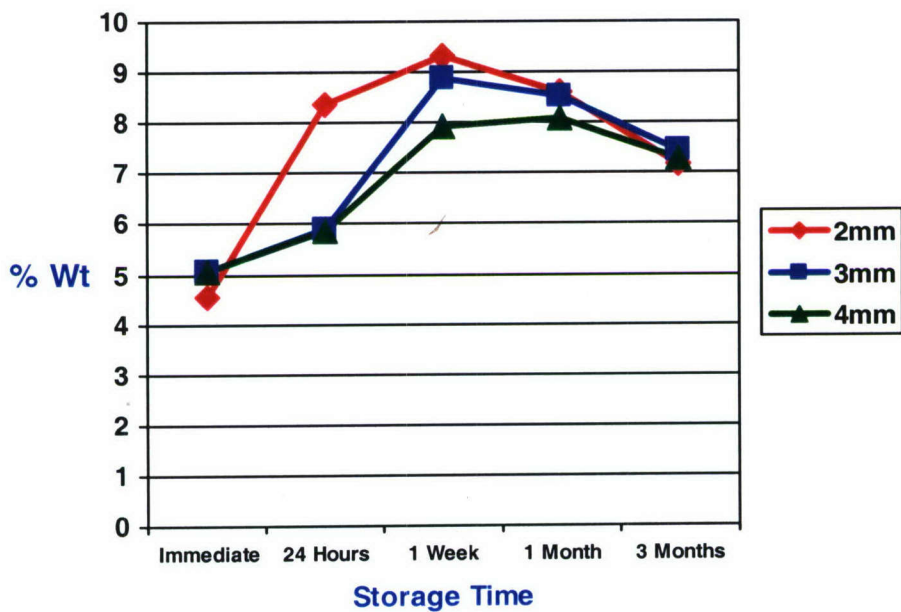
The three resin-modified glass-ionomer materials were additionally analyzed for total weight loss experienced by the samples during the specific heat determinations combined with the DSC thermal scan, and the results for Vitremer can be seen in Figure 53. All of the Vitremer samples experienced significant weight loss between initial fabrication and three months ( $p < 0.0001$ ), but there was no significant difference found between the thicknesses at the end of three months ( $p = 0.716$ ). Interestingly, the results for Fuji II LC and Photac-Fil Quick were similar. All Fuji II LC samples (Figure 54) experienced significant weight loss between immediate fabrication and three months ( $p < 0.0001$ ) but there was no significant difference in total weight loss between the thicknesses at three months ( $p = 0.254$ ). The Photac-Fil Quick samples displayed similar weight loss behavior (Figure 55) demonstrating a significant increase in total weight loss over the total storage time ( $p < 0.0001$ ) but without a significant difference identified between the different thicknesses ( $p = 0.548$ ).

Figure 53. Vitremer Thermal Determinations Mean Total Weight Loss (% Wt)

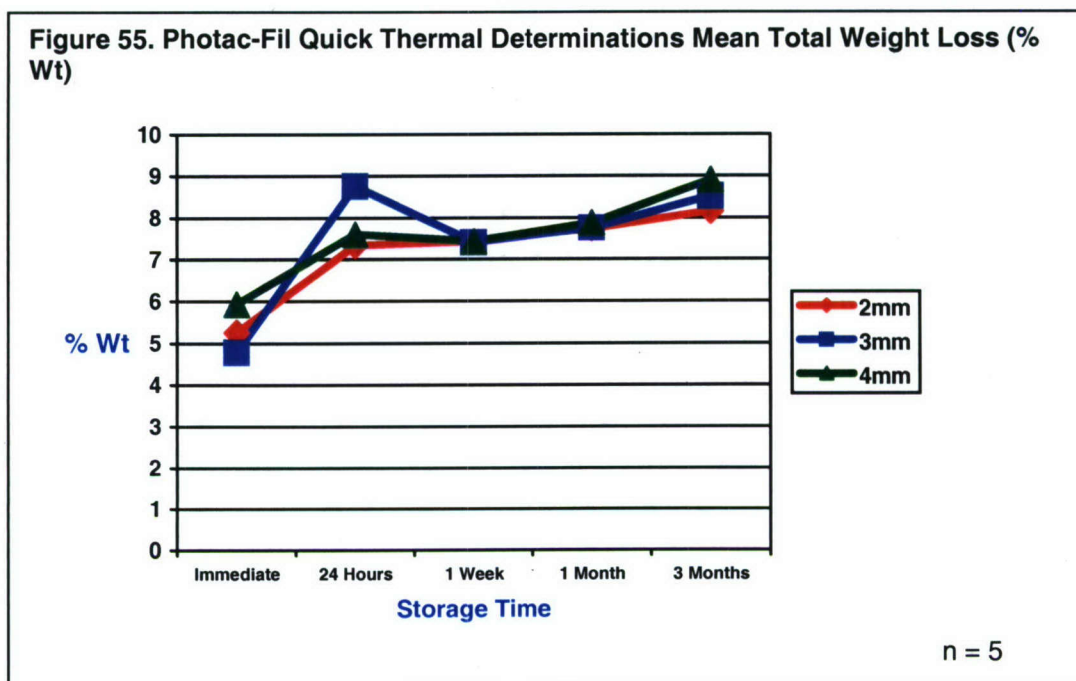


n = 5

Figure 54. Fuji II LC Thermal Determinations Mean Total Weight Loss (% Wt)



n = 5



The total weight loss data provides some insight into the deposition and maturity of the water that may be contained within each resin-modified glass-ionomer material. The comparison of total weight loss to the thermal scan weight loss data will identify some differences, although in some instances the trends may appear to be similar. One striking difference between the two sets of data is that the thermal scan weight loss should involve only the more firmly-bound water that is incorporated in the polyalkenoate hydrogel. As this hydrogel becomes more mature, less water should theoretically be lost in the resin-modified glass-ionomer materials during the heat capacity determinations while more weight loss due to water could be expected to be lost during the thermal scan. For some cases, this has been found to be exactly the case during this three-month evaluation. However, continued evaluations for longer storage times are needed before definitive trends can be identified.

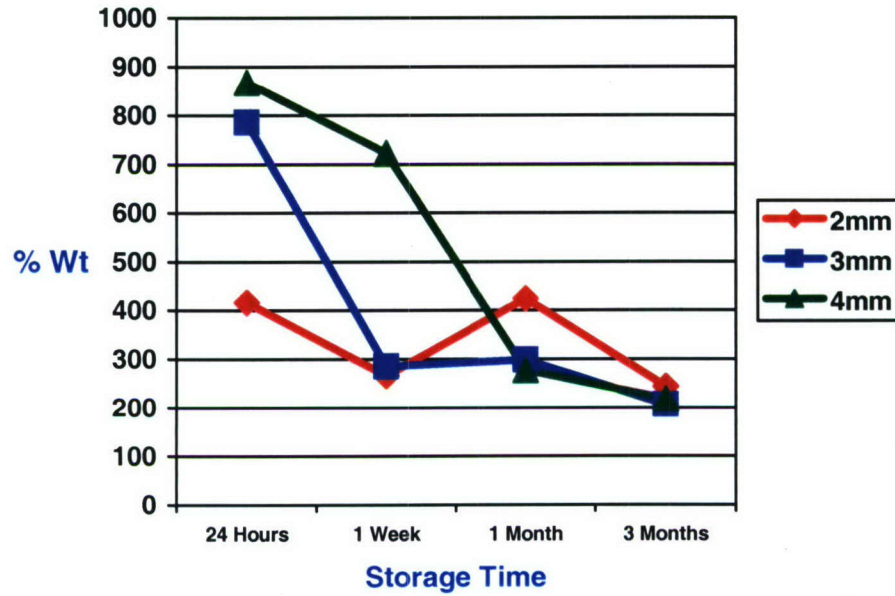
Analysis of the total weight loss of the materials will provide some identity to the nature of the total water behavior of the resin-modified glass-ionomer materials. Due to the maturation processes that occur with glass-ionomer materials in general, it would be expected that overall rate of water loss (as in weight percent loss over time) would decrease as storage time

progressed and the polyalkenoate matrix continues to mature. This behavior was observed at three months with Fuji II LC, Photac-Fil Quick demonstrated a stabilization trend of total weight loss in the evaluation midst, and Vitremer was still demonstrating an increasing weight loss at three months. It cannot be ascertained at present if the present findings will continue to display the same behavior or if the other materials will eventually provide similar total weight loss behavior as demonstrated by Fuji II LC. Further evaluations are ongoing for evaluation of weight loss for increased storage time.

To gain some insight into the effect of water gain during storage to the weight loss during the thermal determinations, the ratios of DSC thermal scan to water gain and total weight loss to water gain (expressed in percent) was analyzed. The immediate groups were excluded from this analysis. The results of the ratio between thermal scan weight loss and water gain for the Vitremer samples is depicted in Figure 56. The ratio of the weight loss during the thermal scans to water gain during storage for the Vitremer samples demonstrated a significant decrease as storage time progressed ( $p < 0.0001$ ). There was no significant difference in the ratio reduction between the 2 mm and 3 mm thicknesses ( $p = 0.755$ ) or between the 3 mm and 4 mm thicknesses ( $p = 0.189$ ). However, a significant difference was identified between the 2 mm and 4 mm thicknesses ( $p = 0.042$ ).

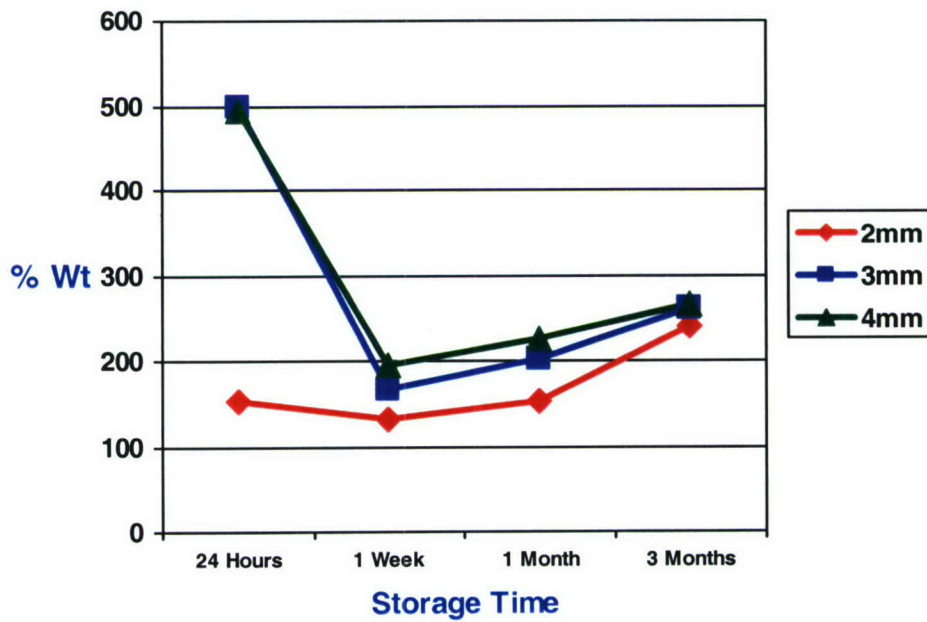
The results of the Fuji II LC ratio of thermal scan weight loss/water gain ratio can be seen in Figure 57.

Figure 56. Vitremer Ratio Mean Thermal Scan Loss/Water Gain (%)



n = 5

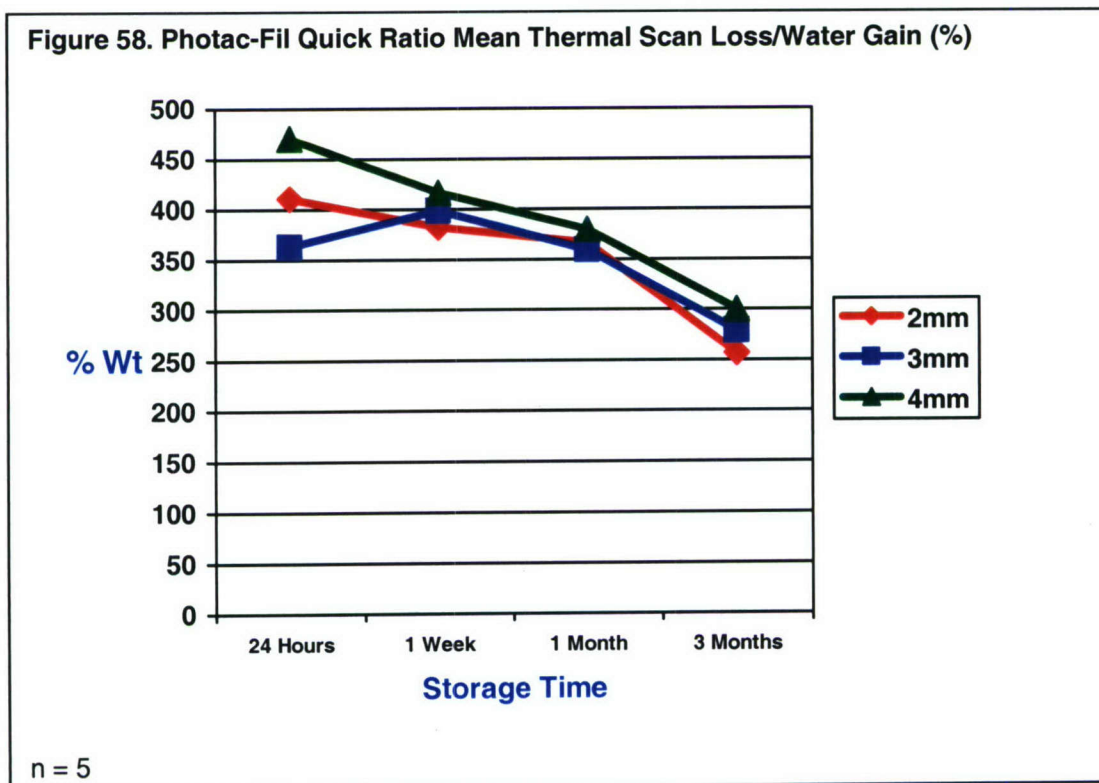
Figure 57. Fuji II LC Ratio Mean Thermal Scan Loss/Water Gain (%)



n = 5

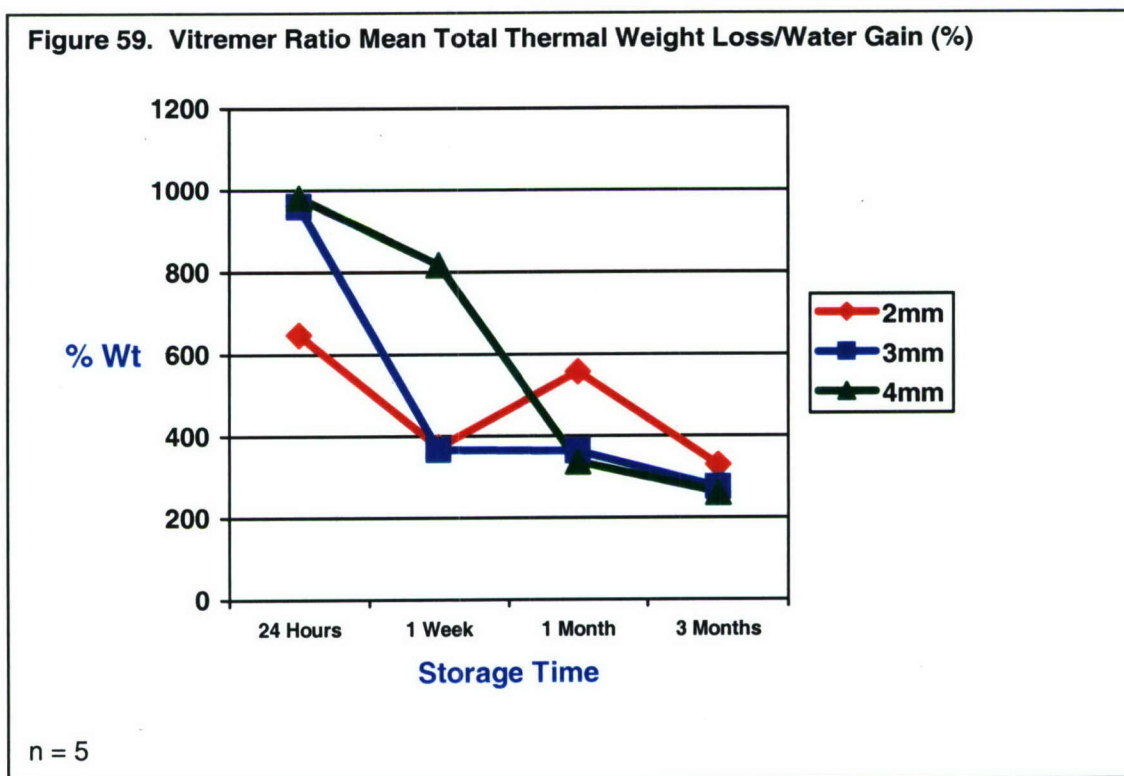
One-way ANOVA evaluation of the Fuji II LC ratio of weight loss during the thermal scans to water gain identified a significant change ( $p < 0.0001$ ) within the samples when analyzed over the storage time. However, this was most punctuated by a difference noted between 24 hours and one week as seen by the 3 mm and 4 mm samples that demonstrated a precipitous and significant ( $p < 0.0001$ ) decline in the ratio. However, after this observation there was no significant difference identified within the samples between one week and three months ( $p > 0.090$ ). A significant difference in ratio behavior was noted between the 2 mm and 3 mm ( $p = 0.010$ ) samples as well between the 2 mm and 4 mm samples ( $p = 0.004$ ) but no difference was identified between the 3 mm and 4 mm samples ( $p = 0.941$ ).

The Photac-Fil Quick samples (Figure 58) thermal scan weight loss to water gain ratio displays a decrease in ratio over time, similar to the case of Vitremer. A significant decrease in the overall



ratio was identified between 24 hours and three months ( $p = 0.002$ ), however no significant difference was found between the thicknesses ( $p = 0.378$ ).

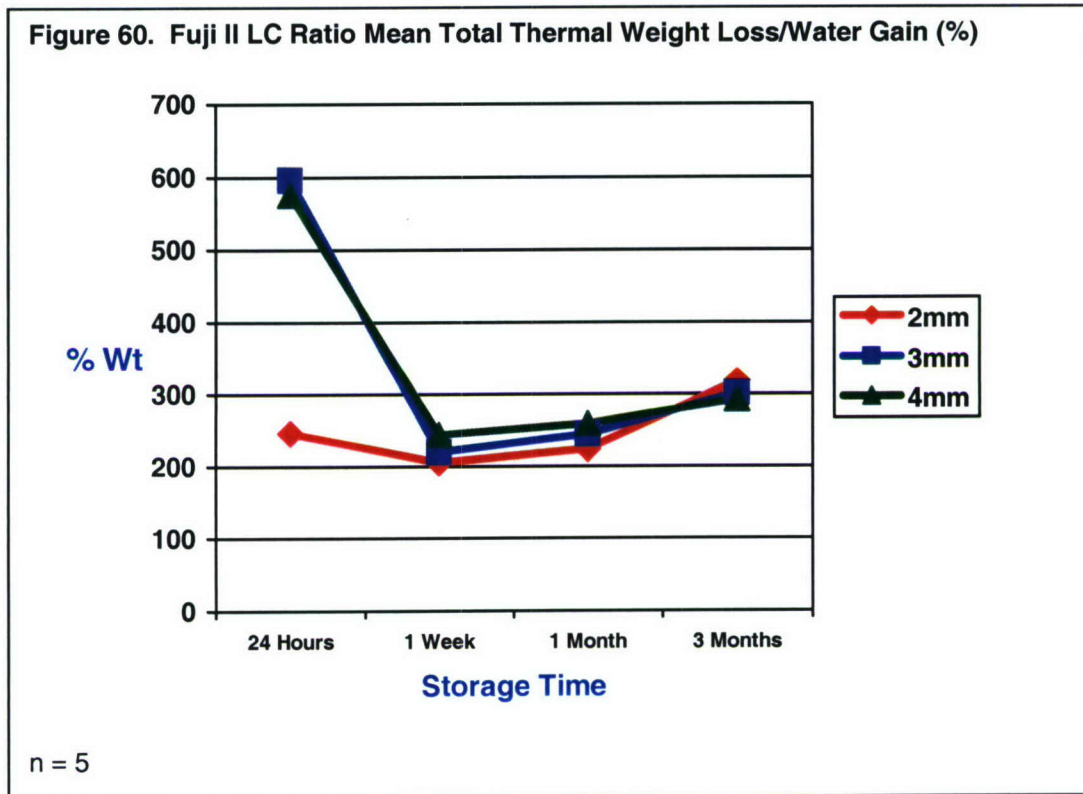
An attempt at additional insight into the dynamics of the resin-modified glass-ionomer water behavior was done with evaluating the ratio of total thermal weight loss to water gain during storage. The analysis of Vitremer total thermal weight loss to water gain is graphically depicted in Figure 59. The behavior of this analysis is nearly the same as the thermal scan weight loss and water gain ratio.



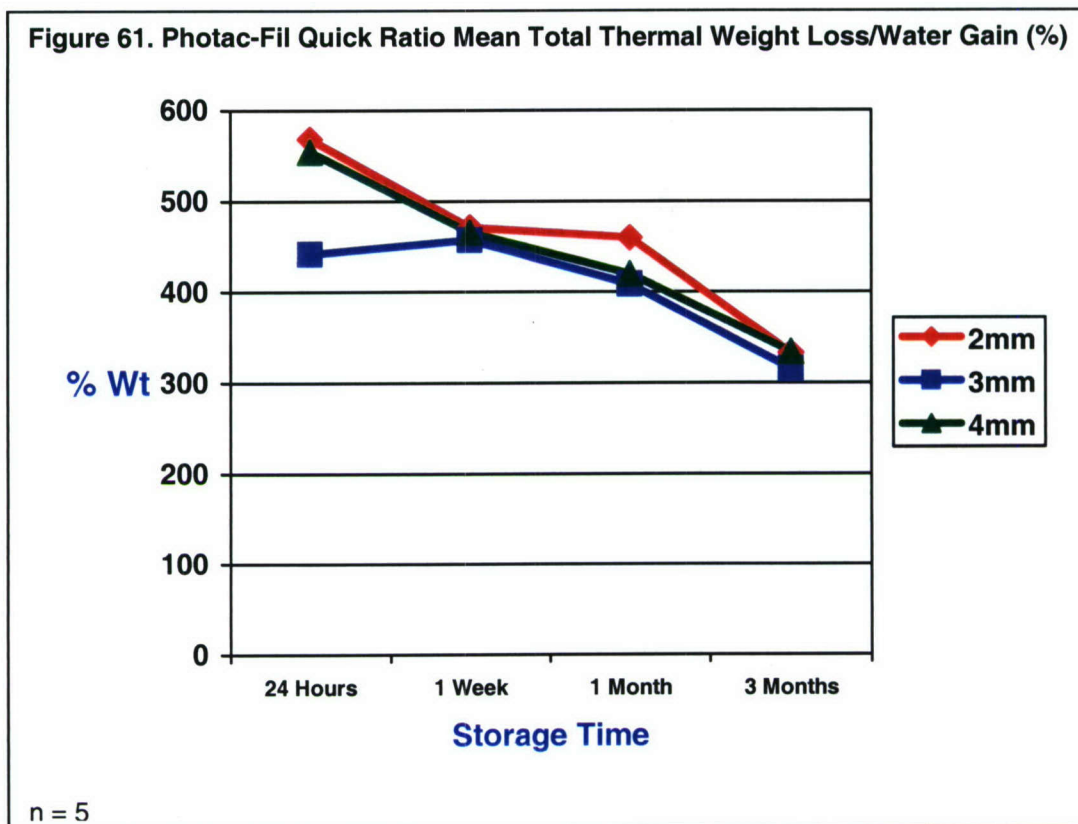
As with the ratio of thermal scan weight loss to water gain, all samples demonstrated a significant reduction in the ratio with increased storage time ( $p < 0.0001$ ). However, the total weight loss to water gain ratio differed from the thermal scan to water gain ratio analysis in that ANOVA found no significant difference in the ratio reduction behavior between the sample thicknesses ( $p = 0.253$ ).

Analysis of the Fuji II LC ratio of total thermal weight loss to water gain (Figure 60) found that all samples displayed a significant difference in the ratio between 24 hours and three months storage ( $p < 0.0001$ ) with the main difference noted between 24 hours and the other storage times, as there were no differences found after one week and three months ( $p > 0.145$ ). As with

Vitremer there was no significant difference identified between the Fuji II LC thicknesses ( $p > 0.075$ ).



As with the thermal scan loss to water gain ratio, the Photac-Fil Quick samples (Figure 61) demonstrated a significant reduction in total thermal weight loss to water gain ratio between 24 hours and three months ( $p < 0.0001$ , with no significant differences noted between the sample thicknesses ( $p = 0.429$ ).



Water is an essential ingredient for all formulations of glass-ionomer materials as water is both a reactant in the early stages of the glass-ionomer setting reaction, but it also enables the formation of the silica-based hydrogel.<sup>93</sup> As glass-ionomer materials mature, a certain water content becomes increasingly resistant to removal by desiccation and is referred to as being more “bound”. The ratio to “bound” to “unbound” has been demonstrated to increase as glass-ionomer products mature.<sup>3,21,93</sup> The exact timing of this conversion of the initial unbound water to the more removal-resistant bound water has not been ascertained, as the earliest detection of bound water has not been reported in the scientific literature.

The weight changes associated with thermal analysis of the resin-modified glass-ionomer restorative materials may provide some insight into the nature of water within these materials. If the assumptions of this thesis are correct, results of the net water retention analysis during the specific heat determinations have demonstrated evidence of net water retention as early as 24 hours for Fuji II LC and one week for both Photac-Fil Quick and Vitremer. It is unclear if this

early evidence of water retention is substantiation of the first formation of bound water in resin-modified glass-ionomer cements.

The ratios of weight loss during both the thermal scan and total weight loss to the water gain during storage was undertaken to possibly provide some erudition into relationship between the water gained during storage and the amount of weight loss during the thermal analysis.

Another assumption made during the thermal analysis was that weight loss during the higher-temperature thermal scans would predominately be due to the more firmly-bound water species. To assume that the weight loss would entirely be represented by water would be incorrect, as resin-modified glass-ionomer materials represent complex solutions of both polyalkenoate and methacrylate components, as well as photoinitiators and other modifiers.<sup>21</sup> Some weight loss during the thermal scan with Fuji II LC and Photac-Fil Quick could be also attributed to unreacted methacrylate components, especially HEMA. However, due to the water-soluble nature of HEMA, it could be reasonable to assume that any unreacted HEMA remaining in the matrix might exist in solution with water during the thermal scan process. Since the methacrylate component is largely grafted upon the polyacrylic acid backbone in Vitremer, it is comfortable to assume that weight loss during the thermal scan could be more due to water loss than the other two materials. However, the reader must be reminded that these simplistic generalizations are made in order to attempt to observe generalized trends of the materials: the emphasis remains that these materials are complex entities and not mere simple mixtures of polyalkenoate components and methacrylates.

All materials demonstrated increased weight loss during the DSC thermal scan as storage time increased. This behavior is expected as all materials were demonstrated to gain weight during storage. Division of the weight loss during the DSC thermal scan by the observed water gain during storage provides some insight into the nature of the water into these materials at the time of the thermal scan. Accordingly, the RMGI materials certainly contain both unbound and bound water in their matrix: but by the time the samples were submitted to the thermal scan a

considerable component of the unbound water has been removed by the specific heat determination. This concept perhaps lends better credence to comparing total weight loss to the water gain during storage.

All three materials demonstrated, with few exceptions, an overall loss in the ratio of thermal total weight loss to water gain with storage time. If the content of RMGI materials are considered, the materials will consist on the outset a mixture of aluminofluorosilicate glasses, polyacrylic acid polymers, methacrylate monomers, water, photoinitiators, and a variety of other proprietary resin components. After preparation the material will contain, depending on its maturity, a mixture of methacrylate polymers, siliceous hydrogel matrix, and unreacted aluminofluorosilicate glasses, polyacrylic acid polymers, and unreacted methacrylate components. Concerning the weight loss observed during the thermal scans, it is felt that any unreacted methacrylate components that are not grafted onto the polyacrylic acid polymer backbone may be removed during the thermal scan. However, loss of unreacted polyacrylic acid components contribution to weight loss during the thermal scan is considered minor as most polyacrylic acids used in the RMGI component demonstrate boiling points in excess of 200 °C and thermal endothermic peaks associated with this phase change was not apparent during the thermal scans. It is felt that probably that the major contributor to the weight loss during the DSC thermal scan is due to water loss, which may be accompanied by other minor components that may be concurrently in solution with the water at the time. As storage time progressed, the ratio of total weight loss during the thermal determinations to water gain decreased in all materials. This represents the transformation of the water that is gained from the unbound to the more stable bound nature in the mature hydrogel matrix.

## **CONCLUSIONS**

Based on the conditions of this study, several encompassing summary statements may be made:

1. The solubility data reveals interesting material trends concerning resin-modified glass-ionomer restorative materials. All three materials demonstrated increased solubility until the one-month storage period. This reflects a continuation of the ongoing ion-exchange process of the polyalkenoate reaction and that resin-modified glass-ionomer materials may be more susceptible to the effects of solution until that time.  
Furthermore, solubility measurement, especially under the conditions of this study, does not provide sufficient sensitivity to provide meaningful data in the determination of resin-modified glass-ionomer depth of cure.
2. The analysis of the hardness data provided evidence of a continuing post-irradiation polyalkenoate reaction. Although hardness increase was noted in deeper layers of all materials, the increase in the 4 mm and 5 mm bottom surfaces was not of sufficient magnitude to reach statistical equivalence with the hardness exhibited by the 2 mm surfaces. At the end of three months, only Fuji II LC demonstrated a bottom surface hardness of the 3 mm samples that were statistically similar to the hardness exhibited by the 2 mm samples.
3. All materials evidenced an increase in specific heat capacity with material aging. This is suspected to be due to increased water uptake and retention, which is strong evidence of the continuation of a post-irradiation polyalkenoate reaction. At the end of the three-month storage there were no significant differences in the specific heat between the 2 mm and 3 mm thicknesses of materials. There remained significant differences between the 2 mm and 4 mm thicknesses in two of the three RMGI materials.
4. All materials exhibited evidence during the differential scanning calorimetry thermal scans that demonstrated a change in material compositional nature with storage time. Each material demonstrated different behavior in the thermal scan in regard to energy requirements and tendencies towards stabilization of the thermal energy requirements

with increased storage time. Each material demonstrated mean thermal scan peak temperature behavior that also provides evidence that the material compositional change within each material is becoming more similar in nature.

5. Analysis of weight loss during the specific heat determinations identified evidence of the first events of net water retention with the resin-modified glass-ionomer materials. This suggests that the first evidence of bound water in Fuji II LC is at 24 hours and at one week with both Photac-Fil Quick and Vitremer.
6. Analysis of thermal determinations weight loss compared to water gain revealed that the resin-modified glass-ionomer materials demonstrated water-retentive behavior in the form of unbound and bound water as that reported by conventional glass-ionomer materials.

The purpose of this investigation was to characterize the depth of cure of resin-modified glass-ionomer restorative materials using physical property testing with the research hypothesis that RMGI materials will display a depth of cure gradient that is more dependent on visible light penetration rather than what residual acid-base chemical setting reaction that may remain. Based on the analysis of the data that was collected under the conditions of this study the research hypothesis is accepted.

Information gained from the hardness testing and thermal analysis did give evidence of a continuing post-photopolymerization reaction, which is certainly indicative of the acid-base polyalkenoate setting reaction. However, the nature of this reaction, especially in the deeper 4 mm and 5 mm depths, did not provide sufficient change in physical properties as to be statistically equivalent to the 2 mm depths. There were instances in which material properties at the 3 mm depth was equivalent to that seen of 2 mm depths, however this was not consistently seen within all materials during all storage times. It is the conclusion from the conditions of this study that for best material properties resin-modified glass-ionomer restorative products should be photopolymerized in thicknesses of no more than two millimeters.

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**APPENDIX A**

**SOLUBILITY DATA**

Table 64. Vitremer Immediate Solubility Experimental Sample Results (grams)

Vitremer Immediate SOLUBILITY (EXPERIMENTAL GROUP)										
O'Haus Analytical Plus Scale										
	pre H2O					post H2O				
	13-Jan-06	14-Jan-06	15-Jan-06	17-Jan-06	18-Jan-06	19-Jan-06	20-Jan-06	21-Jan-06		
<b>Zmm Group</b>										
<b>Sample</b>										
Start weight	0.2155	0.2324	0.2169	0.2162	0.2268	Floss total	2	5		
Floss Weight	0.0111	0.0103	0.0106	0.01	0.0104		0.0524	3		
<b>W1 (start-floss)</b>	0.2044	0.2221	0.2063	0.2062	0.2164			4		
Final constant weight	0.2064	0.2239	0.2078	0.208	0.2175			5		
Floss Weight	0.0111	0.0103	0.0106	0.01	0.0104					
<b>W2 (final-floss)</b>	0.1953	0.2136	0.1972	0.198	0.2071					
<b>Mean</b>	0.21108	0.22706	0.2042	0.20288	0.20234		0.2021	0.20184	0.20224	
<b>sd</b>	0.007618	0.015229	0.007726	0.007653	0.007747		0.007554	0.007747	0.007653	
<b>% SOLUBILITY</b>	4.452055	3.827105	4.411052	3.976722	4.297597		4.192906	4.2767		
	<b>Mean solubility</b>									
<b>Zmm Group</b>										
<b>Sample</b>										
Start weight	0.288	0.2723	0.2763	0.2697	0.2804	Floss total	2	5		
Floss Weight	0.0101	0.0089	0.0102	0.0088	0.0095		0.0475	3		
<b>W1 (start-floss)</b>	0.2779	0.2634	0.2661	0.2609	0.2709			4		
Final constant weight	0.2746	0.2602	0.2641	0.2556	0.2693			5		
Floss Weight	0.0101	0.0089	0.0102	0.0088	0.0095					
<b>W2 (final-floss)</b>	0.2645	0.2513	0.2539	0.2468	0.2598					
<b>Mean</b>	0.26784	0.27882	0.25816	0.25632	0.2554		0.25526	-0.0095		
<b>sd</b>	0.007209	0.006651	0.007302	0.007271	0.007351		0.007459	#DIV/0!		
<b>% SOLUBILITY</b>	4.821878	4.593774	4.584743	5.404369	4.097453		4.700443	0.473978		
	<b>Mean solubility</b>									
<b>Zmm Group</b>										
<b>Sample</b>										
Start weight	0.3254	0.3788	0.3765	0.3623	0.4152	Floss total	2	5		
Floss Weight	0.0109	0.01	0.0098	0.0087	0		0.0394	3		
<b>W1 (start-floss)</b>	0.3145	0.3688	0.3667	0.3536	0.4152			4		
Final constant weight	0.3059	0.3565	0.3498	0.3348	0.3707			5		
Floss Weight	0.0109	0.01	0.0098	0.0087	0					
<b>W2 (final-floss)</b>	0.295	0.3465	0.34	0.3261	0.3707					
<b>Mean</b>	0.36376	0.375495	0.34168	0.33768	0.33768		0.33662	0.33532	0.33566	
<b>sd</b>	0.032395	0.032395	0.032395	0.032395	0.032395		0.032395	0.032395	0.032395	
<b>% SOLUBILITY</b>	6.200318	6.046638	7.281156	7.777149	10.71773		7.604598	1.885815		
	<b>Mean solubility</b>									
<b>Zmm Group</b>										
<b>Sample</b>										
Start weight	0.4481	0.4145	0.4833	0.5052	0.4921	Floss total	2	5		
Floss Weight	0.0107	0.0097	0.0094	0.0089	0.0099		0.0486	3		
<b>W1 (start-floss)</b>	0.4374	0.4048	0.4739	0.4963	0.4822			4		
Final constant weight	0.4251	0.3931	0.4581	0.477	0.4643			5		
Floss Weight	0.0107	0.0097	0.0094	0.0089	0.0099					
<b>W2 (final-floss)</b>	0.4144	0.3834	0.4487	0.4681	0.4544					
<b>Mean</b>	0.45892	0.47214	0.43948	0.43584	0.43435		0.43435	0.4336	0.4338	
<b>sd</b>	0.036929	0.035145	0.034914	0.03435	0.03435		0.03435	0.03436	0.034084	
<b>% SOLUBILITY</b>	5.258345	5.286561	5.317578	5.682047	5.765243		5.461955	0.241603		
	<b>Mean solubility</b>									

Table 65. Vitremer Immediate Solubility Results Control Sample Results (grams)

Vitremer Immediate Solubility (Control GROUP)		O'Haus Analytical Plus Scale									
START: 12 Dec 2005											
		pre H2O					post H2O				
		12-Dec-05	13-Dec-05	14-Dec-05	15-Dec-05	16-Dec-05	17-Dec-05	18-Dec-05			
<b>2mm Group</b>											
Sample		1	2	3	4	5					
Start weight		0.2333	0.2177	0.2151	0.2352	0.2373	Floss total				
Floss Weight		0.0125	0.0125	0.0098	0.0113	0.0125	0.0586				
W1 (start-floss)		0.2208	0.2052	0.2053	0.2239	0.2248					
Final constant weight		0.2252	0.209	0.2062	0.2271	0.229					
Floss Weight		0.0125	0.0125	0.0098	0.0113	0.0125					
W2 (final-floss)		0.2127	0.1965	0.1964	0.2158	0.2165					
Mean		0.216	0.22258	0.20964	0.20844	0.20758					
sd		0.01047053	0.01020931	0.01095892	0.01077697	0.01090527					
% SOLUBILITY		3.67	4.24	4.34	3.62	3.69	Mean solubility	3.91	0.35		
<b>3mm Group</b>											
Sample		1	2	3	4	5					
Start weight		0.276	0.269	0.3235	0.3047	0.2863	Floss total				
Floss Weight		0.0104	0.0108	0.0097	0.0087	0.011	0.0506				
W1 (start-floss)		0.2656	0.2582	0.3138	0.296	0.2753					
Final constant weight		0.2647	0.2567	0.3108	0.2936	0.2738					
Floss Weight		0.0104	0.0108	0.0097	0.0087	0.011					
W2 (final-floss)		0.2543	0.2459	0.3011	0.2849	0.2628					
Mean		0.28178	0.29098	0.2722	0.2705	0.26992					
sd		0.02219786	0.02208201	0.02192788	0.02176481	0.02164943					
% SOLUBILITY		4.25	4.76	4.05	3.75	4.54	Mean solubility	4.27	0.40		
<b>4mm Group</b>											
Sample		1	2	3	4	5					
Start weight		0.363	0.381	0.3954	0.3847	0.3483	Floss total				
Floss Weight		0.01	0.0109	0.0093	0.0111	0.009	0.0503				
W1 (start-floss)		0.353	0.3701	0.3861	0.3736	0.3393					
Final constant weight		0.3451	0.3632	0.3763	0.3653	0.3306					
Floss Weight		0.01	0.0109	0.0093	0.0111	0.009					
W2 (final-floss)		0.3351	0.3523	0.367	0.3542	0.3216					
Mean		0.36442	0.37554	0.35048	0.3476	0.34708					
sd		0.01872023	0.01859503	0.01810202	0.01807935	0.01809677					
% SOLUBILITY		5.07	4.81	4.95	5.19	5.22	Mean solubility	5.05	0.17		
<b>5mm Group</b>											
Sample		1	2	3	4	5					
Start weight		0.4839	0.4664	0.507	0.4893	0.5015	Floss total				
Floss Weight		0.0125	0.0109	0.0101	0.0102	0.011	0.0547				
W1 (start-floss)		0.4714	0.4555	0.4969	0.4791	0.4905					
Final constant weight		0.4604	0.4433	0.4847	0.4664	0.4796					
Floss Weight		0.0125	0.0109	0.0101	0.0102	0.011					
W2 (final-floss)		0.4479	0.4324	0.4746	0.4562	0.4686					
Mean		0.47868	0.49112	0.46146	0.45806	0.45724					
sd		0.01593101	0.01477457	0.01641463	0.01634748	0.01644132					
% SOLUBILITY		4.99	5.07	4.49	4.78	4.46	Mean solubility	4.76	0.28		

Table 66. Vitremer 24-Hour Solubility Results Experimental Sample Results (grams)

Vitremer II 24-HR SOLUBILITY (EXPERIMENTAL GROUP)										
O'Haus Analytical Plus Scale										
	pre H2O					post H2O				
	25-Jan-06	26-Jan-06	27-Jan-06	28-Jan-06	29-Jan-06	30-Jan-06	31-Jan-06			
<b>2mm Group</b>										
<b>Sample</b>	1	2	3	4	5	1	2	3	4	5
Start weight	0.2094	0.2271	0.2214	0.2245	0.2416	Floss total 2				
Floss Weight	0.0096	0.0092	0.0107	0.0094	0.0121	0.0513				
<b>W1 (start-floss)</b>	0.1998	0.2179	0.2107	0.2151	0.2295					
Final constant weight	0.1978	0.2167	0.2098	0.2125	0.2273					
Floss Weight	0.0096	0.0092	0.0107	0.0094	0.0121	Wt-floss	1.073	1.0842	1.016	1.0131
<b>W2 (final-floss)</b>	0.1882	0.2075	0.1991	0.2031	0.2152	Mean	0.2146	0.21684	0.2032	0.20262
<b>% SOLUBILITY</b>	5.81	4.77	5.51	5.58	6.23	sd	0.0115795	0.0114299	0.0106658	0.0107185
						Mean solubility	5.58	5.58	5.58	5.53
<b>3mm Group</b>										
<b>Sample</b>	1	2	3	4	5	1	2	3	4	5
Start weight	0.3127	0.316	0.2836	0.2691	0.3099	Floss total 2				
Floss Weight	0.011	0.0102	0	0.0099	0.0098	0.0409				
<b>W1 (start-floss)</b>	0.3017	0.3058	0.2836	0.2592	0.3001					
Final constant weight	0.2961	0.3004	0.267	0.2542	0.2947					
Floss Weight	0.011	0.0102	0	0.0099	0.0098	Wt - floss	1.4504	1.482	1.3771	1.3715
<b>W2 (final-floss)</b>	0.2851	0.2902	0.267	0.2443	0.2849	Mean	0.29008	0.2964	0.27542	0.2745
<b>% SOLUBILITY</b>	5.50	5.10	5.85	5.75	5.06	sd	0.0207601	0.0201764	0.0207181	0.0205943
						Mean solubility	5.45	5.45	5.45	5.36
<b>4mm Group</b>										
<b>Sample</b>	1	2	3	4	5	1	2	3	4	5
Start weight	0.4022	0.3973	0.39	0.3961	0.3823	Floss total 2				
Floss Weight	0.0107	0.012	0.0101	0.0099	0.0109	0.0536				
<b>W1 (start-floss)</b>	0.3915	0.3853	0.3799	0.3862	0.3714					
Final constant weight	0.3795	0.3762	0.3668	0.3724	0.3622					
Floss Weight	0.0107	0.012	0.0101	0.0099	0.0109	Wt-floss	1.9143	1.9518	1.8142	1.8079
<b>W2 (final-floss)</b>	0.3688	0.3642	0.3567	0.3625	0.3513	Mean	0.38286	0.39036	0.36284	0.36158
<b>% SOLUBILITY</b>	5.80	5.48	6.11	6.14	5.41	sd	0.0076575	0.0076709	0.0071248	0.0069534
						Mean solubility	5.79	5.79	5.79	5.34
<b>5mm Group</b>										
<b>Sample</b>	1	2	3	4	5	1	2	3	4	5
Start weight	0.5015	0.5052	0.4808	0.5022	0.5121	Floss total 2				
Floss Weight	0.011	0.0111	0.0112	0.0112	0.0101	0.0546				
<b>W1 (start-floss)</b>	0.4905	0.4941	0.4696	0.491	0.502					
Final constant weight	0.4781	0.4829	0.4592	0.4773	0.4861					
Floss Weight	0.011	0.0111	0.0112	0.0112	0.0101	Wt-floss	2.4472	2.4772	2.3425	2.3301
<b>W2 (final-floss)</b>	0.4671	0.4718	0.448	0.4661	0.476	Mean	0.48944	0.49544	0.4685	0.4669
<b>% SOLUBILITY</b>	4.77	4.51	4.60	5.07	5.18	sd	0.0117104	0.0115205	0.0108516	0.0105932
						Mean solubility	4.83	4.83	4.83	4.29

Table 67. Vitremer 24-Hour Solubility Results Control Sample Results (grams)

Vitremer II 24-HR SOLUBILITY (CONTROL GROUP)		O'Haus Analytical Plus Scale					pre H2O					post H2O				
		1	2	3	4	5	21-Jan-06	22-Jan-06	23-Jan-06	24-Jan-06	25-Jan-06	26-Jan-06	27-Jan-06			
<b>2mm Group</b>																
Sample		1	2	3	4	5	0.2085	0.2107	0.1988	0.1971	0.1971	0.1971				
Start weight		0.2085	0.2213	0.2317	0.2236	0.2436	0.2213	0.2237	0.2118	0.2094	0.2091	0.2091				
Floss Weight		0.1978	0.2093	0.2202	0.2116	0.2319	0.2317	0.2348	0.2224	0.2204	0.2201	0.2201				
W1 (start-floss)		0.1971	0.2091	0.2201	0.2109	0.2306	0.2236	0.2269	0.2129	0.2107	0.2109	0.2109				
Final constant weight		0.1971	0.2091	0.2201	0.2109	0.2306	0.2436	0.2463	0.2334	0.2307	0.2306	0.2306				
Floss Weight		0.107	0.107	0.115	0.112	0.117	1.0708	1.0845	1.0214	1.0104	1.0099	1.0099				
W2 (final-floss)		0.1864	0.1971	0.2086	0.1989	0.2189	0.21416	0.2169	0.20428	0.20208	0.20198	0.20198				
Mean		0.1864	0.1971	0.2086	0.1989	0.2189	0.21416	0.2169	0.20428	0.20208	0.20198	0.20198				
sd		0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013				
Mean solubility		5.76	5.83	5.27	6.00	5.61	Mean solubility	5.69	5.69	5.69	5.69	5.69				
sd		0.013	0.013	0.013	0.013	0.013	sd	0.013	0.013	0.013	0.013	0.013				
<b>3mm Group</b>																
Sample		1	2	3	4	5	0.297	0.3044	0.2844	0.2819	0.2806	0.2806				
Start weight		0.297	0.2968	0.2656	0.2686	0.2855	0.2968	0.3032	0.2854	0.2821	0.282	0.282				
Floss Weight		0.124	0.108	0.115	0.104	0.119	0.2656	0.2713	0.2553	0.2528	0.2523	0.2523				
W1 (start-floss)		0.2846	0.286	0.2541	0.2582	0.2736	0.2686	0.276	0.2553	0.2522	0.252	0.252				
Final constant weight		0.2806	0.282	0.2523	0.252	0.2701	0.2855	0.2919	0.2734	0.2705	0.2701	0.2701				
Floss Weight		0.124	0.108	0.115	0.104	0.119	1.3565	1.3898	1.2968	1.2825	1.28	1.28				
W2 (final-floss)		0.2682	0.2712	0.2408	0.2416	0.2582	0.2713	0.27796	0.25936	0.2565	0.256	0.256				
Mean		0.2682	0.2712	0.2408	0.2416	0.2582	0.2713	0.27796	0.25936	0.2565	0.256	0.256				
sd		0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015				
Mean solubility		5.76	5.17	5.23	6.43	5.63	Mean solubility	5.55	5.55	5.55	5.55	5.55				
sd		0.015	0.015	0.015	0.015	0.015	sd	0.015	0.015	0.015	0.015	0.015				
<b>4mm Group</b>																
Sample		1	2	3	4	5	0.3631	0.3798	0.3483	0.3447	0.3437	0.3437				
Start weight		0.3631	0.4162	0.412	0.4313	0.4301	0.4162	0.4209	0.4007	0.3965	0.3953	0.3946				
Floss Weight		0.12	0.112	0	0.126	0.118	0.412	0.4177	0.3984	0.3943	0.3933	0.3928				
W1 (start-floss)		0.3511	0.405	0.412	0.4187	0.4183	0.4313	0.4362	0.4159	0.4123	0.4113	0.4107				
Final constant weight		0.3432	0.3946	0.3926	0.4105	0.4111	0.4301	0.4352	0.4167	0.4129	0.4118	0.4111				
Floss Weight		0.012	0.0112	0	0.0126	0.0118	2.0051	2.0422	1.9324	1.9131	1.9078	1.9044				
W2 (final-floss)		0.3312	0.3834	0.3926	0.3979	0.3993	0.40102	0.40844	0.38648	0.38262	0.38104	0.38088				
Mean		0.3312	0.3834	0.3926	0.3979	0.3993	0.40102	0.40844	0.38648	0.38262	0.38104	0.38088				
sd		0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027				
Mean solubility		5.67	5.33	4.71	4.97	4.54	Mean solubility	5.04	5.04	5.04	5.04	5.04				
sd		0.027	0.027	0.027	0.027	0.027	sd	0.027	0.027	0.027	0.027	0.027				
<b>5mm Group</b>																
Sample		1	2	3	4	5	0.5098	0.5156	0.4948	0.489	0.4879	0.4871				
Start weight		0.5098	0.5004	0.4859	0.4903	0.5003	0.5004	0.5056	0.4829	0.478	0.4773	0.4776				
Floss Weight		0.101	0.105	0.098	0.107	0.111	0.4859	0.4918	0.4705	0.4651	0.4643	0.4633				
W1 (start-floss)		0.4997	0.4899	0.4761	0.4796	0.4893	0.4903	0.4966	0.4743	0.4691	0.4685	0.4677				
Final constant weight		0.4871	0.477	0.463	0.4673	0.4742	0.5003	0.5064	0.4824	0.4764	0.4755	0.4744				
Floss Weight		0.101	0.105	0.098	0.107	0.111	2.4346	2.4639	2.3528	2.3214	2.3182	2.3165				
W2 (final-floss)		0.477	0.4685	0.4532	0.4566	0.4632	0.48592	0.49278	0.47056	0.4651	0.46428	0.46364				
Mean		0.477	0.4685	0.4532	0.4566	0.4632	0.48592	0.49278	0.47056	0.4651	0.46428	0.46364				
sd		0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009				
Mean solubility		4.54	4.78	4.81	4.80	5.33	Mean solubility	4.85	4.85	4.85	4.85	4.85				
sd		0.009	0.009	0.009	0.009	0.009	sd	0.009	0.009	0.009	0.009	0.009				

Table 68. Vitremer One-Week Solubility Results Experimental Sample Results (grams)

Vitremer II 24-HR SOLUBILITY (CONTROL GROUP)									
O'Haus Analytical Plus Scale									
	1	2	3	4	5		pre H2O	post H2O	
	21-Jan-06	22-Jan-06	23-Jan-06	24-Jan-06	25-Jan-06	26-Jan-06	27-Jan-06		
<b>2mm Group</b>									
Sample	1	2	3	4	5				
Start weight	0.2085	0.2213	0.2317	0.2236	0.2436	Floss total	0.2085	0.2107	0.1988
Floss Weight	0.0107	0.012	0.0115	0.012	0.0117		0.2213	0.2237	0.2118
<b>W1 (start-floss)</b>	0.1978	0.2093	0.2202	0.2116	0.2319		0.2317	0.2348	0.2224
Final constant weight	0.1971	0.2091	0.2201	0.2109	0.2306		0.2236	0.2269	0.2129
Floss Weight	0.0107	0.012	0.0115	0.012	0.0117		0.2436	0.2463	0.2334
<b>W2 (final-floss)</b>	0.1864	0.1971	0.2086	0.1989	0.2189	Wt-floss	1.0708	1.0845	1.0214
						Mean	0.21416	0.2169	0.20428
<b>% SOLUBILITY</b>	5.76	5.83	5.27	6.00	5.61	sd	0.013	0.013219	0.01291
							Mean solubility	5.69	0.28
<b>3mm Group</b>									
Sample	1	2	3	4	5				
Start weight	0.297	0.2968	0.2656	0.2686	0.2855	Floss total	0.297	0.3044	0.2844
Floss Weight	0.0124	0.0108	0.0115	0.0104	0.0119		0.2968	0.3032	0.2854
<b>W1 (start-floss)</b>	0.2846	0.286	0.2541	0.2582	0.2736		0.2656	0.2713	0.2553
Final constant weight	0.2806	0.282	0.2523	0.252	0.2701		0.2686	0.276	0.2553
Floss Weight	0.0124	0.0108	0.0115	0.0104	0.0119		0.2855	0.2919	0.2734
<b>W2 (final-floss)</b>	0.2682	0.2712	0.2408	0.2416	0.2582	Wt - floss	1.3565	1.3898	1.2968
						Mean	0.2713	0.27796	0.25936
<b>% SOLUBILITY</b>	5.76	5.17	5.23	6.43	5.63	sd	0.01502	0.015239	0.014878
							Mean solubility	5.65	0.50
<b>4mm Group</b>									
Sample	1	2	3	4	5				
Start weight	0.3631	0.4162	0.412	0.4313	0.4301	Floss total	0.3631	0.3798	0.3483
Floss Weight	0.012	0.0112	0	0.0126	0.0118		0.4162	0.4209	0.4007
<b>W1 (start-floss)</b>	0.3511	0.405	0.412	0.4187	0.4183		0.412	0.4177	0.3984
Final constant weight	0.3432	0.3946	0.3926	0.4105	0.4111		0.4313	0.4362	0.4159
Floss Weight	0.012	0.0112	0	0.0126	0.0118		0.4301	0.4352	0.4167
<b>W2 (final-floss)</b>	0.3312	0.3834	0.3926	0.3979	0.3993	Wt-floss	2.0051	2.0422	1.9324
						Mean	0.40102	0.40844	0.38648
<b>% SOLUBILITY</b>	5.67	5.33	4.71	4.97	4.54	sd	0.027831	0.022885	0.027963
							Mean solubility	5.04	0.46
<b>5mm Group</b>									
Sample	1	2	3	4	5				
Start weight	0.5098	0.5004	0.4859	0.4903	0.5003	Floss total	0.5098	0.5156	0.4948
Floss Weight	0.0101	0.0105	0.0098	0.0107	0.011		0.5004	0.5056	0.4829
<b>W1 (start-floss)</b>	0.4997	0.4899	0.4761	0.4796	0.4893		0.4859	0.4918	0.4705
Final constant weight	0.4871	0.477	0.463	0.4673	0.4742		0.4903	0.4966	0.4743
Floss Weight	0.0101	0.0105	0.0098	0.0107	0.011		0.5003	0.5064	0.4824
<b>W2 (final-floss)</b>	0.477	0.4665	0.4532	0.4566	0.4532	Wt-floss	2.4346	2.4639	2.3528
						Mean	0.48692	0.49278	0.47056
<b>% SOLUBILITY</b>	4.54	4.78	4.81	4.80	5.33	sd	0.009405	0.009264	0.009369
							Mean solubility	4.85	0.29

Table 69. Vitremer Restorative One-Week Solubility Control Sample Results (grams)

VITREMER ONE WEEK SOLUBILITY (CONTROL GROUP)														
Weight in grams														
	pre H2O					post H2O								
	5-Jan-06	6-Jan-06	7-Jan-06	8-Jan-06	9-Jan-06	10-Jan-06	11-Jan-06	12-Jan-06						
Sample														
<b>2mm Group</b>														
<b>Sample</b>	1	2	3	4	5	1	2	3	4	5	1	2		
Start weight	0.1913	0.2282	0.212	0.2005	0.2337	0.1913	0.1936	0.182	0.2173	0.2162	0.1802	0.1799		
Floss Weight	0.0128	0.0099	0.0118	0.0109	0.0117	0.2282	0.2311	0.2173	0.2162	0.2161	0.1802	0.1794		
<b>W1 (start-floss)</b>	0.1785	0.2183	0.2002	0.1896	0.222	0.0571	0.2149	0.2023	0.2003	0.2003	0.2003	0.2005		
Final constant weight	0.1794	0.2152	0.2005	0.1886	0.2211	0.2005	0.2033	0.1904	0.1894	0.1893	0.1888	0.1886		
Floss Weight	0.0128	0.0099	0.0118	0.0109	0.0117	0.2337	0.2365	0.2229	0.2217	0.2218	0.2213	0.2209		
<b>W2 (final-floss)</b>	0.1666	0.2053	0.1887	0.1777	0.2094	0.0086	1.0222	0.9578	0.9526	0.9514	0.9493	0.9473		
<b>Wt-floss</b>	0.20	0.20	0.20	0.20	0.20	0.19	0.19	0.19	0.19	0.19	0.19	0.19		
<b>Mean</b>	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02		
<b>sd</b>														
<b>% SOLUBILITY</b>	6.67	5.96	5.74	6.28	5.68	<b>Mean solubility/sd</b>							6.06	0.41
<b>3mm Group</b>														
<b>Sample</b>	1	2	3	4	5	1	2	3	4	5	1	2		
Start weight	0.2916	0.309	0.3097	0.2922	0.2916	0.2916	0.295	0.2798	0.2786	0.2784	0.2775	0.2772		
Floss Weight	0.0101	0.0097	0.011	0.0095	0.0127	0.309	0.3147	0.2946	0.293	0.2928	0.2919	0.2914		
<b>W1 (start-floss)</b>	0.2815	0.2993	0.2987	0.2827	0.2789	0.053	0.3097	0.3147	0.296	0.2969	0.296	0.2944		
Final constant weight	0.277	0.2913	0.2945	0.2768	0.2749	0.2922	0.2963	0.2793	0.2781	0.2778	0.2771	0.2767		
Floss Weight	0.0101	0.0097	0.011	0.0095	0.0127	0.2916	0.2951	0.2771	0.2763	0.2754	0.2749	0.2749		
<b>W2 (final-floss)</b>	0.2669	0.2816	0.2835	0.2673	0.2622	1.4411	1.4628	1.3751	1.369	2960.071	1.3639	1.3616		
<b>Wt-floss</b>	0.29	0.29	0.29	0.29	0.29	0.27	0.27	0.27	0.27	0.27	0.27	0.27		
<b>Mean</b>	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
<b>sd</b>														
<b>% SOLUBILITY</b>	5.19	5.91	5.09	5.45	5.99	<b>Mean solubility/sd</b>							5.52	0.41
<b>4mm Group</b>														
<b>Sample</b>	1	2	3	4	5	1	2	3	4	5	1	2		
Start weight	0.3826	0.4341	0.4018	0.3825	0.4038	0.3826	0.3877	0.3641	0.3622	0.3617	0.3606	0.3601		
Floss Weight	0.0082	0.009	0.0098	0.0118	0.0109	0.4341	0.43769	0.4163	0.4147	0.4144	0.4131	0.4127		
<b>W1 (start-floss)</b>	0.3744	0.4251	0.392	0.3707	0.3929	0.0497	0.4018	0.3833	0.3817	0.3811	0.38	0.3796		
Final constant weight	0.36	0.4127	0.3793	0.361	0.3827	0.3825	0.3866	0.3642	0.3628	0.3624	0.3613	0.361		
Floss Weight	0.0082	0.009	0.0098	0.0118	0.0109	0.4038	0.4101	0.3868	0.3846	0.3841	0.383	0.3826		
<b>W2 (final-floss)</b>	0.3518	0.4037	0.3695	0.3492	0.3718	1.9551	1.98019	1.864	1.8563	1.854	1.8483	1.8463		
<b>Wt-floss</b>	0.39	0.40	0.40	0.40	0.40	0.37	0.37	0.37	0.37	0.37	0.37	0.37		
<b>Mean</b>	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02		
<b>sd</b>														
<b>% SOLUBILITY</b>	6.04	5.03	5.74	5.80	5.37	<b>Mean solubility/sd</b>							5.60	0.39
<b>5mm Group</b>														
<b>Sample</b>	1	2	3	4	5	1	2	3	4	5	1	2		
Start weight	0.4378	0.461	0.4496	0.4811	0.4209	0.4378	0.4381	0.4109	0.4092	0.4086	0.4077	0.4069		
Floss Weight	0.0103	0.0101	0.0088	0.0094	0.0093	0.461	0.4637	0.4372	0.4364	0.4362	0.4338	0.4334		
<b>W1 (start-floss)</b>	0.4275	0.4509	0.4408	0.4717	0.4116	0.0479	0.4496	0.4285	0.4265	0.4261	0.4249	0.4242		
Final constant weight	0.4069	0.4334	0.4242	0.4549	0.3987	0.4811	0.485	0.4591	0.4569	0.4568	0.4555	0.4549		
Floss Weight	0.0103	0.0101	0.0088	0.0094	0.0093	0.4209	0.4258	0.4024	0.4006	0.4003	0.3992	0.3986		
<b>W2 (final-floss)</b>	0.3966	0.4233	0.4154	0.4455	0.3894	2.2025	2.2176	2.0902	2.0807	2.0791	2.0732	2.0697		
<b>Wt-floss</b>	0.44	0.44	0.44	0.44	0.44	0.42	0.42	0.42	0.42	0.42	0.42	0.42		
<b>Mean</b>	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02		
<b>sd</b>														
<b>% SOLUBILITY</b>	7.23	6.12	5.76	5.55	5.39	<b>Mean solubility/sd</b>							6.01	0.73

Table 70. Vitremer One-Month Solubility Experimental Sample Results (grams)

VITREMER ONE MONTH SOLUBILITY (EXPERIMENTAL GROUP)										
O'Haus Analytical Plus Scale										
	pre H2O					post H2O				
	6-Jan-06	7-Jan-06	8-Jan-06	9-Jan-06	10-Jan-06	11-Jan-06	12-Jan-06			
<b>W1m Group</b>										
Sample	1	2	3	4	5	1	2	3	4	5
Start weight	0.2196	0.2451	0.2364	0.2899	0.2261	Floss total	2	0.2451	0.2453	0.2284
Floss Weight	0.0134	0.013	0.0105	0.0112	0.0095	0.0576	3	0.2364	0.2237	0.2222
W1 (start-floss)	0.2062	0.2321	0.2259	0.2787	0.2166	4	0.2899	0.2692	0.2672	0.2221
Final constant weight	0.2051	0.2281	0.2221	0.267	0.2123	5	0.2261	0.2269	0.2134	0.2124
Floss Weight	0.0134	0.013	0.0105	0.0112	0.0095	Wt-floss	1.1595	1.1617	1.0857	1.077
W2 (final-floss)	0.1917	0.2151	0.2116	0.2558	0.2028	Mean	0.2319	0.23234	0.21714	0.21658
						sd	0.0277483	0.0272944	0.0243865	0.02408676
<b>% SOLUBILITY</b>	7.03	7.32	6.33	8.22	6.37	Mean solubility	7.05	7.05	0.78	
<b>W2m Group</b>										
Sample	1	2	3	4	5	1	2	3	4	5
Start weight	0.2947	0.3365	0.2917	0.3057	0.3051	Floss total	2	0.2947	0.295	0.2702
Floss Weight	0.0113	0.0101	0.0114	0.0105	0.0103	0.0536	3	0.3365	0.3374	0.3131
W1 (start-floss)	0.2834	0.3264	0.2803	0.2952	0.2948	4	0.2917	0.2922	0.2745	0.2724
Final constant weight	0.2703	0.3129	0.2719	0.2814	0.2821	5	0.3057	0.306	0.2838	0.2829
Floss Weight	0.0113	0.0101	0.0114	0.0105	0.0103	Wt - floss	1.4801	1.4825	1.3767	1.3729
W2 (final-floss)	0.259	0.3028	0.2605	0.2709	0.2718	Mean	0.29602	0.2965	0.27534	0.27458
						sd	0.0177524	0.0179597	0.0174054	0.01717781
<b>% SOLUBILITY</b>	8.61	7.23	7.06	8.23	7.80	Mean solubility	7.79	7.79	0.65	
<b>W3m Group</b>										
Sample	1	2	3	4	5	1	2	3	4	5
Start weight	0.4048	0.4392	0.4092	0.4106	0.3358	Floss total	2	0.4048	0.4072	0.3833
Floss Weight	0.0113	0.0109	0.0125	0.0115	0.0105	0.0567	3	0.4392	0.44	0.4162
W1 (start-floss)	0.3935	0.4283	0.3967	0.3991	0.3253	4	0.4092	0.4102	0.3859	0.3846
Final constant weight	0.3811	0.4135	0.3822	0.3848	0.3153	5	0.4106	0.4113	0.3886	0.3871
Floss Weight	0.0113	0.0109	0.0125	0.0115	0.0105	Wt-floss	1.9429	1.9481	1.8383	1.8316
W2 (final-floss)	0.3698	0.4026	0.3697	0.3733	0.3048	Mean	0.38858	0.38962	0.36766	0.36632
						sd	0.038335	0.0386076	0.0365797	0.03626407
<b>% SOLUBILITY</b>	6.02	6.00	6.81	6.46	6.30	Mean solubility	6.32	6.32	0.33	
<b>W4m Group</b>										
Sample	1	2	3	4	5	1	2	3	4	5
Start weight	0.4609	0.4934	0.4585	0.4726	0.4475	Floss total	2	0.4609	0.466	0.4329
Floss Weight	0.0116	0.0108	0.0117	0.0106	0.0106	0.0447	3	0.4934	0.4958	0.46
W1 (start-floss)	0.4493	0.4826	0.4468	0.462	0.4475	4	0.4585	0.4595	0.4264	0.4243
Final constant weight	0.4303	0.4571	0.4218	0.4332	0.4111	5	0.4726	0.4728	0.4378	0.4361
Floss Weight	0.0116	0.0108	0.0117	0.0106	0.0106	Wt-floss	2.2882	2.2966	2.1314	2.1224
W2 (final-floss)	0.4187	0.4463	0.4101	0.4226	0.4111	Mean	0.45764	0.45932	0.42528	0.42448
						sd	0.0174438	0.0180585	0.0170679	0.0171906
<b>% SOLUBILITY</b>	6.81	7.52	8.21	8.53	8.13	Mean solubility	7.84	7.84	0.68	

Table 71. Vitremer One-Month Solubility Control Sample Results (grams)

VITREMER ONE MONTH SOLUBILITY (CONTROL GROUP)									
O'Haus Analytical Plus Scale									
START: 12 Dec 05	pre H2O				post H2O				
	12-Jan-06	13-Jan-06	14-Jan-06	15-Jan-06	17-Jan-06	18-Jan-06	19-Jan-06	20-Jan-06	
<b>3mm Group</b>									
<b>Sample</b>	1	2	3	4	5				
Start weight	0.2239	0.2277	0.2288	0.225	0.2333	Floss total	2	0.2112	
Floss Weight	0.014	0.0108	0.0131	0.0115	0.0106	0.06	3	0.2131	
<b>W1 (start-floss)</b>	0.2089	0.2169	0.2157	0.2135	0.2227		4	0.211	
Final constant weight	0.2112	0.2131	0.214	0.214	0.219		5	0.219	
Floss Weight	0.014	0.0108	0.0131	0.0115	0.0106	<b>Wt-floss</b>		1.0787	1.079
<b>W2 (final-floss)</b>	0.1972	0.2023	0.2009	0.1995	0.2084			1.013	1.0111
						<b>Mean</b>		0.21574	0.2158
						<b>sd</b>		0.003684	0.003588
<b>% SOLUBILITY</b>	<b>6.05</b>	<b>6.73</b>	<b>6.86</b>	<b>6.56</b>	<b>6.42</b>	<b>Mean solubility</b>		<b>6.52</b>	<b>6.31</b>
<b>3mm Group</b>									
<b>Sample</b>	1	2	3	4	5				
Start weight	0.2798	0.2916	0.3165	0.3069	0.3114	Floss total	2	0.2615	0.2609
Floss Weight	0.0099	0	0.01	0.0117	0.0105	0.0421	3	0.2673	0.2663
<b>W1 (start-floss)</b>	0.2699	0.2916	0.3065	0.2952	0.3009		4	0.2949	0.2945
Final constant weight	0.2595	0.2659	0.2942	0.2869	0.2901		5	0.2875	0.2869
Floss Weight	0.0099	0	0.01	0.0117	0.0105	<b>Wt - floss</b>		0.2907	0.2903
<b>W2 (final-floss)</b>	0.2496	0.2659	0.2842	0.2752	0.2796			1.3654	1.3621
						<b>Mean</b>		0.29282	0.2991
						<b>sd</b>		0.015172	0.01512
<b>% SOLUBILITY</b>	<b>7.52</b>	<b>8.81</b>	<b>7.28</b>	<b>6.78</b>	<b>7.08</b>	<b>Mean solubility</b>		<b>7.49</b>	<b>6.79</b>
<b>4mm Group</b>									
<b>Sample</b>	1	2	3	4	5				
Start weight	0.3905	0.4142	0.412	0.4036	0.3699	Floss total	2	0.3677	0.3672
Floss Weight	0.0091	0.0116	0.0114	0.0106	0.0101	0.0528	3	0.3655	0.3648
<b>W1 (start-floss)</b>	0.3814	0.4026	0.4006	0.393	0.3798		4	0.3682	0.3675
Final constant weight	0.366	0.3837	0.3866	0.3749	0.3576		5	0.3765	0.3757
Floss Weight	0.0091	0.0116	0.0114	0.0106	0.0101	<b>Wt-floss</b>		0.3593	0.3586
<b>W2 (final-floss)</b>	0.3569	0.3721	0.3752	0.3643	0.3475			1.8244	1.821
						<b>Mean</b>		0.39148	0.39338
						<b>sd</b>		0.011511	0.010695
<b>% SOLUBILITY</b>	<b>6.42</b>	<b>7.58</b>	<b>6.34</b>	<b>7.30</b>	<b>8.50</b>	<b>Mean solubility</b>		<b>7.23</b>	<b>6.89</b>
<b>5mm Group</b>									
<b>Sample</b>	1	2	3	4	5				
Start weight	0.466	0.4662	0.4547	0.4669	0.4561	Floss total	2	0.4288	0.428
Floss Weight	0.0126	0	0.0102	0.0102	0.01	0.043	3	0.4307	0.4296
<b>W1 (start-floss)</b>	0.4534	0.4662	0.4445	0.4567	0.4461		4	0.4164	0.4154
Final constant weight	0.4271	0.4289	0.4148	0.4296	0.4128		5	0.4312	0.4302
Floss Weight	0.0126	0	0.0102	0.0102	0.01	<b>Wt-floss</b>		0.4148	0.4139
<b>W2 (final-floss)</b>	0.4145	0.4289	0.4046	0.4194	0.4028			2.0789	2.0741
						<b>Mean</b>		0.45338	0.45284
						<b>sd</b>		0.006036	0.007063
<b>% SOLUBILITY</b>	<b>8.58</b>	<b>8.00</b>	<b>8.98</b>	<b>8.17</b>	<b>9.71</b>	<b>Mean solubility</b>		<b>8.69</b>	<b>8.68</b>

Table 72. Vitremer Three-Month Solubility Experimental Sample Results (grams)





FUJI II LC Immediate SOLUBILITY (EXPERIMENTAL GROUP) O'Haus Analytical Plus Scale																
	1	2	3	4	5	7-Oct-05	8-Oct-05	9-Oct-05	10-Oct-05	11-Oct-05	12-Oct-05	13-Oct-05	14-Oct-05	15-Oct-05	16-Oct-05	17-Oct-05
<b>zmm Group</b>																
Sample	1	2	3	4	5											
Start weight	0.2466	0.2597	0.2572	0.2493	0.2621	Floss total	0.2376	0.2372	0.237							
Floss Weight	0.0103	0.0101	0.009	0.0089	0.009	0.0473	0.2597	0.2502	0.2494	0.249						
W1 (start-floss)	0.2363	0.2496	0.2482	0.2404	0.2531		0.2572	0.2484	0.2489	0.2486						
Final constant weight	0.237	0.249	0.2486	0.2402	0.2524		0.2493	0.2404	0.24	0.2402						
Floss Weight	0.0103	0.0101	0.009	0.0089	0.009	Wt-floss	0.2621	0.253	0.2526	0.2524						
W2 (final-floss)	0.2267	0.2389	0.2396	0.2313	0.2434	Mean	1.2276	1.1823	1.1808	1.1799						
						sd	0.24552	0.23646	0.23616	0.23698						
% SOLUBILITY	4.06	4.29	3.46	3.79	3.83	Mean solubility	0.006715	0.006601	0.006638	0.006515						
<b>zmm Group</b>																
Sample	1	2	3	4	5											
Start weight	0.336	0.3533	0.3636	0.3623	0.3556	Floss total	0.336	0.3246	0.3234	0.3231						
Floss Weight	0.0106	0.0108	0.0105	0.0095	0.0103	0.0517	0.3533	0.2414	0.3407	0.3403						
W1 (start-floss)	0.3254	0.3425	0.3531	0.3528	0.3453		0.3636	0.3515	0.3508	0.3506						
Final constant weight	0.3231	0.3403	0.3506	0.3485	0.3427		0.3623	0.3496	0.3488	0.3485						
Floss Weight	0.0106	0.0108	0.0105	0.0095	0.0103	Wt-floss	0.3556	0.3437	0.343	0.3427						
W2 (final-floss)	0.3125	0.3295	0.3401	0.339	0.3324	Mean	1.7191	1.5591	1.655	1.6535						
						sd	0.34382	0.31182	0.331	0.3307						
% SOLUBILITY	3.96	3.80	3.68	3.91	3.74	Mean solubility	0.011045	0.046384	0.010841	0.010865						
<b>zmm Group</b>																
Sample	1	2	3	4	5											
Start weight	0.4378	0.4584	0.4538	0.4609	0.4677	Floss total	0.4378	0.4238	0.423	0.4229						
Floss Weight	0.0113	0.0104	0.0116	0.011	0.0104	0.0547	0.4584	0.4439	0.443	0.4426						
W1 (start-floss)	0.4265	0.448	0.4422	0.4499	0.4573		0.4538	0.4389	0.438	0.4376						
Final constant weight	0.4221	0.4221	0.437	0.442	0.449		0.4609	0.4439	0.443	0.4427						
Floss Weight	0.0113	0.0104	0.0116	0.011	0.0104	Wt-floss	0.4677	0.4513	0.4499	0.4494						
W2 (final-floss)	0.4108	0.4117	0.4254	0.431	0.4386	Mean	2.2239	2.1471	2.1422	2.1405						
						sd	0.44478	0.42942	0.42844	0.4281	0.4235					
% SOLUBILITY	3.68	8.10	3.80	4.20	4.09	Mean solubility	0.011207	0.010261	0.010088	0.00995	0.012044					
<b>zmm Group</b>																
Sample	1	2	3	4	5											
Start weight	0.51	0.5404	0.5437	0.5481	0.5453	Floss total	0.51	0.4958	0.4949	0.4943						
Floss Weight	0.107	0.104	0.104	0.102	0.106	0.0523	0.5404	0.5245	0.5236	0.523						
W1 (start-floss)	0.4993	0.53	0.5333	0.5379	0.5347		0.5437	0.528	0.527	0.5264						
Final constant weight	0.487	0.5153	0.519	0.522	0.518		0.5481	0.5307	0.5303	0.5291						
Floss Weight	0.107	0.104	0.104	0.102	0.106	Wt-floss	0.5453	0.5271	0.5274	0.5274						
W2 (final-floss)	0.4763	0.5049	0.5085	0.5118	0.5074	Mean	2.6352	2.5538	2.5493	2.5456						
						sd	0.52704	0.51076	0.50986	0.50912	0.5089	0.50686	0.50572	0.50524	0.50384	0.49524
% SOLUBILITY	4.61	4.74	4.63	4.85	5.11	Mean solubility	0.015623	0.014382	0.014415	0.014304	0.014591	0.01429	0.014261	0.014324	0.014226	0.014302

Table 75. Fuji II LC Immediate Solubility Control Sample Results (grams)

FUJI II LC Immediate SOLUBILITY (Control GROUP)															
O'Haus Analytical Plus Scale															
	pre H2O		post H2O		11-Nov-05		12-Nov-05		13-Nov-05		14-Nov-05		15-Nov-05		
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
<b>2mm Group</b>															
Sample															
Start weight	0.2233	0.2194	0.2368	0.2365	0.2321	Floss total									
Floss Weight	0.0103	0.0095	0.0098	0.0096	0.0101	0.0493									
W1 (start-floss)	0.213	0.2099	0.227	0.2269	0.2274										
Final constant weight	0.2187	0.2152	0.2317	0.2315	0.2274										
Floss Weight	0.0103	0.0095	0.0098	0.0096	0.0101										
W2 (final-floss)	0.2084	0.2057	0.2219	0.2219	0.2173										
Mean	0.21976	0.22696	0.21558	0.21558	0.21498										
sd	0.007897	0.008347	0.007604	0.007576	0.007559										
<b>% SOLUBILITY</b>	2.16	2.00	2.25	2.20	4.44										
Mean solubility	2.61 1.03														
<b>3mm Group</b>															
Sample															
Start weight	0.3027	0.3425	0.3381	0.3326	0.3531	Floss total									
Floss Weight	0.0099	0.0112	0.0106	0.0107	0.0513	0.0513									
W1 (start-floss)	0.2928	0.3336	0.3269	0.322	0.3424										
Final constant weight	0.2968	0.3391	0.331	0.3269	0.3462										
Floss Weight	0.0099	0.0089	0.0112	0.0106	0.0107										
W2 (final-floss)	0.2869	0.3302	0.3198	0.3163	0.3355										
Mean	0.32354	0.33358	0.31844	0.31766	0.31774										
sd	0.018943	0.019454	0.018875	0.019106	0.018961										
<b>% SOLUBILITY</b>	2.02	1.02	2.17	1.77	2.02										
Mean solubility	1.80 0.46														
<b>4mm Group</b>															
Sample															
Start weight	0.4359	0.4333	0.4652	0.4508	0.4247	Floss total									
Floss Weight	0.0083	0.0107	0.0108	0.0082	0	0.038									
W1 (start-floss)	0.4276	0.4226	0.4544	0.4426	0.4247										
Final constant weight	0.4276	0.424	0.455	0.441	0.4155										
Floss Weight	0.0083	0.0107	0.0108	0.0082	0										
W2 (final-floss)	0.4193	0.4133	0.4442	0.4328	0.4155										
Mean	0.43438	0.4448	0.42604	0.42492	0.42502										
sd	0.01603	0.016916	0.015624	0.015577	0.015522										
<b>% SOLUBILITY</b>	1.94	2.20	2.24	2.21	2.17										
Mean solubility	2.15 0.12														
<b>5mm Group</b>															
Sample															
Start weight	0.533	0.5363	0.541	0.538	0.5444	Floss total									
Floss Weight	0.0121	0.0102	0.0097	0.0091	0.0103	0.0514									
W1 (start-floss)	0.5209	0.5261	0.5313	0.5289	0.5341										
Final constant weight	0.5223	0.5255	0.5298	0.5265	0.5323										
Floss Weight	0.0121	0.0102	0.0097	0.0091	0.0103										
W2 (final-floss)	0.5102	0.5153	0.5201	0.5174	0.522										
Mean	0.52826	0.53996	0.51868	0.51706	0.517										
sd	0.00437	0.004414	0.003884	0.003857	0.003877										
<b>% SOLUBILITY</b>	2.05	2.05	2.11	2.17	2.27										
Mean solubility	2.13 0.09														

Table 76. Fuji II LC 24-Hour Solubility Experimental Sample Results (grams)

Fuji II LC 24 Hour solubility		Experimental O'Haus Analytical Plus Scale					pre-H2O					post H2O										
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
<b>2mm Group</b>																						
Sample		1	2	3	4	5																
Start weight		0.2206	0.2378	0.2382	0.224	0.2459	Floss total															
Floss Weight		0.0119	0.0102	0.0101	0.0103	0.0104	0.0529															
<b>W1 (start-floss)</b>		0.2087	0.2276	0.2281	0.2137	0.2355																
Final constant weight		0.2136	0.2303	0.2305	0.2173	0.2381																
Floss Weight		0.0119	0.0102	0.0101	0.0103	0.0104																
<b>W2 (final-floss)</b>		0.2017	0.2201	0.2204	0.207	0.2277																
<b>% SOLUBILITY</b>		3.35	3.30	3.38	3.14	3.31																
<b>3mm Group</b>																						
Sample		1	2	3	4	5																
Start weight		0.322	0.3534	0.3342	0.3499	0.3357	Floss total															
Floss Weight		0.0103	0.0109	0.0111	0.0117	0.011	0.055															
<b>W1 (start-floss)</b>		0.3117	0.3425	0.3231	0.3382	0.3247																
Final constant weight		0.3122	0.3424	0.3241	0.3393	0.3251																
Floss Weight		0.0103	0.0109	0.0111	0.0117	0.011																
<b>W2 (final-floss)</b>		0.3019	0.3315	0.313	0.3276	0.3141																
<b>% SOLUBILITY</b>		3.14	3.21	3.13	3.13	3.26																
<b>4mm Group</b>																						
Sample		1	2	3	4	5																
Start weight		0.4583	0.4618	0.4507	0.4572	0.4357	Floss total															
Floss Weight		0.0113	0.0115	0.0117	0.0102	0.0097	0.0544															
<b>W1 (start-floss)</b>		0.447	0.4503	0.439	0.447	0.426																
Final constant weight		0.445	0.4478	0.4373	0.4435	0.4232																
Floss Weight		0.0113	0.0115	0.0117	0.0102	0.0097																
<b>W2 (final-floss)</b>		0.4337	0.4363	0.4256	0.4333	0.4135																
<b>% SOLUBILITY</b>		2.98	3.11	3.05	3.06	2.93																
<b>5mm Group</b>																						
Sample		1	2	3	4	5																
Start weight		0.538	0.5498	0.5189	0.5247	0.5474	Floss total															
Floss Weight		0.0101	0.0109	0.0089	0.0105	0.0118	0.0522															
<b>W1 (start-floss)</b>		0.5279	0.5389	0.51	0.5142	0.5356																
Final constant weight		0.5227	0.5345	0.5038	0.5094	0.532																
Floss Weight		0.0101	0.0109	0.0089	0.0105	0.0118																
<b>W2 (final-floss)</b>		0.5126	0.5236	0.4949	0.4989	0.5202																
<b>% SOLUBILITY</b>		2.90	2.84	2.96	2.98	2.88																

Table 77. Fuji II LC 24-Hour Solubility Control Sample Results (grams)

Fuji II 24-HR SOLUBILITY (CONTROL GROUP)												
O'Haus Analytical Plus Scale												
	pre H2O					post H2O						
	10-Jan-06	11-Jan-06	12-Jan-06	13-Jan-06	14-Jan-06	15-Jan-06						
<b>2mm Group</b>												
Sample	1	2	3	4	5							
Start weight	0.2482	0.233	0.2409	0.2507	0.2533	Floss total	2	0.2394	0.2394	0.2389	0.239	
Floss Weight	0.0114	0.0106	0.0126	0.0116	0.0103		3	0.2244	0.2244	0.2319	0.2319	
W1 (start-floss)	0.2368	0.2224	0.2283	0.2391	0.243		4	0.2321	0.2321	0.2318	0.2418	
Final constant weight	0.239	0.2239	0.2319	0.2418	0.2445		5	0.2422	0.2422	0.2418	0.2418	
Floss Weight	0.0114	0.0106	0.0126	0.0116	0.0103	Wt-floss		0.2446	0.2446	0.2442	0.2445	
W2 (final-floss)	0.2276	0.2133	0.2193	0.2302	0.2342	Mean		1.1262	1.1262	1.1242	1.1246	
						sd		0.00824906	0.0083271	0.00835153	0.00825033	
<b>% SOLUBILITY</b>	<b>3.89</b>	<b>4.09</b>	<b>3.94</b>	<b>3.72</b>	<b>3.62</b>	<b>Mean solubility</b>		<b>3.85</b>	<b>3.85</b>	<b>3.85</b>	<b>3.85</b>	
<b>3mm Group</b>												
Sample	1	2	3	4	5							
Start weight	0.3593	0.3617	0.3584	0.3644	0.3654	Floss total	2	0.348	0.348	0.3474	0.3474	
Floss Weight	0.0097	0.0119	0.0106	0.0102	0.0087		3	0.3508	0.3508	0.35	0.3502	
W1 (start-floss)	0.3496	0.3498	0.3478	0.3542	0.3567		4	0.3482	0.3482	0.3474	0.3474	
Final constant weight	0.3474	0.3502	0.3474	0.3532	0.3541		5	0.3539	0.3539	0.3531	0.3532	
Floss Weight	0.0097	0.0119	0.0106	0.0102	0.0087	Wt-floss		0.3549	0.3549	0.3542	0.3541	
W2 (final-floss)	0.3377	0.3383	0.3368	0.343	0.3454	Mean		1.7047	1.7047	1.701	1.7012	
						sd		0.00306317	0.0029175	0.00324145	0.00317695	
<b>% SOLUBILITY</b>	<b>3.40</b>	<b>3.29</b>	<b>3.16</b>	<b>3.16</b>	<b>3.17</b>	<b>Mean solubility</b>		<b>3.24</b>	<b>3.24</b>	<b>3.24</b>	<b>3.24</b>	
<b>4mm Group</b>												
Sample	1	2	3	4	5							
Start weight	0.4681	0.4536	0.4775	0.4561	0.4526	Floss total	2	0.4539	0.4539	0.4527	0.4528	
Floss Weight	0.011	0.0109	0.0103	0.011	0.0095		3	0.4412	0.4412	0.4402	0.4403	
W1 (start-floss)	0.4571	0.4427	0.4672	0.4451	0.4431		4	0.464	0.464	0.4628	0.4628	
Final constant weight	0.4528	0.4403	0.4628	0.4409	0.4384		5	0.442	0.442	0.4409	0.4409	
Floss Weight	0.011	0.0109	0.0103	0.011	0.0095	Wt-floss		0.4395	0.4395	0.4385	0.4384	
W2 (final-floss)	0.4418	0.4294	0.4525	0.4299	0.4289	Mean		2.1879	2.1879	2.1824	2.1825	
						sd		0.01084329	0.0107884	0.01059316	0.01055021	
<b>% SOLUBILITY</b>	<b>3.35</b>	<b>3.00</b>	<b>3.15</b>	<b>3.41</b>	<b>3.20</b>	<b>Mean solubility</b>		<b>3.22</b>	<b>3.22</b>	<b>3.22</b>	<b>3.22</b>	
<b>5mm Group</b>												
Sample	1	2	3	4	5							
Start weight	0.5434	0.5321	0.5479	0.5304	0.5438	Floss total	2	0.5271	0.5271	0.5258	0.5259	
Floss Weight	0.0109	0.011	0.0102	0.0089	0.0098		3	0.5175	0.5175	0.5164	0.5162	
W1 (start-floss)	0.5325	0.5211	0.5377	0.5215	0.534		4	0.5306	0.5306	0.5306	0.5306	
Final constant weight	0.5259	0.5162	0.5306	0.5132	0.527		5	0.5143	0.5143	0.5133	0.5132	
Floss Weight	0.0109	0.011	0.0102	0.0089	0.0098	Wt-floss		0.5284	0.5284	0.527	0.527	
W2 (final-floss)	0.515	0.5052	0.5204	0.5043	0.5172	Mean		2.5685	2.5685	2.5623	2.5621	
						sd		0.00777541	0.0074851	0.00746726	0.00756987	
<b>% SOLUBILITY</b>	<b>3.29</b>	<b>3.05</b>	<b>3.22</b>	<b>3.30</b>	<b>3.15</b>	<b>Mean solubility</b>		<b>3.20</b>	<b>3.20</b>	<b>3.20</b>	<b>3.20</b>	

Table 78. Fuji II LC One-Week Solubility Experimental Sample Results (grams)

FUJI II LC One Week SOLUBILITY (EXPERIMENTAL GROUP) O'Haus Analytical Plus Scale												
	pre H2O					post H2O						
	28-Nov-05	29-Nov-05	30-Nov-05	1-Dec-05	2-Dec-05	3-Dec-05	4-Dec-05					
<b>Zmm_Group</b>	1	2	3	4	5							
Sample	0.2134	0.224	0.2288	0.2287	0.2296	Floss total						
Floss Weight	0.0114	0.0112	0.0105	0.0105	0.0089	0.0525						
W1 (start-floss)	0.202	0.2128	0.2183	0.2182	0.2207							
Final constant weight	0.2035	0.2184	0.2179	0.2185	0.2135							
Floss Weight	0.0114	0.0112	0.0105	0.0105	0.0089							
W2 (final-floss)	0.1921	0.2072	0.2074	0.208	0.2046							
Mean	0.2144	0.21468	0.21468	0.21468	0.21468	0.20386						
sd	0.00679706	0.00667623	0.00667623	0.00667623	0.00667623	0.0064162						
<b>% SOLUBILITY</b>	4.90	2.63	4.99	4.67	7.29							
<b>Zmm_Group</b>	1	2	3	4	5							
Sample	0.3639	0.3242	0.352	0.3483	0.3581	Floss total						
Floss Weight	0.102	0.0119	0.0121	0.0118	0.0102	0.0562						
W1 (start-floss)	0.3537	0.3123	0.3399	0.3365	0.3479							
Final constant weight	0.3481	0.3097	0.3361	0.3327	0.3414							
Floss Weight	0.102	0.0119	0.0121	0.0118	0.0102							
W2 (final-floss)	0.3379	0.2978	0.324	0.3209	0.3312							
Mean	0.33806	0.3393	0.3393	0.3393	0.3393	0.32282						
sd	0.01523893	0.01544225	0.01544225	0.01544225	0.01544225	0.014579						
<b>% SOLUBILITY</b>	4.47	4.64	4.68	4.64	4.80							
<b>Zmm_Group</b>	1	2	3	4	5							
Sample	0.4851	0.4358	0.4401	0.4337	0.4458	Floss total						
Floss Weight	0.104	0.0115	0.0119	0.0094	0.0104	0.0536						
W1 (start-floss)	0.4747	0.4243	0.4282	0.4243	0.4354							
Final constant weight	0.4624	0.4145	0.4209	0.4134	0.4245							
Floss Weight	0.104	0.0115	0.0119	0.0094	0.0104							
W2 (final-floss)	0.452	0.403	0.409	0.404	0.4141							
Mean	0.43738	0.43936	0.43936	0.43936	0.43936	0.41736						
sd	0.02119516	0.02059908	0.02059908	0.02059908	0.02059908	0.0202281						
<b>% SOLUBILITY</b>	4.78	5.02	4.48	4.78	4.89							
<b>Zmm_Group</b>	1	2	3	4	5							
Sample	0.5468	0.544	0.5518	0.543	0.5471	Floss total						
Floss Weight	0.0117	0.0115	0.0105	0.0106	0.011	0.0553						
W1 (start-floss)	0.5351	0.5325	0.5413	0.5324	0.5361							
Final constant weight	0.5241	0.5219	0.5281	0.5147	0.5169							
Floss Weight	0.0117	0.0115	0.0105	0.0106	0.011							
W2 (final-floss)	0.5124	0.5104	0.5176	0.5041	0.5059							
Mean	0.53548	0.53782	0.53782	0.53782	0.53782	0.5113						
sd	0.00342899	0.00446117	0.00446117	0.00446117	0.00446117	0.0055324						
<b>% SOLUBILITY</b>	4.24	4.15	4.38	5.32	5.63							

Table 79. Fuji II LC One-Week Solubility Control Sample Results (grams)

FUJI II LC One Week SOLUBILITY (Control GROUP)												
O'Haus Analytical Plus Scale												
	pre H2O					post H2O						
	5-Dec-05	6-Dec-05	7-Dec-05	8-Dec-05	9-Dec-05	10-Dec-05	11-Dec-05	12-Dec-05				
<b>2mm Group</b>												
Sample	1	2	3	4	5							
Start weight	0.2244	0.2284	0.2293	0.2305	0.2275	Floss total						
Floss Weight	0.0119	0.0122	0.0122	0.0108	0.0103	0.0552						
W1 (start-floss)	0.2125	0.2162	0.2193	0.2197	0.2172							
Final constant weight	0.2137	0.2178	0.2178	0.2186	0.2166							
Floss Weight	0.0119	0.0122	0.01	0.0108	0.0103							
W2 (final-floss)	0.2018	0.2056	0.2078	0.2078	0.2063							
Mean	0.21698	0.21858	0.21658	0.21658	0.21658							
sd	0.002308	0.002025	0.001949	0.001937	0.001926							
Mean solubility	5.12					0.20						
<b>3mm Group</b>												
Sample	1	2	3	4	5							
Start weight	0.3728	0.3267	0.3449	0.3427	0.3776	Floss total						
Floss Weight	0.0102	0.0106	0.0084	0.01	0.0106	0.0498						
W1 (start-floss)	0.3626	0.3161	0.3365	0.3327	0.367							
Final constant weight	0.3563	0.312	0.329	0.3275	0.3612							
Floss Weight	0.0102	0.0106	0.0084	0.01	0.0106							
W2 (final-floss)	0.3461	0.3014	0.3206	0.3175	0.3506							
Mean	0.34298	0.34334	0.32776	0.32716	0.32724							
sd	0.021567	0.021888	0.020962	0.020924	0.02084							
Mean solubility	4.59					0.10						
<b>4mm Group</b>												
Sample	1	2	3	4	5							
Start weight	0.4922	0.4615	0.4658	0.4533	0.4433	Floss total						
Floss Weight	0.0097	0.0116	0.0097	0.0098	0.0101	0.0509						
W1 (start-floss)	0.4825	0.4499	0.4561	0.4435	0.4332							
Final constant weight	0.4682	0.4411	0.4456	0.4321	0.4227							
Floss Weight	0.0097	0.0116	0.0097	0.0098	0.0101							
W2 (final-floss)	0.4585	0.4295	0.4359	0.4223	0.4126							
Mean	0.45304	0.45486	0.4345	0.4335	0.43302							
sd	0.018335	0.018319	0.017265	0.017278	0.017197							
Mean solubility	4.69					0.22						
<b>5mm Group</b>												
Sample	1	2	3	4	5							
Start weight	0.5629	0.5409	0.5467	0.5598	0.5597	Floss total						
Floss Weight	0.0138	0.0129	0.0114	0.0124	0.012	0.0625						
W1 (start-floss)	0.5491	0.528	0.5353	0.5474	0.5477							
Final constant weight	0.5382	0.5167	0.5222	0.5336	0.5362							
Floss Weight	0.0138	0.0129	0.0114	0.0124	0.012							
W2 (final-floss)	0.5244	0.5038	0.5108	0.5212	0.5232							
Mean	0.5415	0.54384	0.52038	0.51906	0.5184							
sd	0.009621	0.009696	0.009146	0.009238	0.009208							
Mean solubility	4.58					0.12						

Table 80. Fuji II LC One-Month Solubility Experimental Sample Results (grams)

Fuji II ONE MONTH SOLUBILITY (EXPERIMENTAL GROUP)										
O'Haus Analytical Plus Scale										
	pre H2O					post H2O				
	3-Dec-05	4-Dec-05	5-Dec-05	6-Dec-05	7-Dec-05	8-Dec-05				
<b>2mm Group</b>										
Sample	1	2	3	4	5					
Start weight	0.2274	0.2416	0.2387	0.3087	0.2401	Floss total				
Floss Weight	0.0105	0.0113	0.0114	0.0116	0.0119	0.0567				
W1 (start-floss)	0.2169	0.2303	0.2273	0.2971	0.2282					
Final constant weight	0.2168	0.2292	0.2273	0.2928	0.2289					
Floss Weight	0.0105	0.0113	0.0114	0.0116	0.0119	Wt-floss				
W2 (final-floss)	0.2063	0.2179	0.2159	0.2812	0.217	Mean	1.1998	1.2028	1.1457	2172.922
						sd	0.032574	0.032485	0.030847	971.2385
<b>% SOLUBILITY</b>	4.89	5.38	5.02	5.35	4.91	Mean solubility	5.11	5.11	5.11	0.24
<b>3mm Group</b>										
Sample	1	2	3	4	5					
Start weight	0.3211	0.3551	0.3527	0.3444	0.3365	Floss total				
Floss Weight	0.0083	0.0085	0.0089	0.0088	0.0085	0.043				
W1 (start-floss)	0.3128	0.3466	0.3438	0.3356	0.328					
Final constant weight	0.3045	0.3377	0.3348	0.3275	0.3192					
Floss Weight	0.0083	0.0085	0.0089	0.0088	0.0085	Wt-floss				
W2 (final-floss)	0.2962	0.3292	0.3259	0.3187	0.3107	Mean	1.6668	1.6692	1.593	1.583
						sd	0.013774	0.013626	0.013583	0.013385
<b>% SOLUBILITY</b>	5.31	5.02	5.21	5.04	5.27	Mean solubility	5.17	5.17	5.17	0.13
<b>4mm Group</b>										
Sample	1	2	3	4	5					
Start weight	0.4146	0.4316	0.4132	0.4326	0.4253	Floss total				
Floss Weight	0.0088	0.0086	0.0091	0.0077	0.0089	0.0431				
W1 (start-floss)	0.4058	0.423	0.4041	0.4249	0.4164					
Final constant weight	0.3921	0.4112	0.3932	0.4093	0.4012					
Floss Weight	0.0088	0.0086	0.0091	0.0077	0.0089	Wt-floss				
W2 (final-floss)	0.3833	0.4026	0.3841	0.4016	0.3923	Mean	2.0742	2.0767	1.9803	1.9678
						sd	0.009178	0.008901	0.008741	0.00876
<b>% SOLUBILITY</b>	5.54	4.82	4.95	5.48	5.79	Mean solubility	5.32	5.32	5.32	0.41
<b>5mm Group</b>										
Sample	1	2	3	4	5					
Start weight	0.5452	0.5473	0.5351	0.5581	0.5456	Floss total				
Floss Weight	0.0082	0.0087	0.0106	0.0094	0.0089	0.0458				
W1 (start-floss)	0.537	0.5386	0.5245	0.5487	0.5367					
Final constant weight	0.5168	0.5177	0.5094	0.5292	0.5171					
Floss Weight	0.0082	0.0087	0.0106	0.0094	0.0089	Wt-floss				
W2 (final-floss)	0.5086	0.509	0.4988	0.5198	0.5082	Mean	2.6855	2.6869	2.5667	2.555
						sd	0.008176	0.007896	0.006981	0.007004
<b>% SOLUBILITY</b>	5.29	5.50	4.90	5.27	5.31	Mean solubility	5.25	5.25	5.25	0.22

Table 81. Fuji II LC One-Month Solubility Control Sample Results (grams)

Fuji II ONE MONTH SOLUBILITY (CONTROL GROUP)																
O'Haus Analytical Plus Scale																
	pre H2O					post H2O										
	6-Dec-05	7-Dec-05	8-Dec-05	9-Dec-05	10-Dec-05	11-Dec-05	12-Dec-05	13-Dec-05	14-Dec-05							
<b>Zinn Group</b>																
Sample	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
Start weight	0.2118	0.2363	0.2414	0.24	0.2431	Floss total 2	0.2118	0.2122	0.2035	0.2031	0.2023	0.2118	0.2122	0.2035	0.2031	0.2023
Floss Weight	0.0099	0.0086	0.0105	0.0114	0.0121	0.0527 3	0.2363	0.2372	0.2265	0.2259	0.2253	0.2363	0.2372	0.2265	0.2259	0.2253
W1 (start-floss)	0.2019	0.2275	0.2309	0.2286	0.231	4	0.24	0.2405	0.2293	0.2289	0.2284	0.24	0.2405	0.2293	0.2289	0.2284
Final constant weight	0.2023	0.2253	0.2307	0.2282	0.2313	5	0.2431	0.2435	0.2325	0.2321	0.2317	0.2431	0.2435	0.2325	0.2321	0.2317
Floss Weight	0.0099	0.0088	0.0105	0.0114	0.0121	Wt-floss	1.1199	1.1222	1.071	1.0688	1.0663	1.1199	1.1222	1.071	1.0688	1.0663
W2 (final-floss)	0.1924	0.2165	0.2202	0.2168	0.2192	Mean	0.22398	0.22444	0.2142	0.21376	0.21302	0.22398	0.22444	0.2142	0.21376	0.21302
% SOLUBILITY	4.71	4.84	4.63	5.16	5.11	sd	0.0129455	0.0129367	0.012109	0.0121021	0.01205653	0.0129455	0.0129367	0.012109	0.0121021	0.01205653
						Mean solubility	4.89					0.24				
<b>Zinn Group</b>																
Sample	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
Start weight	0.3509	0.3278	0.3394	0.3336	0.3426	Floss total 2	0.3509	0.3512	0.3365	0.3353	0.3341	0.3509	0.3512	0.3365	0.3353	0.3341
Floss Weight	0.0092	0.0085	0.0094	0.0105	0.0094	0.047 3	0.3278	0.3281	0.3145	0.3136	0.3126	0.3278	0.3281	0.3145	0.3136	0.3126
W1 (start-floss)	0.3417	0.3193	0.33	0.3231	0.3332	4	0.3394	0.3394	0.3254	0.3248	0.3241	0.3394	0.3394	0.3254	0.3248	0.3241
Final constant weight	0.3335	0.3119	0.3229	0.317	0.3264	5	0.3336	0.3337	0.3196	0.3186	0.3179	0.3336	0.3337	0.3196	0.3186	0.3179
Floss Weight	0.0092	0.0085	0.0094	0.0105	0.0094	Wt - floss	1.6473	1.6483	1.578	1.5733	1.5696	1.6473	1.6483	1.578	1.5733	1.5696
W2 (final-floss)	0.3243	0.3034	0.3135	0.3065	0.317	Mean	0.32946	0.32966	0.3156	0.31466	0.31392	0.32946	0.32966	0.3156	0.31466	0.31392
% SOLUBILITY	5.09	4.98	5.00	5.14	4.86	sd	0.0087925	0.0088189	0.0084826	0.0083909	0.00849688	0.0087925	0.0088189	0.0084826	0.0083909	0.00849688
						Mean solubility	5.01					0.11				
<b>Zinn Group</b>																
Sample	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
Start weight	0.4482	0.4519	0.4606	0.439	0.4621	Floss total 2	0.4492	0.4484	0.4304	0.4289	0.4277	0.4492	0.4484	0.4304	0.4289	0.4277
Floss Weight	0.0089	0.0094	0.0096	0.009	0.0084	0.0453 3	0.4519	0.4522	0.4334	0.4319	0.431	0.4519	0.4522	0.4334	0.4319	0.431
W1 (start-floss)	0.4403	0.4425	0.451	0.43	0.4537	4	0.4606	0.4613	0.4427	0.4409	0.4398	0.4606	0.4613	0.4427	0.4409	0.4398
Final constant weight	0.4264	0.4295	0.4385	0.418	0.4405	5	0.439	0.4404	0.4215	0.4203	0.4193	0.439	0.4404	0.4215	0.4203	0.4193
Floss Weight	0.0089	0.0094	0.0096	0.009	0.0084	Wt-floss	0.4621	0.4628	0.445	0.4433	0.4421	0.4621	0.4628	0.445	0.4433	0.4421
W2 (final-floss)	0.4175	0.4201	0.4289	0.409	0.4321	Mean	2.2175	2.2198	2.1277	2.12	2.1146	2.2175	2.2198	2.1277	2.12	2.1146
% SOLUBILITY	5.18	5.06	4.90	4.88	4.76	sd	0.4435	0.44396	0.42554	0.424	0.42292	0.4435	0.44396	0.42554	0.424	0.42292
						Mean solubility	4.96					0.16				
<b>Zinn Group</b>																
Sample	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
Start weight	0.546	0.5701	0.5644	0.4795	0.5151	Floss total 2	0.546	0.5466	0.5255	0.5235	0.5221	0.546	0.5466	0.5255	0.5235	0.5221
Floss Weight	0.0099	0.0097	0.0098	0.0087	0.0086	0.0467 3	0.5701	0.5758	0.5492	0.5469	0.5456	0.5701	0.5758	0.5492	0.5469	0.5456
W1 (start-floss)	0.5361	0.5604	0.5546	0.4708	0.5065	4	0.5644	0.5668	0.5437	0.5414	0.5401	0.5644	0.5668	0.5437	0.5414	0.5401
Final constant weight	0.52	0.5436	0.5382	0.4558	0.4915	5	0.4795	0.4813	0.4601	0.4586	0.4573	0.4795	0.4813	0.4601	0.4586	0.4573
Floss Weight	0.0099	0.0097	0.0098	0.0087	0.0086	Wt-floss	0.5151	0.5159	0.496	0.4943	0.4932	0.5151	0.5159	0.496	0.4943	0.4932
W2 (final-floss)	0.5101	0.5339	0.5284	0.4471	0.4829	Mean	2.6284	2.6397	2.5278	2.518	2.5116	2.6284	2.6397	2.5278	2.518	2.5116
% SOLUBILITY	4.85	4.73	4.72	5.03	4.66	sd	0.52568	0.52794	0.50556	0.5036	0.50232	0.52568	0.52794	0.50556	0.5036	0.50232
						Mean solubility	4.80					0.15				

Table 82. Fuji II LC Three-Month Solubility Experimental Sample Results (grams)

Fuji II THREE MONTH SOLUBILITY (EXPERIMENTAL GROUP)												
O'Haus Analytical Plus Scale												
	pre H2O					post H2O						
	3-Nov-05	4-Nov-05	7-Nov-05	8-Nov-05	9-Nov-05	10-Nov-05						
<b>2mm Group</b>												
Sample	1	2	3	4	5							
Start weight	0.2137	0.221	0.2265	0.2196	0.2204	Floss total	2					
Floss Weight	0.0071	0.008	0.0072	0.0079	0.0079		3					
W1 (start-floss)	0.2066	0.213	0.2193	0.2117	0.2125		4					
Final constant weight	0.2052	0.2123	0.2173	0.2114	0.212		5					
Floss Weight	0.0071	0.008	0.0072	0.0079	0.0079	Wt-floss						
W2 (final-floss)	0.1981	0.2043	0.2101	0.2035	0.2041	Mean						
						sd						
<b>% SOLUBILITY</b>	4.11	4.08	4.20	3.87	3.95	Mean solubility						
						sd						
<b>3mm Group</b>												
Sample	1	2	3	4	5							
Start weight	0.3234	0.2963	0.3074	0.3058	0.3111	Floss total	2					
Floss Weight	0.0081	0.0079	0.0077	0.0074	0.0078		3					
W1 (start-floss)	0.3153	0.2884	0.2997	0.2984	0.3033		4					
Final constant weight	0.3109	0.286	0.2934	0.293	0.2985		5					
Floss Weight	0.0081	0.0079	0.0074	0.0074	0.0078	Wt - floss						
W2 (final-floss)	0.3028	0.2781	0.286	0.2856	0.2907	Mean						
						sd						
<b>% SOLUBILITY</b>	3.96	3.57	4.57	4.29	4.15	Mean solubility						
						sd						
<b>4mm Group</b>												
Sample	1	2	3	4	5							
Start weight	0.4148	0.4221	0.4262	0.383	0.4325	Floss total	2					
Floss Weight	0.0083	0.0075	0.0071	0.0066	0.0086		3					
W1 (start-floss)	0.4065	0.4146	0.4191	0.3764	0.4239		4					
Final constant weight	0.398	0.4072	0.4083	0.367	0.4136		5					
Floss Weight	0.0083	0.0075	0.0071	0.0066	0.0086	Wt-floss						
W2 (final-floss)	0.3897	0.3997	0.4012	0.3604	0.405	Mean						
						sd						
<b>% SOLUBILITY</b>	4.13	3.59	4.27	4.25	4.46	Mean solubility						
						sd						
<b>5mm Group</b>												
Sample	1	2	3	4	5							
Start weight	0.5194	0.4841	0.5421	0.4894	0.5092	Floss total	2					
Floss Weight	0.0084	0.0073	0.0078	0.008	0.0083		3					
W1 (start-floss)	0.511	0.4768	0.5343	0.4814	0.5009		4					
Final constant weight	0.4998	0.4665	0.5197	0.4714	0.4904		5					
Floss Weight	0.0084	0.0073	0.0078	0.008	0.0083	Wt-floss						
W2 (final-floss)	0.4914	0.4592	0.5119	0.4634	0.4821	Mean						
						sd						
<b>% SOLUBILITY</b>	3.84	3.69	4.19	3.74	3.75	Mean solubility						
						sd						

Table 83. Fuji II LC Three-Month Solubility Control Sample Results (grams)

Fuji II THREE MONTH SOLUBILITY (CONTROL GROUP)												
O'Haus Analytical Plus Scale												
	pre H2O			post H2O								
	8-Nov-05	9-Nov-05	10-Nov-05	11-Nov-05	12-Nov-05	13-Nov-05						
<b>2mm Group</b>												
Sample	1	2	3	4	5							
Start weight	0.2224	0.23	0.233	0.2096	0.2395	Floss total	1	0.2224	0.2222	0.212	0.2069	0.2119
Floss Weight	0.0074	0.0075	0.0075	0.0094	0.0087		2	0.23	0.2312	0.2199	0.2193	0.2188
W1 (start-floss)	0.215	0.2225	0.2255	0.2002	0.2308		3	0.233	0.2316	0.222	0.2212	0.2211
Final constant weight	0.2119	0.2188	0.2212	0.2001	0.2287		4	0.2096	0.2107	0.2006	0.2003	0.2001
Floss Weight	0.0074	0.0075	0.0075	0.0074	0.0087		5	0.2395	0.2402	0.2296	0.2289	0.2286
W2 (final-floss)	0.2045	0.2113	0.2137	0.1927	0.22		Wt-floss	1.094	1.0954	1.0436	1.0361	1.0399
							Mean	0.2188	0.21908	0.20872	0.20722	0.20798
							sd	0.011458	0.011198	0.011022	0.011525	0.010776
<b>% SOLUBILITY</b>	<b>4.88</b>	<b>5.03</b>	<b>5.23</b>	<b>3.75</b>	<b>4.68</b>			<b>Mean solubility</b>	<b>4.72</b>	<b>0.58</b>		
<b>3mm Group</b>												
Sample	1	2	3	4	5							
Start weight	0.2973	0.2945	0.2936	0.3028	0.2946	Floss total	1	0.2973	0.2979	0.2838	0.2832	0.2826
Floss Weight	0.0078	0.008	0.0077	0.0066	0.0067		2	0.2945	0.294	0.2793	0.2787	0.2784
W1 (start-floss)	0.2895	0.2865	0.2859	0.2879	0.2879		3	0.2936	0.2943	0.2816	0.2813	0.2809
Final constant weight	0.2826	0.2782	0.2806	0.2825	0.2784		4	0.3028	0.2995	0.2838	0.283	0.2826
Floss Weight	0.0078	0.008	0.0077	0.0066	0.0067		5	0.2946	0.2951	0.2794	0.2789	0.2785
W2 (final-floss)	0.2748	0.2702	0.2729	0.2759	0.2717		Wt - floss	1.446	1.444	1.3711	1.3683	1.3655
							Mean	0.2892	0.2888	0.27422	0.27366	0.27328
							sd	0.003753	0.00242	0.002225	0.002158	0.002131
<b>% SOLUBILITY</b>	<b>5.08</b>	<b>5.69</b>	<b>4.55</b>	<b>6.85</b>	<b>5.63</b>			<b>Mean solubility</b>	<b>5.56</b>	<b>0.86</b>		
<b>4mm Group</b>												
Sample	1	2	3	4	5							
Start weight	0.454	0.3436	0.4194	0.427	0.4257	Floss total	1	0.454	0.4553	0.4351	0.4337	0.4331
Floss Weight	0.0076	0.0077	0.0072	0.0077	0.0082		2	0.3436	0.3432	0.328	0.3272	0.3264
W1 (start-floss)	0.4464	0.3359	0.4122	0.4193	0.4175		3	0.4194	0.4208	0.4012	0.3999	0.3995
Final constant weight	0.4331	0.3264	0.3993	0.4077	0.4076		4	0.427	0.4274	0.4093	0.4083	0.4076
Floss Weight	0.0076	0.0077	0.0072	0.0077	0.0082		5	0.4257	0.4259	0.4093	0.4081	0.4077
W2 (final-floss)	0.4255	0.3187	0.3921	0.4	0.3994		Wt-floss	2.0313	2.0342	1.9445	1.9388	1.9362
							Mean	0.40626	0.40684	0.3889	0.38776	0.38724
							sd	0.041507	0.042084	0.04041	0.040206	0.040177
<b>% SOLUBILITY</b>	<b>4.68</b>	<b>5.12</b>	<b>4.88</b>	<b>4.60</b>	<b>4.34</b>			<b>Mean solubility</b>	<b>4.72</b>	<b>0.29</b>		
<b>5mm Group</b>												
Sample	1	2	3	4	5							
Start weight	0.5361	0.5183	0.522	0.5312	0.5405	Floss total	1	0.5361	0.538	0.5164	0.5148	0.514
Floss Weight	0.009	0.0081	0.0077	0.0071	0.007		2	0.5183	0.5196	0.4972	0.4955	0.4948
W1 (start-floss)	0.5271	0.5102	0.5143	0.5241	0.5335		3	0.522	0.5258	0.5013	0.4996	0.4989
Final constant weight	0.514	0.4947	0.4989	0.5085	0.5175		4	0.5312	0.5329	0.511	0.5089	0.5084
Floss Weight	0.009	0.0081	0.0077	0.0071	0.007		5	0.5405	0.5414	0.5202	0.5182	0.5175
W2 (final-floss)	0.505	0.4866	0.4912	0.5014	0.5105		Wt-floss	2.6092	2.6188	2.5072	2.4981	2.485
							Mean	0.52184	0.52376	0.50144	0.49962	0.497
							sd	0.009342	0.008893	0.009779	0.009697	0.012429
<b>% SOLUBILITY</b>	<b>4.19</b>	<b>4.63</b>	<b>4.49</b>	<b>4.33</b>	<b>4.31</b>			<b>Mean solubility</b>	<b>4.39</b>	<b>0.17</b>		

Table 84. Photac-Fil Quick Immediate Solubility Experimental Sample Results (grams)

Photac Immediate SOLUBILITY (EXPERIMENTAL GROUP)																		
O'Haus Analytical Plus Scale																		
	pre H2O		post H2O		19-Jan-06		17-Dec-05		18-Dec-05		19-Dec-05		20-Dec-05		21-Dec-05		22-Dec-05	
<b>3mm Group</b>																		
Sample	1	2	3	4	5	Floss total		Floss total		Floss total		Floss total		Floss total		Floss total		
Start weight	0.2564	0.2526	0.2643	0.2601	0.2705	0.0565		0.0565		0.0565		0.0565		0.0565		0.0565		
Floss Weight	0.0117	0.0116	0.0118	0.0101	0.0113	0.0565		0.0565		0.0565		0.0565		0.0565		0.0565		
<b>W1 (start-floss)</b>	0.2447	0.241	0.2525	0.25	0.2592	0.0565		0.0565		0.0565		0.0565		0.0565		0.0565		
Final constant weight	0.2459	0.2409	0.253	0.255	0.2607	0.0565		0.0565		0.0565		0.0565		0.0565		0.0565		
Floss Weight	0.0117	0.0116	0.0118	0.0101	0.0113	0.0565		0.0565		0.0565		0.0565		0.0565		0.0565		
<b>W2 (final-floss)</b>	0.2342	0.2293	0.2412	0.2449	0.2494	0.0565		0.0565		0.0565		0.0565		0.0565		0.0565		
<b>% SOLUBILITY</b>	4.29	4.85	4.48	2.04	3.78	3.89		3.89		3.89		3.89		3.89		3.89		
<b>3mm Group</b>																		
Sample	1	2	3	4	5	Floss total		Floss total		Floss total		Floss total		Floss total		Floss total		
Start weight	0.3465	0.3573	0.3622	0.3482	0.3494	0.0598		0.0598		0.0598		0.0598		0.0598		0.0598		
Floss Weight	0.0123	0.0122	0.0126	0.0117	0.011	0.0598		0.0598		0.0598		0.0598		0.0598		0.0598		
<b>W1 (start-floss)</b>	0.3342	0.3451	0.3496	0.3365	0.3384	0.0598		0.0598		0.0598		0.0598		0.0598		0.0598		
Final constant weight	0.3285	0.3394	0.348	0.3372	0.3261	0.0598		0.0598		0.0598		0.0598		0.0598		0.0598		
Floss Weight	0.0123	0.0122	0.0126	0.0117	0.011	0.0598		0.0598		0.0598		0.0598		0.0598		0.0598		
<b>W2 (final-floss)</b>	0.3162	0.3272	0.3354	0.3255	0.3151	0.0598		0.0598		0.0598		0.0598		0.0598		0.0598		
<b>% SOLUBILITY</b>	5.39	5.19	4.06	3.27	6.89	4.96		4.96		4.96		4.96		4.96		4.96		
<b>4mm Group</b>																		
Sample	1	2	3	4	5	Floss total		Floss total		Floss total		Floss total		Floss total		Floss total		
Start weight	0.4637	0.4603	0.4625	0.4741	0.4603	0.067		0.067		0.067		0.067		0.067		0.067		
Floss Weight	0.0135	0.0129	0.0139	0.0144	0.0123	0.067		0.067		0.067		0.067		0.067		0.067		
<b>W1 (start-floss)</b>	0.4502	0.4474	0.4486	0.4597	0.448	0.067		0.067		0.067		0.067		0.067		0.067		
Final constant weight	0.433	0.4378	0.44	0.4518	0.434	0.067		0.067		0.067		0.067		0.067		0.067		
Floss Weight	0.0135	0.0129	0.0139	0.0144	0.0123	0.067		0.067		0.067		0.067		0.067		0.067		
<b>W2 (final-floss)</b>	0.4195	0.4249	0.4261	0.4374	0.4217	0.067		0.067		0.067		0.067		0.067		0.067		
<b>% SOLUBILITY</b>	6.82	5.03	5.02	4.85	5.87	5.52		5.52		5.52		5.52		5.52		5.52		
<b>5mm Group</b>																		
Sample	1	2	3	4	5	Floss total		Floss total		Floss total		Floss total		Floss total		Floss total		
Start weight	0.5581	0.565	0.556	0.5543	0.5536	0.056		0.056		0.056		0.056		0.056		0.056		
Floss Weight	0.0113	0.011	0.0118	0.0107	0.0112	0.056		0.056		0.056		0.056		0.056		0.056		
<b>W1 (start-floss)</b>	0.5468	0.554	0.5442	0.5436	0.5424	0.056		0.056		0.056		0.056		0.056		0.056		
Final constant weight	0.526	0.5377	0.5214	0.5206	0.5272	0.056		0.056		0.056		0.056		0.056		0.056		
Floss Weight	0.0113	0.011	0.0118	0.0107	0.0112	0.056		0.056		0.056		0.056		0.056		0.056		
<b>W2 (final-floss)</b>	0.5147	0.5267	0.5096	0.5099	0.516	0.056		0.056		0.056		0.056		0.056		0.056		
<b>% SOLUBILITY</b>	5.87	4.93	6.36	6.20	4.87	5.64		5.64		5.64		5.64		5.64		5.64		

Table 85. Photac-Fil Quick Immediate Solubility Control Sample Results (grams)

Photac-Fil Quick IMMEDIATE SOLUBILITY CONTROL																							
O'Haus Analytical Plus Scale																							
	pre H2O			post H2O			16-Dec-05		17-Dec-05		18-Dec-05		19-Dec-05		20-Dec-05		21-Dec-05		22-Dec-05				
	1	2	3	4	5	Floss total	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5		
<b>3mm Group</b>																							
Sample																							
Start weight	0.2403	0.2367	0.2499	0.2546	0.2531	Floss total	0.2403	0.2367	0.2499	0.2546	0.2531	0.2403	0.2367	0.2499	0.2546	0.2531	0.2403	0.2367	0.2499	0.2546	0.2531		
Floss Weight	0.0117	0.0121	0.0117	0.0096	0.0105	0.0556	0.0117	0.0121	0.0117	0.0096	0.0105	0.0117	0.0121	0.0117	0.0096	0.0105	0.0117	0.0121	0.0117	0.0096	0.0105		
W1 (start-floss)	0.2286	0.2246	0.2382	0.245	0.2426		0.2286	0.2246	0.2382	0.245	0.2426	0.2286	0.2246	0.2382	0.245	0.2426	0.2286	0.2246	0.2382	0.245	0.2426		
Final constant weight	0.2305	0.2262	0.2412	0.2463	0.2434		0.2305	0.2262	0.2412	0.2463	0.2434	0.2305	0.2262	0.2412	0.2463	0.2434	0.2305	0.2262	0.2412	0.2463	0.2434		
Floss Weight	0.0117	0.0121	0.0117	0.0096	0.0105		0.0117	0.0121	0.0117	0.0096	0.0105	0.0117	0.0121	0.0117	0.0096	0.0105	0.0117	0.0121	0.0117	0.0096	0.0105		
W2 (final-floss)	0.2188	0.2141	0.2295	0.2367	0.2329		0.2188	0.2141	0.2295	0.2367	0.2329	0.2188	0.2141	0.2295	0.2367	0.2329	0.2188	0.2141	0.2295	0.2367	0.2329		
Mean	0.2358	0.2464	0.22774	0.22666	0.2264		0.2358	0.2464	0.22774	0.22666	0.2264	0.2358	0.2464	0.22774	0.22666	0.2264	0.2358	0.2464	0.22774	0.22666	0.2264		
sd	0.007974	0.009074	0.008749	0.008715	0.008698		0.007974	0.009074	0.008749	0.008715	0.008698	0.007974	0.009074	0.008749	0.008715	0.008698	0.007974	0.009074	0.008749	0.008715	0.008698		
Mean solubility	4.00					4.00	4.00					4.00	4.00					4.00	4.00				
<b>3mm Group</b>																							
Sample																							
Start weight	0.3214	0.336	0.3436	0.3425	0.3539	Floss total	0.3214	0.336	0.3436	0.3425	0.3539	0.3214	0.336	0.3436	0.3425	0.3539	0.3214	0.336	0.3436	0.3425	0.3539		
Floss Weight	0.0112	0.0122	0.0111	0.0109	0.01	0.0553	0.0112	0.0122	0.0111	0.0109	0.01	0.0112	0.0122	0.0111	0.0109	0.01	0.0112	0.0122	0.0111	0.0109	0.01		
W1 (start-floss)	0.3102	0.3238	0.3326	0.3316	0.3439		0.3102	0.3238	0.3326	0.3316	0.3439	0.3102	0.3238	0.3326	0.3316	0.3439	0.3102	0.3238	0.3326	0.3316	0.3439		
Final constant weight	0.31	0.3241	0.3302	0.331	0.3431		0.31	0.3241	0.3302	0.331	0.3431	0.31	0.3241	0.3302	0.331	0.3431	0.31	0.3241	0.3302	0.331	0.3431		
Floss Weight	0.0112	0.0122	0.0111	0.0109	0.01		0.0112	0.0122	0.0111	0.0109	0.01	0.0112	0.0122	0.0111	0.0109	0.01	0.0112	0.0122	0.0111	0.0109	0.01		
W2 (final-floss)	0.2988	0.3119	0.3192	0.3201	0.3331		0.2988	0.3119	0.3192	0.3201	0.3331	0.2988	0.3119	0.3192	0.3201	0.3331	0.2988	0.3119	0.3192	0.3201	0.3331		
Mean	0.32842	0.34216	0.31932	0.31764	0.31662		0.32842	0.34216	0.31932	0.31764	0.31662	0.32842	0.34216	0.31932	0.31764	0.31662	0.32842	0.34216	0.31932	0.31764	0.31662		
sd	0.011969	0.012871	0.012184	0.012053	0.011993		0.011969	0.012871	0.012184	0.012053	0.011993	0.011969	0.012871	0.012184	0.012053	0.011993	0.011969	0.012871	0.012184	0.012053	0.011993		
Mean solubility	3.60					3.60	3.60					3.60	3.60					3.60	3.60				
<b>4mm Group</b>																							
Sample																							
Start weight	0.4201	0.4352	0.4451	0.4344	0.4618	Floss total	0.4201	0.4352	0.4451	0.4344	0.4618	0.4201	0.4352	0.4451	0.4344	0.4618	0.4201	0.4352	0.4451	0.4344	0.4618		
Floss Weight	0.0103	0.0096	0.0119	0.0112	0.0112	0.0542	0.0103	0.0096	0.0119	0.0112	0.0112	0.0103	0.0096	0.0119	0.0112	0.0112	0.0103	0.0096	0.0119	0.0112	0.0112		
W1 (start-floss)	0.4098	0.4256	0.4332	0.4232	0.4506		0.4098	0.4256	0.4332	0.4232	0.4506	0.4098	0.4256	0.4332	0.4232	0.4506	0.4098	0.4256	0.4332	0.4232	0.4506		
Final constant weight	0.4045	0.4205	0.4285	0.4194	0.4465		0.4045	0.4205	0.4285	0.4194	0.4465	0.4045	0.4205	0.4285	0.4194	0.4465	0.4045	0.4205	0.4285	0.4194	0.4465		
Floss Weight	0.0103	0.0096	0.0119	0.0112	0.0112		0.0103	0.0096	0.0119	0.0112	0.0112	0.0103	0.0096	0.0119	0.0112	0.0112	0.0103	0.0096	0.0119	0.0112	0.0112		
W2 (final-floss)	0.3942	0.4109	0.4166	0.4082	0.4353		0.3942	0.4109	0.4166	0.4082	0.4353	0.3942	0.4109	0.4166	0.4082	0.4353	0.3942	0.4109	0.4166	0.4082	0.4353		
Mean	0.42848	0.447	0.41724	0.4148	0.41382		0.42848	0.447	0.41724	0.4148	0.41382	0.42848	0.447	0.41724	0.4148	0.41382	0.42848	0.447	0.41724	0.4148	0.41382		
sd	0.015406	0.01599	0.015476	0.015499	0.015251		0.015406	0.01599	0.015476	0.015499	0.015251	0.015406	0.01599	0.015476	0.015499	0.015251	0.015406	0.01599	0.015476	0.015499	0.015251		
Mean solubility	3.61					3.61	3.61					3.61	3.61					3.61	3.61				
<b>5mm Group</b>																							
Sample																							
Start weight	0.5293	0.5301	0.5461	0.5546	0.5381	Floss total	0.5293	0.5301	0.5461	0.5546	0.5381	0.5293	0.5301	0.5461	0.5546	0.5381	0.5293	0.5301	0.5461	0.5546	0.5381		
Floss Weight	0.0115	0.0114	0.0097	0.0086	0.0101	0.0513	0.0115	0.0114	0.0097	0.0086	0.0101	0.0115	0.0114	0.0097	0.0086	0.0101	0.0115	0.0114	0.0097	0.0086	0.0101		
W1 (start-floss)	0.5178	0.5187	0.5364	0.546	0.528		0.5178	0.5187	0.5364	0.546	0.528	0.5178	0.5187	0.5364	0.546	0.528	0.5178	0.5187	0.5364	0.546	0.528		
Final constant weight	0.5116	0.512	0.529	0.5379	0.5206		0.5116	0.512	0.529	0.5379	0.5206	0.5116	0.512	0.529	0.5379	0.5206	0.5116	0.512	0.529	0.5379	0.5206		
Floss Weight	0.0115	0.0114	0.0097	0.0086	0.0101		0.0115	0.0114	0.0097	0.0086	0.0101	0.0115	0.0114	0.0097	0.0086	0.0101	0.0115	0.0114	0.0097	0.0086	0.0101		
W2 (final-floss)	0.5001	0.5006	0.5193	0.5293	0.5105		0.5001	0.5006	0.5193	0.5293	0.5105	0.5001	0.5006	0.5193	0.5293	0.5105	0.5001	0.5006	0.5193	0.5293	0.5105		
Mean	0.52938	0.52572	0.51634	0.51274	0.51196		0.52938	0.52572	0.51634	0.51274	0.51196	0.52938	0.52572	0.51634	0.51274	0.51196	0.52938	0.52572	0.51634	0.51274	0.51196		
sd	0.010792	0.009912	0.011391	0.011402	0.011333		0.010792	0.009912	0.011391	0.011402	0.011333	0.010792	0.009912	0.011391	0.011402	0.011333	0.010792	0.009912	0.011391	0.011402	0.011333		
Mean solubility	3.29					3.29	3.29					3.29	3.29					3.29	3.29				

Table 86. Photac-Fil Quick 24-Hour Solubility Experimental Sample Results (grams)

PHOTAC 24 hour SOLUBILITY (EXPERIMENTAL GROUP)												
O'Haus Analytical Plus Scale												
	pre H2O					post H2O						
	4-Feb-06	5-Feb-06	6-Feb-06	7-Feb-06	8-Feb-06	9-Feb-06	10-Feb-06	11-Feb-06				
<b>2mm Group</b>												
Sample	1	2	3	4	5	1	2	3	4	5	1	2
Start weight	0.2257	0.2298	0.2356	0.2414	0.2554	Floss total	2	3	4	5	0.2136	0.2123
Floss Weight	0.0097	0.0111	0.0092	0.0091	0.0114	0.0505	3	4	5	0.2189	0.2189	0.2189
W1 (start-floss)	0.216	0.2187	0.2264	0.2323	0.244		4	5	0.2232	0.2232	0.2232	0.2232
Final constant weight	0.2072	0.212	0.2189	0.2232	0.2361		5	0.2361	0.2361	0.2361	0.2361	0.2361
Floss Weight	0.0097	0.0111	0.0092	0.0091	0.0114	Wt-floss	1.1374	1.1438	1.0554	1.0484	1.0471	1.0469
W2 (final-floss)	0.1975	0.2009	0.2097	0.2141	0.2247	Mean	0.22748	0.22876	0.21108	0.20968	0.20942	0.20938
						sd	0.0115945	0.0117551	0.0112384	0.0112424	0.0112231	0.0111484
<b>% SOLUBILITY</b>	8.56	8.14	7.38	7.83	7.91	Mean solubility	7.96	0.43				
<b>3mm Group</b>												
Sample	1	2	3	4	5	1	2	3	4	5	1	2
Start weight	0.367	0.3693	0.3472	0.3045	0.3615	Floss total	2	3	4	5	0.3454	0.3432
Floss Weight	0.108	0.104	0.118	0.102	0	0.0432	3	4	5	0.3512	0.349	0.3485
W1 (start-floss)	0.3562	0.3589	0.3354	0.2943	0.3615		4	5	0.3246	0.3246	0.3246	0.3242
Final constant weight	0.3423	0.3483	0.3242	0.2826	0.3405		5	0.2826	0.2826	0.2826	0.2826	0.2826
Floss Weight	0.108	0.104	0.118	0.102	0	Wt - floss	1.7063	1.7208	1.6093	1.599	1.5963	1.5947
W2 (final-floss)	0.3315	0.3379	0.3124	0.2724	0.3405	Mean	0.34126	0.34416	0.32186	0.3198	0.31926	0.31894
						sd	0.027945	0.0273616	0.0268835	0.0266665	0.0266709	0.02666812
<b>% SOLUBILITY</b>	6.93	5.85	6.86	7.44	5.81	Mean solubility	6.58	0.72				
<b>4mm Group</b>												
Sample	1	2	3	4	5	1	2	3	4	5	1	2
Start weight	0.4595	0.4566	0.4612	0.4257	0.4444	Floss total	2	3	4	5	0.4374	0.4356
Floss Weight	0.0096	0.0094	0.0102	0.0096	0.0101	0.0489	3	4	5	0.4348	0.4348	0.4348
W1 (start-floss)	0.4499	0.4472	0.451	0.4161	0.4343		4	5	0.4357	0.435	0.4348	0.434
Final constant weight	0.4337	0.4308	0.434	0.3975	0.4198		5	0.3987	0.3987	0.3987	0.3978	0.3975
Floss Weight	0.0096	0.0094	0.0102	0.0096	0.0101	Wt-floss	2.1934	2.2264	2.0839	2.0753	2.072	2.0705
W2 (final-floss)	0.4241	0.4214	0.4238	0.3879	0.4097	Mean	0.43868	0.44528	0.41678	0.41506	0.4144	0.41352
						sd	0.0111983	0.0140344	0.0155114	0.0154633	0.015375	0.01541606
<b>% SOLUBILITY</b>	5.73	5.77	6.03	6.78	5.66	Mean solubility	6.00	0.46				
<b>5mm Group</b>												
Sample	1	2	3	4	5	1	2	3	4	5	1	2
Start weight	0.5246	0.5206	0.55	0.5201	0.5284	Floss total	2	3	4	5	0.5246	0.5331
Floss Weight	0.0116	0.0097	0.0108	0.0085	0.0105	0.0511	3	4	5	0.4988	0.498	0.4971
W1 (start-floss)	0.513	0.5109	0.5392	0.5116	0.5179		4	5	0.4911	0.4911	0.4911	0.4895
Final constant weight	0.4969	0.4899	0.5213	0.4898	0.4967		5	0.5218	0.5218	0.5218	0.5218	0.5213
Floss Weight	0.0116	0.0097	0.0108	0.0085	0.0105	Wt-floss	2.5926	2.6314	2.4637	2.4535	2.45	2.3854
W2 (final-floss)	0.4853	0.4802	0.5105	0.4813	0.4862	Mean	0.51852	0.52628	0.49274	0.4907	0.49	0.47708
						sd	0.0123506	0.0126069	0.0130374	0.0130452	0.0130318	0.0308753
<b>% SOLUBILITY</b>	5.40	6.01	5.32	5.92	6.12	Mean solubility	5.75	0.37				

Table 87. Photac-Fil Quick 24-Hour Solubility Control Sample Results (grams)

PHOTAC 24 hour SOLUBILITY (CONTROL GROUP)												
O'Haus Analytical Plus Scale												
	pre H2O			post H2O								
	1-Feb-06	2-Feb-06	3-Feb-06	4-Feb-06	5-Feb-06	6-Feb-06	7-Feb-06	8-Feb-06	9-Feb-06			
<b>2mm Group</b>												
Sample	1	2	3	4	5							
Start weight	0.238	0.232	0.2372	0.2433	0.2626	Floss total	2	0.2238	0.2234			
Floss Weight	0.102	0.0094	0.0106	0.0095	0.103	0.05	3	0.232	0.2346	0.2193	0.219	
W1 (start-floss)	0.2278	0.2226	0.2266	0.2338	0.2523	4	0.2372	0.2389	0.2246	0.2233	0.223	
Final constant weight	0.2234	0.219	0.223	0.2294	0.2485	5	0.2626	0.2644	0.2504	0.2489	0.2485	
Floss Weight	0.102	0.0094	0.0106	0.0095	0.103	Wt-floss	1	1.1631	1.1728	1.1014	1.0949	
W2 (final-floss)	0.2132	0.2096	0.2124	0.2199	0.2382	Mean	0.23262	0.23456	0.22028	0.21898	0.21866	
						sd	0.011866	0.0116513	0.0118647	0.0117259	0.0116961	
<b>% SOLUBILITY</b>	6.41	5.84	6.27	5.95	5.59	Mean solubility	6.01					0.33
<b>3mm Group</b>												
Sample	1	2	3	4	5							
Start weight	0.3681	0.3683	0.3673	0.3438	0.3677	Floss total	2	0.3681	0.3737	0.3523	0.3497	
Floss Weight	0.0096	0.0097	0.0097	0.0113	0.0107	0.051	3	0.3683	0.3743	0.3538	0.3516	
W1 (start-floss)	0.3585	0.3586	0.3576	0.3325	0.357	4	0.3673	0.3733	0.3527	0.3503	0.3495	
Final constant weight	0.3487	0.3507	0.349	0.3256	0.345	5	0.3438	0.3486	0.3285	0.3264	0.3256	
Floss Weight	0.0096	0.0097	0.0097	0.0113	0.0107	Wt-floss	1	0.3677	0.3724	0.3489	0.3461	
W2 (final-floss)	0.3391	0.341	0.3393	0.3143	0.3343	Mean	0.35284	0.35826	0.33704	0.33462	0.3339	
						sd	0.010762	0.0111235	0.0106348	0.010497	0.0103685	
<b>% SOLUBILITY</b>	5.41	4.91	5.12	5.47	6.36	Mean solubility	5.45					0.55
<b>4mm Group</b>												
Sample	1	2	3	4	5							
Start weight	0.4549	0.4346	0.4625	0.4402	0.4501	Floss total	2	0.4549	0.4621	0.4378	0.4346	
Floss Weight	0.0095	0.0105	0.0104	0.0093	0.0091	0.0488	3	0.4346	0.4407	0.4184	0.4156	
W1 (start-floss)	0.4454	0.4241	0.4521	0.4309	0.441	4	0.4625	0.4708	0.4452	0.4422	0.4414	
Final constant weight	0.4311	0.4132	0.4394	0.4167	0.4261	5	0.4402	0.449	0.4222	0.4194	0.4185	
Floss Weight	0.0095	0.0105	0.0104	0.0093	0.0091	Wt-floss	1	0.4501	0.4564	0.4317	0.4288	
W2 (final-floss)	0.4216	0.4027	0.429	0.4074	0.417	Mean	2	2.1935	2.2302	2.1065	2.0918	
						sd	0.4387	0.44604	0.4213	0.41836	0.41742	
<b>% SOLUBILITY</b>	5.34	5.05	5.11	5.45	5.44	Mean solubility	5.28					0.19
<b>5mm Group</b>												
Sample	1	2	3	4	5							
Start weight	0.5364	0.5222	0.5309	0.5402	0.5579	Floss total	2	0.5364	0.5453	0.5195	0.5157	
Floss Weight	0.0093	0.0102	0.0087	0.0103	0.0092	0.0477	3	0.5222	0.5301	0.5014	0.4982	
W1 (start-floss)	0.5271	0.512	0.5222	0.5299	0.5487	4	0.5309	0.5388	0.5127	0.5091	0.5081	
Final constant weight	0.5122	0.4948	0.5058	0.5148	0.5212	5	0.5402	0.5464	0.5214	0.5181	0.517	
Floss Weight	0.0093	0.0102	0.0087	0.0103	0.0092	Wt-floss	1	0.5579	0.5621	0.5295	0.5253	
W2 (final-floss)	0.5029	0.4846	0.4971	0.5045	0.512	Mean	2	2.6399	2.675	2.5368	2.5187	
						sd	0.52798	0.535	0.50736	0.50374	0.50268	
<b>% SOLUBILITY</b>	4.59	5.35	4.81	4.79	6.69	Mean solubility	5.25					0.85

Table 88. Photac-Fil Quick One-Week Solubility Experimental Sample Results (grams)

Photac FII Quick ONE WEEK SOLUBILITY EXPERIMENTAL													
OHaus Analytical Plus Scale													
	pre H2O					post H2O							
	8-Dec-05	9-Dec-05	10-Dec-05	11-Dec-05	12-Dec-05	13-Dec-05	14-Dec-05						
<b>2mm Group</b>													
Sample	1	2	3	4	5								
Start weight	0.2246	0.2365	0.2523	0.2331	0.2541	Floss total							
Floss Weight	0.0099	0.0113	0.0106	0.0106	0.0119	0.0543							
W1 (start-floss)	0.2147	0.2252	0.2417	0.2225	0.2422								
Final constant weight	0.2102	0.222	0.2422	0.2184	0.2385								
Floss Weight	0.0099	0.0113	0.0106	0.0106	0.0119								
W2 (final-floss)	0.2003	0.2107	0.2316	0.2078	0.2266								
Mean	0.22926	0.23076	0.21662	0.21568	0.2154								
sd	0.0127186	0.0137438	0.01358113	0.01361756	0.01361756								
<b>% SOLUBILITY</b>	6.71	6.44	4.18	6.61	6.44								
Mean solubility						6.07	1.07						
<b>3mm Group</b>													
Sample	1	2	3	4	5								
Start weight	0.3519	0.3174	0.3438	0.3207	0.328	Floss total							
Floss Weight	0.0111	0.0091	0.0101	0.011	0.0101	0.0514							
W1 (start-floss)	0.3408	0.3083	0.3337	0.3097	0.3179								
Final constant weight	0.3294	0.2967	0.3215	0.2988	0.3059								
Floss Weight	0.0111	0.0091	0.0101	0.011	0.0101								
W2 (final-floss)	0.3183	0.2876	0.3114	0.2878	0.2958								
Mean	0.32208	0.32286	0.30274	0.30124	0.30076								
sd	0.0149286	0.0145684	0.01444393	0.01439364	0.01439906								
<b>% SOLUBILITY</b>	6.60	6.71	6.68	7.07	6.95								
Mean solubility						6.80	0.20						
<b>4mm Group</b>													
Sample	1	2	3	4	5								
Start weight	0.4372	0.4091	0.4685	0.4119	0.4684	Floss total							
Floss Weight	0.0118	0.0124	0.0118	0.0117	0.0126	0.0603							
W1 (start-floss)	0.4254	0.3967	0.4567	0.4002	0.4558								
Final constant weight	0.4107	0.3828	0.4427	0.3876	0.4403								
Floss Weight	0.0118	0.0124	0.0118	0.0117	0.0126								
W2 (final-floss)	0.3989	0.3704	0.4309	0.3759	0.4277								
Mean	0.42696	0.42826	0.40462	0.4023	0.40166								
sd	0.0290098	0.0290053	0.02863926	0.02839574	0.02832467								
<b>% SOLUBILITY</b>	6.23	6.63	5.65	6.07	6.16								
Mean solubility						6.15	0.35						
<b>5mm Group</b>													
Sample	1	2	3	4	5								
Start weight	0.5571	0.5784	0.5353	0.5461	0.5541	Floss total							
Floss Weight	0.0102	0.0122	0.0102	0.0111	0.0114	0.0551							
W1 (start-floss)	0.5469	0.5662	0.5251	0.535	0.5427								
Final constant weight	0.5238	0.542	0.5021	0.5109	0.5208								
Floss Weight	0.0102	0.0122	0.0102	0.0111	0.0114								
W2 (final-floss)	0.5136	0.5298	0.4919	0.4998	0.5094								
Mean	0.54318	0.5447	0.51434	0.51134	0.51026								
sd	0.0159443	0.0159172	0.01522524	0.01506745	0.0150024								
<b>% SOLUBILITY</b>	6.09	6.43	6.32	6.58	6.14								
Mean solubility						6.31	0.20						

Table 89. Photac-Fil Quick One-Week Solubility Control Sample Results (grams)



PHOTAC ONE MONTH SOLUBILITY (EXPERIMENTAL GROUP)										
O'Haus Analytical Plus Scale										
	pre H2O					post H2O				
	7-Dec-05	8-Dec-05	9-Dec-05	10-Dec-05	11-Dec-05	12-Dec-05	13-Dec-05	14-Dec-05		
<b>Zamm Group</b>										
Sample	1	2	3	4	5	1	2	3	4	5
Start weight	0.2266	0.2244	0.216	0.2258	0.2265	Floss total 2	0.2265	Floss total 2	0.2265	Floss total 2
Floss Weight	0.0101	0.0098	0.0104	0.0107	0.0102	0.0512 3	0.0102	0.0512 3	0.0102	0.0512 3
W1 (start-floss)	0.2165	0.2146	0.2056	0.2151	0.2163	4	0.2258	0.2264	0.2122	0.2112
Final constant weight	0.2117	0.2088	0.202	0.211	0.2092	5	0.2265	0.2247	0.2103	0.2093
Floss Weight	0.0101	0.0098	0.0104	0.0107	0.0102	Wt.-floss	1.0681	1.0979	0.9972	0.9915
W2 (final-floss)	0.2016	0.199	0.1916	0.2003	0.199	Mean	0.21362	0.21958	0.19944	0.19842
						sd	0.0044808	0.0141516	0.0038441	0.00386691
<b>% SOLUBILITY</b>	<b>6.88</b>	<b>7.27</b>	<b>6.81</b>	<b>6.88</b>	<b>8.00</b>	<b>Mean solubility</b>	<b>7.17</b>	<b>7.17</b>	<b>0.50</b>	<b>0.50</b>
<b>Zamm Group</b>										
Sample	1	2	3	4	5	1	2	3	4	5
Start weight	0.3437	0.3389	0.3444	0.336	0.3581	Floss total 2	0.3437	0.3445	0.3262	0.3247
Floss Weight	0.0091	0.0098	0.0083	0.0078	0.0081	0.0431 3	0.3389	0.3387	0.3219	0.3204
W1 (start-floss)	0.3346	0.3291	0.3361	0.3282	0.35	4	0.3444	0.3447	0.3273	0.3257
Final constant weight	0.3232	0.319	0.3224	0.3138	0.3371	5	0.336	0.3353	0.3165	0.3151
Floss Weight	0.0091	0.0098	0.0083	0.0078	0.0081	Wt.-floss	0.3581	0.358	0.3403	0.3386
W2 (final-floss)	0.3141	0.3092	0.3141	0.306	0.329	Mean	1.678	1.6781	1.5891	1.5932
						sd	0.3356	0.33562	0.31782	0.31628
<b>% SOLUBILITY</b>	<b>6.13</b>	<b>6.05</b>	<b>6.55</b>	<b>6.76</b>	<b>6.00</b>	<b>Mean solubility</b>	<b>6.30</b>	<b>6.30</b>	<b>0.34</b>	<b>0.34</b>
<b>Zamm Group</b>										
Sample	1	2	3	4	5	1	2	3	4	5
Start weight	0.4645	0.438	0.4342	0.428	0.426	Floss total 2	0.4645	0.4632	0.4379	0.4356
Floss Weight	0.0096	0.0098	0.0103	0.0108	0.009	0.0495 3	0.438	0.4373	0.413	0.4108
W1 (start-floss)	0.4549	0.4282	0.4239	0.4172	0.417	4	0.4342	0.4331	0.4115	0.4091
Final constant weight	0.4334	0.4087	0.407	0.3988	0.3976	5	0.428	0.4263	0.4029	0.4007
Floss Weight	0.0096	0.0098	0.0103	0.0108	0.009	Wt.-floss	0.426	0.4234	0.4014	0.3992
W2 (final-floss)	0.4238	0.3989	0.3967	0.388	0.3886	Mean	2.1412	2.1338	2.0172	2.0059
						sd	0.42824	0.42676	0.40344	0.40118
<b>% SOLUBILITY</b>	<b>6.84</b>	<b>6.84</b>	<b>6.42</b>	<b>7.00</b>	<b>6.81</b>	<b>Mean solubility</b>	<b>6.78</b>	<b>6.78</b>	<b>0.22</b>	<b>0.22</b>
<b>Zamm Group</b>										
Sample	1	2	3	4	5	1	2	3	4	5
Start weight	0.5384	0.5457	0.5343	0.5504	0.5619	Floss total 2	0.5384	0.5362	0.5067	0.5036
Floss Weight	0.0107	0.0105	0.0087	0.0085	0.0087	0.0471 3	0.5457	0.5429	0.5169	0.514
W1 (start-floss)	0.5277	0.5352	0.5256	0.5419	0.5532	4	0.5343	0.5329	0.5107	0.5075
Final constant weight	0.5015	0.5118	0.5052	0.5159	0.5269	5	0.5504	0.5493	0.5207	0.5175
Floss Weight	0.0107	0.0105	0.0087	0.0085	0.0087	Wt.-floss	0.5619	0.56	0.5328	0.5293
W2 (final-floss)	0.4908	0.5013	0.4965	0.5074	0.5182	Mean	2.6836	2.6742	2.5407	2.5248
						sd	0.538029	0.53484	0.50814	0.50486
<b>% SOLUBILITY</b>	<b>6.99</b>	<b>6.33</b>	<b>5.54</b>	<b>6.37</b>	<b>6.33</b>	<b>Mean solubility</b>	<b>6.31</b>	<b>6.31</b>	<b>0.52</b>	<b>0.52</b>

Table 91. Photac-Fil Quick One-Month Solubility Control Sample Results (grams)

PHOTAC ONE MONTH SOLUBILITY (CONTROL GROUP)										
O'Haus Analytical Plus Scale										
	pre H2O					post H2O				
	3-Jan-06	4-Jan-06	5-Jan-06	6-Jan-06	7-Jan-06	8-Jan-06	9-Jan-06			
<b>2mm Group</b>										
Sample	1	2	3	4	5	1	2	3	4	5
Start weight	0.2276	0.2287	0.2245	0.2103	0.2578	Floss total 2	0.2276	0.2287	0.2156	0.2145
Floss Weight	0.0107	0.0117	0.0111	0.0109	0.0121	0.0585 3	0.2287	0.2174	0.2169	0.2162
W1 (start-floss)	0.2169	0.217	0.2134	0.1994	0.2457	4	0.2245	0.2128	0.2123	0.2115
Final constant weight	0.2145	0.2162	0.2115	0.1972	0.2412	5	0.2103	0.1984	0.1979	0.1972
Floss Weight	0.0107	0.0117	0.0111	0.0109	0.0121	Wt-floss	0.2578	0.2425	0.2418	0.2412
W2 (final-floss)	0.2038	0.2045	0.2004	0.1863	0.2291	Mean	1.0924	1.0302	1.0277	1.0241
						sd	0.21848	0.20604	0.20554	0.20482
							0.0173089	0.017448	0.0159326	0.0158486
<b>% SOLUBILITY</b>	6.04	5.76	6.09	6.57	6.76	Mean solubility	6.24	6.24	6.24	6.41
<b>3mm Group</b>										
Sample	1	2	3	4	5	1	2	3	4	5
Start weight	0.3446	0.3621	0.3467	0.3503	0.3595	Floss total 2	0.3446	0.3443	0.3279	0.3255
Floss Weight	0.0109	0.0115	0.0101	0.0099	0.0106	0.053 3	0.3621	0.3614	0.3448	0.3426
W1 (start-floss)	0.3337	0.3506	0.3366	0.3404	0.3489	4	0.3467	0.346	0.3305	0.3291
Final constant weight	0.3252	0.3424	0.3282	0.3305	0.3396	5	0.3503	0.35	0.3327	0.3306
Floss Weight	0.0109	0.0115	0.0101	0.0099	0.0106	Wt-floss	0.3595	0.3601	0.3423	0.3407
W2 (final-floss)	0.3143	0.3309	0.3181	0.3206	0.329	Mean	1.7102	1.7088	1.6252	1.6185
						sd	0.34204	0.34176	0.32504	0.3227
<b>% SOLUBILITY</b>	5.81	5.62	5.50	5.82	5.70	Mean solubility	5.69	5.69	5.69	5.70
<b>4mm Group</b>										
Sample	1	2	3	4	5	1	2	3	4	5
Start weight	0.467	0.4688	0.4723	0.4549	0.4722	Floss total 2	0.467	0.4686	0.4455	0.4431
Floss Weight	0.0093	0.0096	0.0105	0.0107	0.0111	0.0512 3	0.4688	0.4688	0.4455	0.4431
W1 (start-floss)	0.4577	0.4592	0.4618	0.4442	0.4611	4	0.4723	0.4722	0.4496	0.4472
Final constant weight	0.4412	0.4425	0.4457	0.4302	0.4472	5	0.4549	0.4557	0.4337	0.432
Floss Weight	0.0093	0.0096	0.0105	0.0107	0.0111	Wt-floss	0.4722	0.4727	0.4514	0.4487
W2 (final-floss)	0.4319	0.4329	0.4352	0.4195	0.4361	Mean	2.284	2.2868	2.1756	2.1643
						sd	0.4568	0.45736	0.43512	0.43286
<b>% SOLUBILITY</b>	5.64	5.73	5.76	5.56	5.42	Mean solubility	5.62	5.62	5.62	5.62
<b>5mm Group</b>										
Sample	1	2	3	4	5	1	2	3	4	5
Start weight	0.5675	0.5616	0.5478	0.5466	0.5714	Floss total 2	0.5675	0.5671	0.5436	0.5388
Floss Weight	0.0103	0.0096	0.0087	0.0087	0.0099	0.0472 3	0.5616	0.5611	0.5362	0.5318
W1 (start-floss)	0.5572	0.552	0.5391	0.5379	0.5615	4	0.5478	0.547	0.5225	0.5199
Final constant weight	0.5381	0.5313	0.5175	0.5169	0.541	5	0.5466	0.5465	0.5216	0.5191
Floss Weight	0.0103	0.0096	0.0087	0.0087	0.0099	Wt-floss	0.5714	0.571	0.5461	0.5436
W2 (final-floss)	0.5278	0.5217	0.5088	0.5082	0.5311	Mean	2.7477	2.7455	2.6228	2.6093
						sd	0.54954	0.5491	0.52456	0.52014
<b>% SOLUBILITY</b>	5.28	5.49	5.62	5.52	5.41	Mean solubility	5.46	5.46	5.46	5.46

Table 92. Photac-Fil Quick Three-Month Solubility Experimental Sample Results (grams)

PHOTAC THREE MONTH SOLUBILITY (EXPERIMENTAL GROUP)												
O'Haus Analytical Plus Scale												
	pre H2O					post H2O						
	20-Oct-05	21 Oct 05	22-Oct-05	24-Oct-05	25-Oct-05	26-Oct-05	27-Oct-05					
<b>2mm Group</b>												
Sample	1	2	3	4	5							
Start weight	0.2315	0.2251	0.223	0.2346	0.2328	Floss total	2	0.2182	0.2183			
Floss Weight	0.0078	0.0082	0.0082	0.0093	0.0082		3	0.2139	0.2138			
W1 (start-floss)	0.2237	0.2169	0.2148	0.2253	0.2246		4	0.2116	0.2115			
Final constant weight	0.2183	0.2138	0.2115	0.2225	0.2208		5	0.2208	0.2208			
Floss Weight	0.0078	0.0082	0.0082	0.0093	0.0082	Wt-floss		1.0454	1.0452			
W2 (final-floss)	0.2105	0.2056	0.2033	0.2132	0.2126	Mean		0.20996	0.20908	0.20904		
						sd		0.00461324	0.00461324	0.0046408		
<b>% SOLUBILITY</b>	5.90	5.21	5.35	5.37	5.34	Mean solubility		5.44	5.27			
<b>3mm Group</b>												
Sample	1	2	3	4	5							
Start weight	0.353	0.3303	0.3285	0.3323	0.3447	Floss total	2	0.3347	0.3344			
Floss Weight	0.0083	0.0079	0.0075	0.0073	0.0081		3	0.3139	0.3138			
W1 (start-floss)	0.3447	0.3224	0.321	0.325	0.3366		4	0.3107	0.3105			
Final constant weight	0.3344	0.3138	0.3105	0.3161	0.328		5	0.3164	0.3161			
Floss Weight	0.0083	0.0079	0.0075	0.0073	0.0081	Wt - floss		0.3283	0.328			
W2 (final-floss)	0.3261	0.3059	0.303	0.3088	0.3199	Mean		1.5649	1.5637			
						sd		0.31298	0.31274			
<b>% SOLUBILITY</b>	5.40	5.12	5.61	4.98	4.96	Mean solubility		5.21	5.28			
<b>4mm Group</b>												
Sample	1	2	3	4	5							
Start weight	0.4536	0.4501	0.4402	0.4382	0.4396	Floss total	2	0.4277	0.4272	0.427		
Floss Weight	0.0075	0.0074	0.0069	0.0074	0.0074		3	0.4252	0.4248	0.4245		
W1 (start-floss)	0.4461	0.4427	0.4333	0.4308	0.4322		4	0.4195	0.4192	0.4188		
Final constant weight	0.427	0.4245	0.4188	0.4134	0.4164		5	0.4142	0.4136	0.4134		
Floss Weight	0.0075	0.0074	0.0069	0.0074	0.0074	Wt-floss		0.417	0.4167	0.4163		
W2 (final-floss)	0.4195	0.4171	0.4119	0.406	0.409	Mean		2.067	2.0649	2.0634		
						sd		0.4134	0.41298	0.41268		
<b>% SOLUBILITY</b>	5.96	5.78	4.94	5.76	5.37	Mean solubility		5.56	5.41			
<b>5mm Group</b>												
Sample	1	2	3	4	5							
Start weight	0.5608	0.5569	0.5606	0.5547	0.5542	Floss total	2	0.5314	0.5314	0.5311		
Floss Weight	0.0069	0.0073	0.0075	0.0077	0.0073		3	0.5277	0.5273	0.527		
W1 (start-floss)	0.5539	0.5496	0.5531	0.547	0.5469		4	0.5319	0.5315	0.531		
Final constant weight	0.5311	0.527	0.531	0.5236	0.5244		5	0.5247	0.5241	0.5238		
Floss Weight	0.0069	0.0073	0.0075	0.0077	0.0073	Wt-floss		0.5249	0.5249	0.5246		
W2 (final-floss)	0.5242	0.5197	0.5235	0.5159	0.5171	Mean		2.601	2.6025	2.601		
						sd		0.5205	0.5205	0.52008		
<b>% SOLUBILITY</b>	5.36	5.44	5.35	5.69	5.45	Mean solubility		5.46	5.13			

Table 93. Photac-Fil Quick Three Month Solubility Control Sample Results (grams)

PHOTAC THREE MONTH SOLUBILITY (CONTROL GROUP)										
O'Haus Analytical Plus Scale										
	pre H2O					post H2O				
	2-Nov-05	3-Nov-05	4-Nov-05	7-Nov-05	8-Nov-05	9-Nov-05				
<b>2mm Group</b>										
Sample	1	2	3	4	5					
Start weight	0.2297	0.2266	0.2326	0.2339	0.2357	Floss total	2	0.2185	0.2178	0.2178
Floss Weight	0.009	0.0086	0.0084	0.0077	0.0083	0.042	3	0.2166	0.2157	0.2157
W1 (start-floss)	0.2207	0.218	0.2242	0.2262	0.2274		4	0.222	0.2212	0.2212
Final constant weight	0.2178	0.2157	0.2213	0.2212	0.2237		5	0.2221	0.2212	0.2212
Floss Weight	0.009	0.0086	0.0084	0.0077	0.0083	Wt-floss		0.2357	0.2359	0.2357
W2 (final-floss)	0.2088	0.2071	0.2129	0.2135	0.2154			1.1165	1.1188	1.0576
						Mean		0.2233	0.22376	0.21152
						sd		0.0035937	0.0037806	0.0031571
<b>% SOLUBILITY</b>	<b>5.39</b>	<b>5.00</b>	<b>5.04</b>	<b>5.61</b>	<b>5.28</b>	<b>Mean solubility</b>		<b>5.26</b>	<b>5.26</b>	<b>0.25</b>
<b>3mm Group</b>										
Sample	1	2	3	4	5					
Start weight	0.2642	0.327	0.3318	0.3232	0.3506	Floss total	2	0.2525	0.2513	0.2513
Floss Weight	0.0093	0.0081	0.0082	0.0077	0.0066	0.0399	3	0.3135	0.3116	0.3114
W1 (start-floss)	0.2549	0.3189	0.3236	0.3155	0.344		4	0.3318	0.3322	0.3145
Final constant weight	0.2513	0.3114	0.3145	0.3093	0.3348		5	0.3232	0.324	0.3094
Floss Weight	0.0093	0.0081	0.0082	0.0077	0.0066	Wt - floss		0.3506	0.3527	0.3349
W2 (final-floss)	0.242	0.3033	0.3063	0.3016	0.3282			1.5569	1.5632	1.4818
						Mean		0.31138	0.31264	0.2978
						sd		0.0325823	0.0329464	0.0314299
<b>% SOLUBILITY</b>	<b>5.06</b>	<b>4.89</b>	<b>5.35</b>	<b>4.41</b>	<b>4.59</b>	<b>Mean solubility</b>		<b>4.86</b>	<b>4.86</b>	<b>0.37</b>
<b>4mm Group</b>										
Sample	1	2	3	4	5					
Start weight	0.4623	0.4256	0.4255	0.435	0.438	Floss total	2	0.4418	0.4396	0.4393
Floss Weight	0.0087	0.0076	0.0071	0.0077	0.0075	0.0386	3	0.4065	0.4048	0.4046
W1 (start-floss)	0.4536	0.418	0.4184	0.4273	0.4305		4	0.4255	0.4259	0.4051
Final constant weight	0.439	0.4045	0.4046	0.4116	0.4167		5	0.435	0.4344	0.4121
Floss Weight	0.0087	0.0076	0.0071	0.0077	0.0075	Wt-floss		0.438	0.4389	0.4171
W2 (final-floss)	0.4303	0.3969	0.3975	0.4039	0.4092			2.1478	2.1489	2.0501
						Mean		0.42956	0.42978	0.41002
						sd		0.0150575	0.0149451	0.0144171
<b>% SOLUBILITY</b>	<b>5.14</b>	<b>5.05</b>	<b>5.00</b>	<b>5.48</b>	<b>4.95</b>	<b>Mean solubility</b>		<b>5.12</b>	<b>5.12</b>	<b>0.21</b>
<b>5mm Group</b>										
Sample	1	2	3	4	5					
Start weight	0.5636	0.5327	0.4998	0.5031	0.5183	Floss total	2	0.5413	0.5379	0.5376
Floss Weight	0.0065	0.0077	0.0078	0.0079	0.0078	0.0377	3	0.5093	0.5066	0.5062
W1 (start-floss)	0.5571	0.525	0.492	0.4952	0.5105		4	0.4998	0.5042	0.4739
Final constant weight	0.5376	0.5062	0.4736	0.48	0.489		5	0.5031	0.5025	0.4804
Floss Weight	0.0065	0.0077	0.0078	0.0079	0.0078	Wt-floss		0.5183	0.516	0.4892
W2 (final-floss)	0.5311	0.4985	0.4658	0.4721	0.4812			2.5798	2.5856	2.4504
						Mean		0.51596	0.51712	0.49284
						sd		0.0259689	0.0267267	0.0259978
<b>% SOLUBILITY</b>	<b>4.67</b>	<b>5.05</b>	<b>5.33</b>	<b>4.66</b>	<b>5.74</b>	<b>Mean solubility</b>		<b>5.09</b>	<b>5.09</b>	<b>0.46</b>

**APPENDIX B**

**HARDNESS TESTING DATA**

**Table 94. Vitremer 24-Hour Hardness (KHN)**

Vitremer 24 Hour Hardness										
<b>2mm</b>										
	1	2	3	4	5					
top	29.8	24.8	22.9	24.7	25.0	avg	24.5	st dev	0.4	% bottom/top
	29.1	24.5	24.3	25.2	25.9		24.5			
avg	27.2	23.3	25.5	22.4	25.6	st dev	0.4	0.4	94.28766	
	28.7	24.2	24.2	24.1	25.5					
st dev	1.3	0.8	1.3	1.5	0.5					
	1	2	3	4	5					
bottom	25.5	21.3	22.1	24.1	23.1	avg	23.1	st dev	0.3	% bottom/top
	24.7	23.0	22.8	23.9	24.9		23.1			
avg	25.5	20.8	23.5	22.4	25.4	st dev	0.3	0.3	94.28766	
	25.2	21.7	22.8	23.5	24.5					
st dev	0.5	1.2	0.7	0.9	1.2					
<b>3mm</b>										
	1	2	3	4	5					
top	25.2	26.4	26.4	24.8	24.6	avg	24.9	st dev	0.3	% bottom/top
	28.0	24.6	24.0	24.6	23.6		24.9			
avg	26.4	26.0	24.4	26.2	22.9	st dev	0.3	0.3	91.12228	
	26.5	25.7	24.9	25.2	23.7					
st dev	1.4	0.9	1.3	0.9	0.9					
	1	2	3	4	5					
bottom	23.7	23.8	22.0	24.3	22.0	avg	22.7	st dev	0.4	% bottom/top
	22.9	21.4	24.0	21.9	20.0		22.7			
avg	23.6	23.6	23.3	23.0	22.7	st dev	0.4	0.4	91.12228	
	23.4	22.9	23.1	23.1	21.6					
st dev	0.4	1.3	1.0	1.2	1.4					
<b>4mm</b>										
	1	2	3	4	5					
top	26.9	23.7	25.4	25.8	22.9	avg	23.9	st dev	0.4	% bottom/top
	25.3	23.0	23.8	23.9	22.2		23.9			
avg	26.0	24.8	25.5	22.8	22.4	st dev	0.4	0.4	85.884	
	26.1	23.8	24.9	24.2	22.5					
st dev	0.8	0.9	1.0	1.5	0.4					
	1	2	3	4	5					
bottom	21.8	24.2	21.6	19.1	17.9	avg	20.5	st dev	0.7	% bottom/top
	20.3	21.8	19.4	22.7	18.2		20.5			
avg	20.7	20.8	20.3	22.1	17.7	st dev	0.7	0.7	85.884	
	20.9	22.3	20.4	21.3	17.9					
st dev	0.8	1.7	1.1	1.9	0.3					
<b>5mm</b>										
	1	2	3	4	5					
top	25.8	22.9	26.2	23.2	23.9	avg	24.1	st dev	0.6	% bottom/top
	22.8	23.0	26.0	23.4	22.1		24.1			
avg	25.9	24.1	25.2	24.2	24.7	st dev	0.6	0.6	70.88958	
	24.8	23.3	25.8	23.6	23.6					
st dev	1.8	0.7	0.5	0.5	1.3					
	1	2	3	4	5					
bottom	20.7	14.8	20.6	13.6	17.7	avg	17.1	st dev	0.6	% bottom/top
	17.5	13.3	21.4	13.9	19.4		17.1			
avg	17.6	16.4	19.8	14.0	19.9	st dev	0.6	0.6	70.88958	
	18.6	14.8	20.6	13.8	19.0					
st dev	1.8	1.6	0.8	0.2	1.2					

**Table 95. Vitremer One-Week Hardness (KHN)**

Vitremer 1 Week Hardness										
<b>2mm</b>										
	1	2	3	4	5					
	22.9	22.6	23.0	22.4	23.1					
top	22.7	22.5	21.0	22.7	21.9	avg	22.4			
	22.3	23.3	22.4	22.0	22.4	st dev	0.3			
avg	22.6	22.8	22.1	22.4	22.5					
st dev	0.3	0.4	1.0	0.4	0.6				% bottom/top	88.8
	1	2	3	4	5					
	20.0	19.4	19.9	19.1	19.4					
bottom	19.9	20.0	20.5	19.8	19.7	avg	19.9			
	20.1	20.7	20.0	20.0	20.7	st dev	0.2			
avg	20.0	20.0	20.1	19.6	19.9					
st dev	0.1	0.7	0.3	0.5	0.7					
<b>3mm</b>										
	1	2	3	4	5					
	22.9	21.4	22.8	21.6	22.4					
top	22.4	22.2	21.6	22.1	23.4	avg	22.4			
	22.7	22.5	23.8	23.1	22.3	st dev	0.3			
avg	22.7	22.0	22.7	22.3	22.7					
st dev	0.3	0.6	1.1	0.8	0.6				% bottom/top	80.1
	1	2	3	4	5					
	18.7	18.4	18.7	18.6	18.5					
bottom	17.3	16.9	19.1	17.7	17.8	avg	18.0			
	17.6	16.9	17.8	17.9	17.2	st dev	0.1			
avg	17.9	17.4	18.5	18.1	17.8					
st dev	0.7	0.9	0.7	0.5	0.7					
<b>4mm</b>										
	1	2	3	4	5					
	22.0	22.3	22.5	22.0	22.2					
top	22.9	22.2	21.8	22.1	22.7	avg	22.1			
	21.8	21.0	22.1	22.4	21.5	st dev	0.2			
avg	22.2	21.8	22.1	22.2	22.1					
st dev	0.6	0.7	0.4	0.2	0.6				% bottom/top	78.4
	1	2	3	4	5					
	17.0	17.2	18.3	17.8	18.0					
bottom	16.5	16.9	17.6	16.9	17.3	avg	17.3			
	16.5	16.8	17.0	16.7	17.1	st dev	0.2			
avg	16.7	17.0	17.6	17.1	17.5					
st dev	0.3	0.2	0.7	0.6	0.5					
<b>5mm</b>										
	1	2	3	4	5					
	22.5	22.3	22.7	22.8	23.1					
top	22.9	23.5	23.7	22.2	22.1	avg	22.8			
	22.4	22.1	22.4	23.5	22.6	st dev	0.2			
avg	22.6	22.6	22.9	22.8	22.6					
st dev	0.3	0.8	0.7	0.7	0.5				% bottom/top	67.6
	1	2	3	4	5					
	15.4	15.0	15.2	15.6	16.0					
bottom	14.3	14.5	14.4	15.8	15.8	avg	15.4			
	16.0	16.1	15.8	15.2	15.1	st dev	0.2			
avg	15.2	15.2	15.1	15.5	15.6					
st dev	0.9	0.8	0.7	0.3	0.5					

**Table 96. Vitremer One-Month Hardness (KHN)**

Vitremer 1 Month Hardness									
<b>2mm</b>									
	1	2	3	4	5				
top	25.5	28.0	27.3	26.7	27.2	avg	27.1	0.4	
	25.8	25.8	26.2	27.1	26.3				
avg	25.4	28.3	26.1	28.2	28.2	st dev			
	25.6	27.4	26.5	27.3	27.2				
st dev	0.2	1.4	0.7	0.8	1.0				% bottom/top
									89.92
	1	2	3	4	5				
bottom	23.8	25.3	25.4	24.6	25.5	avg	24.4	0.4	
	22.1	24.2	23.1	25.3	23.3				
avg	22.7	24.4	23.0	25.1	23.4	st dev			
	22.9	24.6	23.8	25.0	24.1				
st dev	0.9	0.6	1.4	0.4	1.2				
<b>3mm</b>									
	1	2	3	4	5				
top	28.0	27.9	25.1	27.6	27.0	avg	26.7	0.3	
	27.1	26.9	27.4	26.1	27.3				
avg	26.3	26.6	26.8	27.0	24.7	st dev			
	27.1	27.1	26.4	26.9	26.3				
st dev	0.9	0.7	1.2	0.8	1.4				% bottom/top
									89.45
	1	2	3	4	5				
bottom	24.4	24.3	22.8	23.8	25.9	avg	23.9	0.6	
	24.3	25.1	23.1	22.6	23.7				
avg	24.5	23.5	22.5	25.5	23.8	st dev			
	24.4	24.3	22.8	24.0	24.5				
st dev	0.1	0.8	0.3	1.5	1.2				
<b>4mm</b>									
	1	2	3	4	5				
top	27.8	27.7	28.4	27.8	26.4	avg	27.7	0.4	
	27.1	28.1	28.8	28.2	26.1				
avg	28.2	26.8	28.1	27.6	28.5	st dev			
	27.7	27.5	28.4	27.9	27.0				
st dev	0.6	0.7	0.4	0.3	1.3				% bottom/top
									77.26
	1	2	3	4	5				
bottom	21.3	21.2	21.4	22.3	22.8	avg	21.4	0.2	
	22.3	21.3	22.7	21.1	21.2				
avg	20.4	19.5	21.3	21.3	20.8	st dev			
	21.3	20.7	21.8	21.6	21.6				
st dev	1.0	1.0	0.8	0.6	1.1				
<b>5mm</b>									
	1	2	3	4	5				
top	28.5	28.8	27.6	27.7	27.9	avg	27.8	0.5	
	27.8	28.5	26.1	28.1	27.3				
avg	27.4	26.2	28.3	28.1	28.8	st dev			
	27.9	27.8	27.3	28.0	28.0				
st dev	0.6	1.4	1.1	0.2	0.8				% bottom/top
									66.50
	1	2	3	4	5				
bottom	17.4	17.9	18.3	19.2	17.5	avg	18.5	0.2	
	19.2	19.2	18.1	18.6	18.8				
avg	18.2	18.9	19.0	18.4	17.8	st dev			
	18.3	18.7	18.5	18.7	18.0				
st dev	0.9	0.7	0.5	0.4	0.7				

**Table 97. Vitremer Three-Month Hardness (KHN)**

Vitremer 3 Month Hardness										
<b>2mm</b>										
	1	2	3	4	5					
	27.5	26.9	29.5	25.6	27.4					
top	28.0	26.8	28.7	26.9	26.0	avg	27.1			
	25.6	27.1	27.0	27.2	25.7	st dev	0.5			
avg	27.0	26.9	28.4	26.6	26.4					
st dev	1.3	0.2	1.3	0.9	0.9				% bottom/top	91.81034
	1	2	3	4	5					
	28.0	24.0	24.6	25.4	26.9					
bottom	25.9	26.8	22.6	25.4	23.3	avg	24.9			
	26.6	25.3	23.0	25.2	25.7	st dev	0.6			
avg	26.8	25.4	23.4	25.3	25.3					
st dev	1.1	1.4	1.1	0.1	1.8					
<b>3mm</b>										
	1	2	3	4	5					
	26.8	22.4	22.4	24.7	23.4					
top	26.9	25.0	22.8	22.8	23.3	avg	23.3			
	28.5	26.2	21.3	23.4	21.7	st dev	0.5			
avg	27.4	24.5	22.2	23.6	22.8					
st dev	1.0	1.9	0.8	1.0	1.0				% bottom/top	85.89835
	1	2	3	4	5					
	22.7	18.5	19.2	19.3	19.1					
bottom	24.5	21.0	20.2	20.3	19.7	avg	20.0			
	25.0	21.4	21.6	20.5	19.2	st dev	0.5			
avg	24.1	20.3	20.3	20.0	19.3					
st dev	1.2	1.6	1.2	0.6	0.3					
<b>4mm</b>										
	1	2	3	4	5					
	23.6	15.9	25.1	20.3	26.1					
top	22.6	16.1	24.3	20.7	25.7	avg	21.7			
	22.3	17.8	23.3	21.6	23.1	st dev	0.4			
avg	22.8	16.6	24.2	20.9	25.0					
st dev	0.7	1.0	0.9	0.7	1.6				% bottom/top	76.57692
	1	2	3	4	5					
	20.9	13.5	18.6	17.6	16.0					
bottom	19.9	14.0	17.5	17.3	16.4	avg	16.6			
	20.7	15.3	18.1	18.0	16.8	st dev	0.2			
avg	20.5	14.3	18.1	17.6	16.4					
st dev	0.5	0.9	0.6	0.4	0.4					
<b>5mm</b>										
	1	2	3	4	5					
	26.0	25.0	25.2	22.8	24.0					
top	24.7	24.9	25.0	24.1	23.1	avg	24.5			
	25.4	25.1	27.1	24.0	23.3	st dev	0.4			
avg	25.4	25.0	25.8	23.6	23.5					
st dev	0.7	0.1	1.2	0.7	0.5				% bottom/top	68.46049
	1	2	3	4	5					
	14.9	18.4	16.0	18.1	16.2					
bottom	14.4	15.2	16.9	18.1	15.8	avg	16.8			
	16.6	17.3	15.7	16.6	16.7	st dev	0.5			
avg	15.3	17.0	16.2	17.6	16.2					
st dev	1.2	1.6	0.6	0.9	0.5					

**Table 98. Fuji II LC 24-Hour Hardness (KHN)**

FUJI II LC 24 HOUR HARDNESS										
<b>2mm</b>										
	1	2	3	4	5					
	21.3	20.4	21.0	20.1	21.0					
top	22.2	21.4	20.5	21.8	21.3	avg	20.8			
	20.3	21.0	19.7	21.1	20.7	st dev	0.3			
avg	21.3	20.9	20.4	21.0	21.0					
st dev	1.0	0.5	0.7	0.9	0.3				% bottom/top	88.2
	1	2	3	4	5					
	19.0	18.0	17.9	17.7	18.6					
bottom	17.9	18.7	18.9	17.3	18.5	avg	18.4			
	19.8	19.2	18.4	18.6	18.8	st dev	0.3			
avg	18.9	18.6	18.4	17.9	18.6					
st dev	1.0	0.6	0.5	0.7	0.2					
<b>3mm</b>										
	1	2	3	4	5					
	19.5	19.9	20.8	19.5	19.6					
top	19.8	20.0	21.2	21.1	21.3	avg	20.4			
	20.1	20.5	19.9	20.3	20.5	st dev	0.3			
avg	19.8	20.1	20.6	20.3	20.5					
st dev	0.3	0.3	0.7	0.8	0.9				% bottom/top	74.7
	1	2	3	4	5					
	14.9	14.6	14.8	15.8	14.6					
bottom	14.4	15.5	15.4	15.2	15.9	avg	15.2			
	15.1	15.3	15.6	15.7	14.3	st dev	0.2			
avg	14.8	15.1	15.3	15.6	14.9					
st dev	0.4	0.5	0.4	0.3	0.9					
<b>4mm</b>										
	1	2	3	4	5					
	19.8	19.6	20.0	19.4	21.1					
top	20.1	20.5	19.3	20.5	21.2	avg	20.2			
	21.2	20.8	19.8	19.7	20.2	st dev	0.1			
avg	20.4	20.3	19.7	19.9	20.8					
st dev	0.7	0.6	0.4	0.6	0.6				% bottom/top	57.7
	1	2	3	4	5					
	9.5	13.6	9.9	11.9	12.5					
bottom	9.4	12.4	11.8	11.4	10.3	avg	11.6			
	10.6	13.5	11.3	10.8	10.2	st dev	0.3			
avg	9.8	13.2	11.0	11.4	11.0					
st dev	0.7	0.7	1.0	0.6	1.3					
<b>5mm</b>										
	1	2	3	4	5					
	20.7	20.2	20.3	21.7	20.7					
top	21.8	19.6	20.6	20.0	20.5	avg	20.2			
	21.0	19.8	19.8	19.7	19.9	st dev	0.3			
avg	21.2	19.9	20.2	20.5	20.4					
st dev	0.6	0.3	0.4	1.1	0.4				% bottom/top	47.8
	1	2	3	4	5					
	10.9	8.7	10.2	9.2	9.7					
bottom	9.3	10.8	10.0	9.6	9.6	avg	9.7			
	9.7	10.1	9.1	9.2	9.9	st dev	0.4			
avg	10.0	9.9	9.7	9.3	9.7					
st dev	0.8	1.0	0.6	0.2	0.2					

**Table 99. Fuji II LC One-Week Hardness (KHN)**

FUJI II LC 1 Week Hardness										
<b>2mm</b>										
	1	2	3	4	5					
	20.9	21.5	21.6	20.7	20.0					
top	19.3	22.0	19.8	22.0	19.5	avg	20.7			
	20.7	22.2	19.3	20.3	19.1	st dev	0.3			
avg	20.3	21.9	20.2	21.0	19.5					
st dev	0.9	0.4	1.2	0.9	0.5				% bottom/top	90.77
	1	2	3	4	5					
	20.8	20.7	19.1	17.0	21.7					
bottom	20.7	19.3	18.9	16.4	18.3	avg	18.8			
	19.2	19.2	19.8	15.7	19.0	st dev	0.5			
avg	20.2	19.7	19.3	16.4	19.7					
st dev	0.9	0.8	0.5	0.7	1.8					
<b>3mm</b>										
	1	2	3	4	5					
	20.5	20.1	19.9	21.3	20.6					
top	21.9	20.2	20.6	21.2	21.1	avg	20.6			
	22.0	20.1	20.9	20.2	20.7	st dev	0.3			
avg	21.5	20.1	20.5	20.9	20.8					
st dev	0.8	0.1	0.5	0.6	0.3				% bottom/top	88.50
	1	2	3	4	5					
	18.0	17.6	17.9	19.4	18.0					
bottom	19.8	18.0	17.7	19.6	17.1	avg	18.2			
	19.3	18.6	18.1	18.3	18.2	st dev	0.3			
avg	19.0	18.1	17.9	19.1	17.8					
st dev	0.9	0.5	0.2	0.7	0.6					
<b>4mm</b>										
	1	2	3	4	5					
	19.8	20.1	20.0	20.9	22.6					
top	21.0	21.2	21.6	21.0	22.5	avg	21.3			
	21.9	21.0	21.4	20.7	22.0	st dev	0.4			
avg	20.9	20.8	21.0	20.9	22.4					
st dev	1.1	0.6	0.9	0.2	0.3				% bottom/top	72.59
	1	2	3	4	5					
	14.1	13.8	14.5	15.7	15.8					
bottom	14.4	16.1	15.9	15.6	13.9	avg	15.4			
	15.5	16.6	15.0	14.8	17.4	st dev	0.6			
avg	14.7	15.5	15.1	15.4	15.7					
st dev	0.7	1.5	0.7	0.5	1.8					
<b>5mm</b>										
	1	2	3	4	5					
	20.9	22.1	21.6	20.3	22.2					
top	21.4	22.2	21.4	20.0	21.8	avg	21.3			
	20.6	22.6	20.3	19.5	21.8	st dev	0.2			
avg	21.0	22.3	21.1	19.9	21.9					
st dev	0.4	0.3	0.7	0.4	0.2				% bottom/top	60.24
	1	2	3	4	5					
	12.5	11.9	13.7	13.0	13.1					
bottom	12.2	12.4	13.2	11.9	13.4	avg	12.8			
	12.4	12.0	11.4	13.9	14.2	st dev	0.5			
avg	12.4	12.1	12.8	12.9	13.6					
st dev	0.2	0.3	1.2	1.0	0.6					

**Table 100. Fuji II LC One-Month Hardness (KHN)**

FUJI II LC 1 Month Hardness										
<b>2mm</b>										
	1	2	3	4	5					
	18.7	18.9	19.0	18.8	21.2					
top	19.3	21.3	18.8	20.3	21.1	avg	20.0			
	19.0	20.7	19.3	21.2	19.9	st dev	0.5			
avg	19.0	20.3	19.0	20.1	20.7					
st dev	0.3	1.2	0.3	1.2	0.7				% bottom/top	90.94
	1	2	3	4	5					
	17.2	17.3	19.0	18.2	18.5					
bottom	17.5	17.5	17.9	18.3	18.8	avg	18.2			
	17.5	18.5	17.3	18.7	18.7	st dev	0.3			
avg	17.4	17.8	18.1	18.4	18.7					
st dev	0.2	0.6	0.9	0.3	0.2					
<b>3mm</b>										
	1	2	3	4	5					
	20.3	19.2	21.8	22.4	20.4					
top	20.6	19.4	20.5	19.3	19.8	avg	20.1			
	21.0	18.5	19.2	20.9	20.3	st dev	0.6			
avg	20.6	19.0	20.5	20.9	20.2					
st dev	0.4	0.5	1.3	1.6	0.3				% bottom/top	82.91
	1	2	3	4	5					
	17.0	17.1	16.0	17.8	15.8					
bottom	16.3	16.5	15.7	17.9	16.5	avg	16.7			
	17.5	16.7	16.2	17.3	16.9	st dev	0.2			
avg	16.9	16.8	16.0	17.7	16.4					
st dev	0.6	0.3	0.3	0.3	0.6					
<b>4mm</b>										
	1	2	3	4	5					
	20.5	20.8	18.8	20.1	19.2					
top	20.9	19.8	18.6	20.9	19.0	avg	19.6			
	18.3	18.7	18.0	19.9	21.2	st dev	0.4			
avg	19.9	19.8	18.5	20.3	19.8					
st dev	1.4	1.1	0.4	0.5	1.2				% bottom/top	60.49
	1	2	3	4	5					
	14.4	12.2	12.3	11.2	11.1					
bottom	12.5	12.3	11.8	12.7	11.0	avg	11.8			
	15.1	13.2	11.9	9.9	12.5	st dev	0.5			
avg	14.0	12.6	12.0	11.3	11.5					
st dev	1.3	0.6	0.3	1.4	0.8					
<b>5mm</b>										
	1	2	3	4	5					
	20.8	20.2	20.0	19.9	20.2					
top	19.2	18.0	20.3	20.9	20.5	avg	20.1			
	20.5	20.0	19.9	21.8	19.9	st dev	0.4			
avg	20.2	19.4	20.1	20.9	20.2					
st dev	0.9	1.2	0.2	1.0	0.3				% bottom/top	54.23
	1	2	3	4	5					
	9.1	10.0	11.9	9.4	11.5					
bottom	9.7	11.0	9.9	9.7	11.6	avg	10.9			
	9.8	11.4	12.1	10.0	12.6	st dev	0.4			
avg	9.5	10.8	11.3	9.7	11.9					
st dev	0.4	0.7	1.2	0.3	0.6					

**Table 101. Fuji II LC Three-Month Hardness (KHN)**

FUJI II LC 3 Month Hardness										
<b>2mm</b>										
	1	2	3	4	5					
	20.3	20.7	22.3	21.7	20.9					
top	20.4	19.6	20.7	18.0	18.3	avg	20.6			
	21.1	20.1	21.5	23.7	20.2	st dev	1.0			
avg	20.6	20.1	21.5	21.1	19.8					
st dev	0.4	0.6	0.8	2.9	1.3				% bottom/top	90.23
	1	2	3	4	5					
	19.8	18.9	18.4	18.3	18.1					
bottom	19.7	17.1	18.4	19.8	18.9	avg	18.6			
	19.5	19.9	17.5	20.5	17.7	st dev	0.5			
avg	19.7	18.6	18.1	19.5	18.2					
st dev	0.2	1.4	0.5	1.1	0.6					
<b>3mm</b>										
	1	2	3	4	5					
	20.3	21.3	21.4	20.5	20.5					
top	21.4	20.5	21.0	20.2	20.2	avg	20.6			
	21.3	20.1	22.2	19.7	19.7	st dev	0.1			
avg	21.0	20.6	21.5	20.1	20.1					
st dev	0.6	0.6	0.6	0.4	0.4				% bottom/top	94.18
	1	2	3	4	5					
	19.7	19.3	19.6	19.1	19.1					
bottom	19.3	19.6	19.5	19.3	19.3	avg	19.4			
	19.6	19.2	20.1	19.4	19.4	st dev	0.1			
avg	19.5	19.4	19.7	19.3	19.3					
st dev	0.2	0.2	0.3	0.2	0.2					
<b>4mm</b>										
	1	2	3	4	5					
	20.3	20.6	22.8	20.0	20.2					
top	21.9	21.8	20.5	20.5	21.4	avg	21.3			
	22.2	22.0	23.3	21.9	20.9	st dev	0.3			
avg	21.5	21.5	22.2	20.8	20.8					
st dev	1.0	0.8	1.5	1.0	0.6				% bottom/top	61.43
	1	2	3	4	5					
	13.3	15.9	14.4	13.4	12.2					
bottom	13.8	13.8	15.4	11.1	11.8	avg	13.1			
	15.2	13.0	15.5	10.1	10.6	st dev	0.5			
avg	14.1	14.2	15.1	11.5	11.5					
st dev	1.0	1.5	0.6	1.7	0.8					
<b>5mm</b>										
	1	2	3	4	5					
	22.0	20.8	20.4	20.0	22.4					
top	21.6	20.7	21.0	20.4	21.8	avg	21.0			
	21.0	22.1	20.2	20.4	21.2	st dev	0.2			
avg	21.5	21.2	20.5	20.3	21.8					
st dev	0.5	0.8	0.4	0.2	0.6				% bottom/top	50.62
	1	2	3	4	5					
	11.9	11.3	10.9	9.8	9.1					
bottom	10.3	9.4	11.0	12.8	10.5	avg	10.6			
	12.8	10.4	10.0	11.3	10.8	st dev	0.4			
avg	11.7	10.4	10.6	11.3	10.1					
st dev	1.3	0.9	0.6	1.5	0.9					

Table 102. Photac-Fil Quick 24-Hour Hardness (KHN)

Photac-Fil Quick 24 Hour Hardness										
<b>2mm</b>										
	1	2	3	4	5					
	11.8	11.3	12.8	11.0	11.9					
top	11.6	10.1	12.3	12.7	11.6	avg	11.5			
	12.2	11.0	11.0	10.6	11.5	st dev	0.4			
avg	11.9	10.8	12.0	11.4	11.7					
st dev	0.3	0.6	0.9	1.1	0.2				% bottom/top	81.7
	1	2	3	4	5					
	9.8	9.0	10.3	8.7	7.8					
bottom	10.8	8.9	11.2	10.3	9.3	avg	9.4			
	10.4	9.5	10.1	9.1	8.5	st dev	0.2			
avg	10.3	9.1	10.5	9.4	8.5					
st dev	0.5	0.3	0.6	0.8	0.7					
<b>3mm</b>										
	1	2	3	4	5					
	11.6	13.1	12.6	11.9	10.4					
top	13.3	12.4	11.7	10.9	10.1	avg	11.6			
	12.2	10.9	12.7	12.5	10.2	st dev	0.4			
avg	12.4	12.1	12.3	11.8	10.2					
st dev	0.9	1.1	0.6	0.8	0.2				% bottom/top	79.0
	1	2	3	4	5					
	9.7	9.2	8.7	9.0	8.0					
bottom	10.0	8.5	9.9	8.3	9.4	avg	9.2			
	8.7	9.8	10.0	9.6	9.8	st dev	0.1			
avg	9.5	9.2	9.6	8.9	9.1					
st dev	0.7	0.7	0.7	0.7	0.9					
<b>4mm</b>										
	1	2	3	4	5					
	13.4	12.7	11.6	11.1	11.8					
top	12.4	12.9	10.7	12.7	12.8	avg	12.0			
	12.4	13.5	10.6	11.1	12.1	st dev	0.2			
avg	12.7	13.0	11.0	11.6	12.2					
st dev	0.6	0.4	0.6	0.9	0.5				% bottom/top	70.0
	1	2	3	4	5					
	7.6	8.2	7.4	8.1	8.9					
bottom	10.1	9.3	8.1	8.0	8.4	avg	8.4			
	10.4	8.6	7.7	8.6	9.3	st dev	0.5			
avg	9.4	8.7	7.7	8.2	8.9					
st dev	1.5	0.6	0.4	0.3	0.4					
<b>5mm</b>										
	1	2	3	4	5					
	11.7	12.5	12.6	10.7	12.0					
top	11.4	11.2	12.7	10.7	12.4	avg	11.6			
	13.2	11.4	11.9	9.2	11.6	st dev	0.3			
avg	12.1	11.7	12.4	10.2	12.0					
st dev	1.0	0.7	0.4	0.9	0.4				% bottom/top	75.5
	1	2	3	4	5					
	9.5	8.8	8.2	7.8	7.6					
bottom	8.0	10.4	9.1	9.6	7.7	avg	8.7			
	8.9	10.4	8.2	9.6	7.4	st dev	0.4			
avg	8.8	9.9	8.5	9.0	7.6					
st dev	0.8	0.9	0.5	1.1	0.2					

**Table 103. Photac-Fil Quick One-Week Hardness (KHN)**

Photac-Fil Quick 1 Week Hardness										
<b>2mm</b>										
	1	2	3	4	5					
	14.1	14.2	14.6	13.2	13.9					
top	13.8	12.5	14.4	13.5	14.2	avg	13.7			
	13.3	12.9	13.4	13.8	14.1	st dev	0.3			
avg	13.7	13.2	14.1	13.5	14.1					
st dev	0.4	0.9	0.6	0.3	0.2				% bottom/top	87.3
	1	2	3	4	5					
	12.5	12.7	12.1	11.4	11.8					
bottom	12.2	13.1	11.9	11.6	11.5	avg	12.0			
	12.3	11.9	12.0	11.9	11.9	st dev	0.2			
avg	12.3	12.6	12.0	11.6	11.7					
st dev	0.2	0.6	0.1	0.3	0.2					
<b>3mm</b>										
	1	2	3	4	5					
	13.9	13.7	14.2	14.5	13.4					
top	13.3	12.6	14.1	13.4	13.3	avg	13.6			
	12.6	12.6	13.6	13.3	13.9	st dev	0.2			
avg	13.3	13.0	14.0	13.7	13.5					
st dev	0.7	0.6	0.3	0.7	0.3				% bottom/top	83.3
	1	2	3	4	5					
	11.0	11.8	11.3	10.6	10.6					
bottom	10.4	11.9	11.9	11.0	11.2	avg	11.3			
	12.1	11.9	11.0	11.3	11.0	st dev	0.3			
avg	11.2	11.9	11.4	11.0	10.9					
st dev	0.9	0.1	0.5	0.4	0.3					
<b>4mm</b>										
	1	2	3	4	5					
	14.5	12.4	12.5	13.6	13.3					
top	13.9	12.8	11.7	13.3	13.1	avg	12.8			
	12.8	12.9	12.3	12.5	12.8	st dev	0.3			
avg	13.7	12.7	12.2	13.1	13.1					
st dev	0.9	0.3	0.4	0.6	0.3				% bottom/top	82.3
	1	2	3	4	5					
	10.6	9.6	10.5	10.6	11.2					
bottom	10.9	10.9	10.4	10.9	11.0	avg	10.5			
	10.3	10.2	10.2	10.5	10.1	st dev	0.2			
avg	10.6	10.2	10.4	10.7	10.8					
st dev	0.3	0.7	0.2	0.2	0.6					
<b>5mm</b>										
	1	2	3	4	5					
	12.9	13.0	13.0	12.3	12.5					
top	12.7	13.2	12.4	12.0	13.8	avg	12.7			
	13.4	12.9	12.1	12.5	12.8	st dev	0.2			
avg	13.0	13.0	12.5	12.3	13.0					
st dev	0.4	0.2	0.5	0.3	0.7				% bottom/top	80.4
	1	2	3	4	5					
	8.4	10.2	10.5	10.8	9.8					
bottom	9.4	10.8	9.4	10.1	10.6	avg	10.2			
	8.5	10.3	10.0	9.9	10.3	st dev	0.1			
avg	8.7	10.4	10.0	10.3	10.2					
st dev	0.5	0.3	0.6	0.5	0.4					

**Table 104. Photac-Fil Quick One-Month Hardness (KHN)**

Photac-Fil Quick 1 Month Hardness											
<b>2mm</b>											
	1	2	3	4	5						
top	20.1	17.1	18.2	19.2	17.8	avg	17.5	st dev	0.5	% bottom/top	
	17.0	17.4	18.0	17.7	16.4						
avg	17.0	16.4	17.2	17.5	17.6	18.0	17.0	17.8	18.1		17.3
	18.0	17.0	17.8	18.1	17.3						
st dev	1.8	0.5	0.5	0.9	0.8						
	1	2	3	4	5						
bottom	16.1	17.2	16.9	16.3	16.2	avg	16.3	st dev	0.1		92.9
	16.1	16.5	16.4	15.8	15.6						
avg	15.6	16.5	16.5	15.9	15.8	15.9	16.7	16.6	16.0		15.9
	15.9	16.7	16.6	16.0	15.9						
st dev	0.3	0.4	0.3	0.3	0.3						
<b>3mm</b>											
	1	2	3	4	5						
top	17.7	19.4	18.7	19.8	17.6	avg	18.1	st dev	0.6	% bottom/top	
	16.7	17.3	19.0	17.2	17.3						
avg	16.9	17.6	18.5	17.5	17.4	17.1	18.1	18.7	18.2		17.4
	17.1	18.1	18.7	18.2	17.4						
st dev	0.5	1.1	0.3	1.4	0.2						
	1	2	3	4	5						
bottom	15.4	16.7	15.8	15.7	15.9	avg	15.6	st dev	0.2		86.1
	15.1	15.8	15.0	14.9	15.2						
avg	15.2	16.8	14.9	14.8	15.6	15.2	16.4	15.2	15.1		15.6
	15.2	16.4	15.2	15.1	15.6						
st dev	0.2	0.6	0.5	0.5	0.4						
<b>4mm</b>											
	1	2	3	4	5						
top	18.7	19.1	18.6	18.9	19.0	avg	18.2	st dev	0.2	% bottom/top	
	18.0	17.9	18.8	18.8	17.2						
avg	17.6	18.3	17.1	17.5	17.5	18.1	18.4	18.2	18.4		17.9
	18.1	18.4	18.2	18.4	17.9						
st dev	0.6	0.6	0.9	0.8	1.0						
	1	2	3	4	5						
bottom	15.3	15.5	14.9	12.2	14.5	avg	14.5	st dev	0.4		79.7
	15.2	15.1	15.1	13.8	15.2						
avg	15.0	14.9	15.0	14.0	14.2	15.2	15.2	15.0	13.3		14.6
	15.2	15.2	15.0	13.3	14.6						
st dev	0.2	0.3	0.1	1.0	0.5						
<b>5mm</b>											
	1	2	3	4	5						
top	17.4	16.7	17.6	19.8	17.8	avg	17.9	st dev	0.6	% bottom/top	
	14.8	17.1	17.3	19.7	17.2						
avg	17.6	18.2	17.4	18.8	17.3	16.6	17.3	17.4	19.4		17.4
	16.6	17.3	17.4	19.4	17.4						
st dev	1.6	0.8	0.2	0.6	0.3						
	1	2	3	4	5						
bottom	10.9	9.7	10.4	13.5	10.4	avg	11.2	st dev	0.2		62.4
	9.0	10.3	10.9	13.7	10.8						
avg	9.7	10.4	11.3	12.7	10.0	9.9	10.1	10.9	13.3		10.4
	9.9	10.1	10.9	13.3	10.4						
st dev	1.0	0.4	0.5	0.5	0.4						

Table 105. Photac-Fil Quick Three-Month Hardness (KHN)

Photac-Fil Quick 3 Month Hardness										
<b>2mm</b>										
	1	2	3	4	5					
	18.4	17.9	17.5	16.8	19.2					
top	15.3	16.5	16.5	17.2	16.9	avg	17.0			
	16.9	15.4	16.3	17.8	16.5	st dev	0.5			
avg	16.9	16.6	16.8	17.3	17.5					
st dev	1.6	1.3	0.6	0.5	1.5				% bottom/top	90.56
	1	2	3	4	5					
	16.4	16.2	16.2	15.6	15.8					
bottom	15.9	14.9	16.1	15.2	15.2	avg	15.4			
	16.0	15.0	14.2	15.0	15.8	st dev	0.4			
avg	16.1	15.4	15.5	15.3	15.6					
st dev	0.3	0.7	1.1	0.3	0.3					
<b>3mm</b>										
	1	2	3	4	5					
	16.8	17.4	16.4	16.9	17.6					
top	17.0	16.0	17.0	16.6	16.9	avg	16.8			
	16.2	16.4	16.1	17.0	17.0	st dev	0.2			
avg	16.7	16.6	16.5	16.8	17.2					
st dev	0.4	0.7	0.5	0.2	0.4				% bottom/top	80.73
	1	2	3	4	5					
	13.4	14.2	13.3	11.2	13.9					
bottom	13.1	13.6	13.8	13.1	13.3	avg	13.5			
	14.3	13.4	14.0	14.5	14.2	st dev	0.5			
avg	13.6	13.7	13.7	12.9	13.8					
st dev	0.6	0.4	0.4	1.7	0.5					
<b>4mm</b>										
	1	2	3	4	5					
	17.2	16.9	16.0	17.0	17.6					
top	16.8	16.1	17.0	17.2	17.0	avg	16.9			
	16.4	16.6	16.8	16.9	17.4	st dev	0.1			
avg	16.8	16.5	16.6	17.0	17.3					
st dev	0.4	0.4	0.5	0.2	0.3				% bottom/top	66.37
	1	2	3	4	5					
	10.6	11.8	11.5	10.9	10.7					
bottom	10.8	11.8	11.4	11.5	10.1	avg	11.2			
	9.9	11.6	10.7	11.4	11.0	st dev	0.1			
avg	10.4	11.7	11.2	11.3	10.6					
st dev	0.5	0.1	0.4	0.3	0.5					
<b>5mm</b>										
	1	2	3	4	5					
	17.7	16.3	17.1	17.8	18.0					
top	17.8	16.7	17.7	18.0	16.2	avg	17.3			
	17.7	18.0	17.5	17.7	16.8	st dev	0.4			
avg	17.7	17.0	17.4	17.8	17.0					
st dev	0.1	0.9	0.3	0.2	0.9				% bottom/top	61.85
	1	2	3	4	5					
	11.2	11.3	10.9	9.9	12.2					
bottom	12.6	11.4	9.4	9.2	11.9	avg	10.7			
	11.0	10.9	10.1	10.2	11.2	st dev	0.2			
avg	11.6	11.2	10.1	9.7	11.8					
st dev	0.9	0.3	0.7	0.5	0.5					

**APPENDIX C**

**SPECIFIC HEAT**

**THERMAL ANALYSIS DATA**

Table 106. Vitremer Specific Heat Results (J/gC°)

Vitremer	Specific Heat Capacity		
<b>IMMEDIATE</b>			
<b>Sample</b>	<b>2mm</b>	<b>3mm</b>	<b>4mm</b>
1	1.2	1.09	0.97
2	1.31	1.08	0.95
3	1.19	1.09	0.94
4	1.2	1.03	0.91
5	1.17	1.02	1.01
<b>Mean</b>	<b>1.21</b>	<b>1.06</b>	<b>0.96</b>
<b>SD</b>	<b>0.06</b>	<b>0.03</b>	<b>0.04</b>
<b>24 Hours</b>			
<b>Sample</b>	<b>2mm</b>	<b>3mm</b>	<b>4mm</b>
1	1.26	0.99	1
2	1.32	1.01	0.96
3	1.26	1.12	0.77
4	1.1	1.07	0.95
5	1.17	1.05	0.93
<b>Mean</b>	<b>1.22</b>	<b>1.05</b>	<b>0.92</b>
<b>SD</b>	<b>0.09</b>	<b>0.05</b>	<b>0.09</b>
<b>1 WEEK</b>			
<b>Sample</b>	<b>2mm</b>	<b>3mm</b>	<b>4mm</b>
1	1.32	1.15	1.02
2	1.27	1.04	0.99
3	1.28	1.1	0.95
4	1.28	1.07	0.94
5	1.27	1.12	1
<b>Mean</b>	<b>1.28</b>	<b>1.10</b>	<b>0.98</b>
<b>SD</b>	<b>0.02</b>	<b>0.04</b>	<b>0.03</b>
<b>1 MONTH</b>			
<b>Sample</b>	<b>2mm</b>	<b>3mm</b>	<b>4mm</b>
1	1.25	1.11	1.09
2	1.24	1.09	1
3	1.24	1.15	1.07
4	1.29	1.12	0.99
5	1.26	1.14	
<b>Mean</b>	<b>1.26</b>	<b>1.12</b>	<b>1.04</b>
<b>SD</b>	<b>0.02</b>	<b>0.02</b>	<b>0.05</b>
<b>3 MONTHS</b>			
<b>Sample</b>	<b>2mm</b>	<b>3mm</b>	<b>4mm</b>
1	1.31	1.37	1.18
2	1.44	1.18	1.1
3	1.33	1.19	1.16
4	1.44	1.09	1.19
5	1.26	1.32	1.1
<b>Mean</b>	<b>1.36</b>	<b>1.23</b>	<b>1.15</b>
<b>SD</b>	<b>0.08</b>	<b>0.11</b>	<b>0.04</b>

Table 107. Fuji II LC Specific Heat Results (J/gC°)

FUJI II LC Specific Heat (J/gC°)			
<b>IMMEDIATE</b>			
<b>Sample</b>	<b>2mm</b>	<b>3mm</b>	<b>4mm</b>
1	1.03	0.94	0.84
2	1.02	0.96	0.78
3	1.02	0.94	0.83
4	1.06	0.89	0.86
5	1.05	0.92	0.82
<b>Mean</b>	<b>1.04</b>	<b>0.93</b>	<b>0.83</b>
<b>SD</b>	<b>0.02</b>	<b>0.03</b>	<b>0.03</b>
<b>24 Hours</b>			
<b>Sample</b>	<b>2mm</b>	<b>3mm</b>	<b>4mm</b>
1.00	1.21	0.98	0.89
2.00	1.20	0.95	0.93
3.00	1.19	1.00	0.92
4.00	1.23	0.97	0.92
5.00	1.21	0.97	0.91
<b>Mean</b>	<b>1.21</b>	<b>0.97</b>	<b>0.91</b>
<b>SD</b>	<b>0.01</b>	<b>0.02</b>	<b>0.02</b>
<b>1 WEEK</b>			
<b>Sample</b>	<b>2mm</b>	<b>3mm</b>	<b>4mm</b>
1.00	1.16	1.05	0.99
2.00	1.14	1.10	1.09
3.00	1.19	1.12	1.01
4.00	1.19	1.07	0.99
5.00	1.17	0.99	1.00
<b>Mean</b>	<b>1.17</b>	<b>1.07</b>	<b>1.02</b>
<b>SD</b>	<b>0.02</b>	<b>0.05</b>	<b>0.04</b>
<b>1 MONTH</b>			
<b>Sample</b>	<b>2mm</b>	<b>3mm</b>	<b>4mm</b>
1.00	1.24	0.98	0.92
2.00	1.13	0.98	0.99
3.00	1.22	0.95	0.97
4.00	1.03	0.92	0.97
5.00	1.18	1.00	0.95
<b>Mean</b>	<b>1.16</b>	<b>0.97</b>	<b>0.96</b>
<b>SD</b>	<b>0.08</b>	<b>0.03</b>	<b>0.03</b>
<b>3 MONTHS</b>			
<b>Sample</b>	<b>2mm</b>	<b>3mm</b>	<b>4mm</b>
1.00	1.16	0.96	0.98
2.00	0.77	1.02	1.00
3.00	1.01	1.01	0.87
4.00	1.16	0.96	0.99
5.00	1.14	0.99	0.99
<b>Mean</b>	<b>1.05</b>	<b>0.99</b>	<b>0.97</b>
<b>SD</b>	<b>0.17</b>	<b>0.03</b>	<b>0.05</b>

Table 108. Photac-Fil Quick Specific Heat Results (J/gC°)

Photac-Fil Quick Specific Heat (J/gC°)			
<b>IMMEDIATE</b>			
<b>Sample</b>	<b>2mm</b>	<b>3mm</b>	<b>4mm</b>
1	1.07	0.86	0.82
2	1.05	0.92	0.82
3	1.05	0.97	0.83
4	1.13	0.98	0.87
5	1.08	0.90	0.81
<b>Mean</b>	<b>1.08</b>	<b>0.93</b>	<b>0.83</b>
<b>SD</b>	<b>0.03</b>	<b>0.05</b>	<b>0.02</b>
<b>24 Hour</b>			
<b>Sample</b>	<b>2mm</b>	<b>3mm</b>	<b>4mm</b>
1	1.22	1.06	0.84
2	1.13	1.16	0.89
3	1.21	1.10	0.94
4	1.15	1.11	0.96
5	1.22	1.12	0.81
<b>Mean</b>	<b>1.19</b>	<b>1.11</b>	<b>0.89</b>
<b>SD</b>	<b>0.04</b>	<b>0.04</b>	<b>0.06</b>
<b>1 WEEK</b>			
<b>Sample</b>	<b>2mm</b>	<b>3mm</b>	<b>4mm</b>
1	1.05	0.98	0.93
2	1.11	0.94	0.90
3	0.84	0.92	0.99
4	1.13	0.92	0.96
5	1.13	0.90	0.96
<b>Mean</b>	<b>1.05</b>	<b>0.93</b>	<b>0.95</b>
<b>SD</b>	<b>0.12</b>	<b>0.03</b>	<b>0.03</b>
<b>1 MONTH</b>			
<b>Sample</b>	<b>2mm</b>	<b>3mm</b>	<b>4mm</b>
1	1.02	1.03	1.00
2	0.91	1.00	0.92
3	1.15	1.04	0.85
4	1.16	0.97	0.89
5	1.15	0.94	0.93
<b>Mean</b>	<b>1.08</b>	<b>1.00</b>	<b>0.92</b>
<b>SD</b>	<b>0.11</b>	<b>0.04</b>	<b>0.06</b>
<b>3 MONTHS</b>			
<b>Sample</b>	<b>2mm</b>	<b>3mm</b>	<b>4mm</b>
1	1.09	1.04	0.91
2	1.16	1.01	0.96
3	1.15	1.02	0.99
4	1.17	1.03	0.99
5	1.22	1.02	0.99
<b>Mean</b>	<b>1.16</b>	<b>1.02</b>	<b>0.97</b>
<b>SD</b>	<b>0.05</b>	<b>0.01</b>	<b>0.03</b>

## **APPENDIX D**

### **DIFFERENTIAL SCANNING CALORIMETRY THERMAL SCAN THERMAL ANALYSIS DATA**

Table 109. Vitremer DSC Thermal Scan Results (J/gm)

Vitremer	DSC SCAN THERMAL RESULTS (J/gm)					
<b>IMMEDIATE</b>						
Sample	2mm	Peak °C	3mm	Peak °C	4mm	Peak °C
1	-2.39	185.01	-50.82	158.18	-34.84	161.99
2	-4.14	174.58	-41.8	155.03	-41.85	154.25
3	-2.28	183.5	-43.72	156.53	-46.22	152.61
4	-3.22	186.56	-36.15	160.96	-56.11	150.67
5	-2.84	185.06	-31.43	158.44	-57.27	134.07
<b>Mean</b>	<b>-2.97</b>	<b>182.94</b>	<b>-40.78</b>	<b>157.83</b>	<b>-47.26</b>	<b>150.72</b>
<b>SD</b>	<b>0.75</b>	<b>4.80</b>	<b>6.62</b>	<b>1.99</b>	<b>8.52</b>	<b>9.17</b>
<b>24 hours</b>						
Sample	2mm	Peak °C	3mm	Peak °C	4mm	Peak °C
1	-37.07	109.86	-46.69	131.93	-55.45	136.78
2	-32.23	111.53	-40.52	126.43	-50.05	136.31
3	-29.1	107.43	-51.13	122.41	-65.67	130.87
4	-16	103.84	-51.89	125.85	-51.9	132.45
5	-22.54	107.43	-49.53	147.43	-51.86	131.2
<b>Mean</b>	<b>-27.39</b>	<b>108.02</b>	<b>-47.95</b>	<b>130.81</b>	<b>-54.99</b>	<b>133.52</b>
<b>SD</b>	<b>8.27</b>	<b>2.91</b>	<b>4.12</b>	<b>8.85</b>	<b>5.62</b>	<b>2.53</b>
<b>1 WEEK</b>						
Sample	2mm	Peak °C	3mm	Peak °C	4mm	Peak °C
1	-31.76	109.77	-61.78	140.55	-60.78	129.16
2	-45.33	115.54	-75.02	134.27	-81.63	133.28
3	-46.23	110.6	-66.01	141.35	-71.64	134.45
4	-45.97	106.48	-62.7	130.2	-57.48	133.62
5	-47.36	111.02	-55.38	126.41	-66.93	138.04
<b>Mean</b>	<b>-43.33</b>	<b>110.68</b>	<b>-64.18</b>	<b>134.56</b>	<b>-67.69</b>	<b>133.71</b>
<b>SD</b>	<b>6.51</b>	<b>3.25</b>	<b>6.42</b>	<b>5.79</b>	<b>8.51</b>	<b>2.84</b>
<b>1 MONTH</b>						
Sample	2mm	Peak °C	3mm	Peak °C	4mm	Peak °C
1	-51.94	117.9	-71.24	131.01	-114.45	132.95
2	-45.7	116.06	-83.89	133.48	-129.96	131.92
3	-54.02	114.22	-93.49	132	-92.74	132.16
4	-44.59	110.75	-101.74	132.7	-94.83	131
5	-52.34	114.24	-93.08	131.04	-85.27	129.4
<b>Mean</b>	<b>-49.72</b>	<b>114.63</b>	<b>-88.69</b>	<b>132.05</b>	<b>-103.45</b>	<b>131.49</b>
<b>SD</b>	<b>4.26</b>	<b>2.65</b>	<b>10.39</b>	<b>0.96</b>	<b>16.39</b>	<b>1.21</b>
<b>3 MONTHS</b>						
Sample	2mm	Peak °C	3mm	Peak °C	4mm	Peak °C
1	-102.52	122.7	-136.94	126.66	-130.69	126.83
2	-68.54	119.11	-112.35	131.37	-122.02	128.91
3	-98.17	126.63	-104.86	131.02	-143.73	126.06
4	-96.78	119.91	-79.61	129.56	-57.48	133.62
5	-84.15	119.34	-84.03	130.29	-66.93	138.04
<b>Mean</b>	<b>-90.03</b>	<b>121.54</b>	<b>-103.56</b>	<b>129.78</b>	<b>-104.17</b>	<b>130.69</b>
<b>SD</b>	<b>13.82</b>	<b>3.19</b>	<b>20.73</b>	<b>1.68</b>	<b>35.08</b>	<b>4.52</b>

Table 110. Fuji II LC DSC Thermal Scan Results (J/gm)

FUJI II LC DSC SCAN THERMAL RESULTS						
<b>IMMEDIATE</b>						
Sample	2mm	Peak °C	3mm	Peak °C	4mm	Peak °C
1	-24.21	183.01	-33.75	174.06	-32.96	164.06
2	-25.49	183.77	-37.29	175.15	-38.49	161.60
3	-24.06	180.83	-33.73	172.40	-31.34	163.00
4	-2.25	82.65	-26.34	180.42	-35.74	164.23
5	-0.85	81.89	-36.56	171.47	-33.86	165.17
Mean	-15.37	142.43	-33.53	174.70	-34.48	163.61
SD	12.64	54.93	3.88	3.13	2.46	1.22
<b>24 hours</b>						
Sample	2mm	Peak °C	3mm	Peak °C	4mm	Peak °C
1	-37.01	119.84	-23.58	128.37	-37.73	137.25
2	-38.71	117.39	-36.44	146.94	-40.58	143.85
3	-28.96	106.32	-40.21	151.56	-40.27	138.89
4	-41.75	142.42	-34.22	157.47	-32.74	143.35
5	-37.93	146.69	-38.80	149.04	-42.75	142.61
Mean	-36.87	126.53	-34.65	146.68	-38.81	141.19
SD	4.77	17.29	5.90	9.81	3.43	2.63
<b>1 WEEK</b>						
Sample	2mm	Peak °C	3mm	Peak °C	4mm	Peak °C
1	-49.64	145.63	-81.90	145.78	-74.48	135.89
2	-51.97	115.01	-78.47	148.74	-74.86	136.86
3	-57.90	122.44	-78.15	147.26	-69.43	138.49
4	-52.77	131.67	-80.85	148.70	-72.22	139.33
5	-49.79	115.99	-80.76	145.95	-73.50	139.19
Mean	-52.41	126.15	-80.03	147.29	-72.90	137.95
SD	3.35	12.76	1.46	1.28	1.96	1.35
<b>1 MONTH</b>						
Sample	2mm	Peak °C	3mm	Peak °C	4mm	Peak °C
1	-30.90	128.24	-82.05	142.53	-70.14	136.68
2	-57.91	126.47	-74.32	144.23	-82.08	131.80
3	-41.79	117.13	-67.23	138.71	-84.02	142.05
4	-46.71	136.68	-77.15	144.90	-78.53	131.02
5	-53.28	134.36	-82.14	144.09	-76.62	136.58
Mean	-46.12	128.58	-76.58	142.89	-78.28	135.63
SD	10.50	7.66	5.54	2.23	4.83	3.98
<b>3 MONTHS</b>						
Sample	2mm	Peak °C	3mm	Peak °C	4mm	Peak °C
1	-54.69	136.13	-73.36	141.26	-86.27	141.12
2	-38.18	136.78	-72.26	140.06	-80.76	141.23
3	-42.03	143.60	-73.70	141.82	-73.57	136.44
4	-53.41	130.42	-79.98	142.50	-77.92	132.18
5	-49.97	117.44	-75.38	142.90	-89.20	143.32
Mean	-47.66	132.87	-74.94	141.71	-81.54	138.86
SD	7.24	9.81	2.71	1.00	5.63	4.03

Table 111. Photac-Fil Quick Thermal Scan Results (J/gm)

PHOTAC-FIL QUIK DSC THERMAL SCAN RESULTS (J/gm)						
IMMEDIATE						
Sample	2mm	Peak °C	3mm	Peak °C	4mm	Peak °C
1	-4.61	134.36	-29.49	193.12	-42.99	174.07
2	-3.44	115.69	-33.12	197.81	-42.66	176.14
3	-5.39	109.72	-30.45	196.44	-42.26	173.59
4	-3.97	59.76	-31.86	197.58	-48.59	173.60
5	-21.41	196.81	-45.49	186.72	-41.20	175.55
Mean	-7.76	123.27	-34.08	194.33	-43.54	174.59
SD	7.66	49.51	5.84	4.16	2.60	1.06
24 hours						
Sample	2mm	Peak °C	3mm	Peak °C	4mm	Peak °C
1	-35.75	144.05	-65.98	158.38	-46.43	160.57
2	-32.19	162.00	-72.35	144.94	-53.12	153.53
3	-36.49	147.91	-69.73	152.55	-66.80	150.44
4	-37.70	111.14	-75.59	142.74	-69.45	153.07
5	-32.73	108.36	-70.84	148.22	-55.55	153.92
Mean	-34.97	134.69	-70.90	149.37	-58.27	154.31
SD	2.40	23.75	3.15	5.59	8.62	3.36
1 WEEK						
Sample	2mm	Peak °C	3mm	Peak °C	4mm	Peak °C
1	-34.64	139.38	-72.18	145.72	-79.04	144.54
2	-36.54	134.54	-58.99	148.69	-72.21	143.77
3	-39.82	145.91	-69.66	145.94	-73.56	139.91
4	-64.64	143.77	-67.79	143.59	-67.58	144.99
5	-58.33	142.52	-69.98	142.74	-62.55	143.25
Mean	-46.79	141.22	-67.72	145.34	-70.99	143.29
SD	13.72	4.42	4.58	2.08	5.58	1.79
1 MONTH						
Sample	2mm	Peak °C	3mm	Peak °C	4mm	Peak °C
1	-48.94	139.90	-75.85	140.55	-81.85	141.00
2	-41.36	132.92	-75.82	139.66	-81.60	142.65
3	-41.01	138.24	-74.89	139.66	-74.78	140.31
4	-53.79	138.00	-70.63	140.19	-74.29	140.05
5	-53.55	134.39	-72.97	140.62	-73.29	141.08
Mean	-47.73	136.69	-74.03	140.14	-77.16	141.02
SD	6.28	2.91	2.00	0.42	3.76	0.91
3 MONTHS						
Sample	2mm	Peak °C	3mm	Peak °C	4mm	Peak °C
1	-62.47	125.41	-89.83	137.58	-99.04	139.36
2	-47.00	128.96	-90.57	136.56	-96.78	139.50
3	-57.73	133.54	-94.67	137.76	-104.29	134.31
4	-66.28	133.65	-95.60	138.07	-100.01	136.68
5	-61.94	125.79	-90.60	137.56	-99.63	137.32
Mean	-59.08	129.47	-92.25	137.51	-99.95	137.43
SD	7.40	4.01	2.39	0.51	2.44	1.91

## **APPENDIX E**

### **THERMAL WEIGHT CHANGE DATA**

Table 112. Vitremer Immediate Thermal Weight Data

Vitremer Immediate Thermal Weight Change		Weights in mg							
2mm 40 µl pan	pan empty filled + cure		Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan	Total % loss	
	1	31.71 95.59	95.59	95.05	94.67	94.42	91.4		
		weight - pan	63.88	63.34	62.96	62.71	69.69		
		diff from original weight	0	-0.54	-0.92	-1.17	-4.19		
		diff from previous weight	0	-0.54	-0.38	-0.25	-3.02		
		Est H2O loss				1.17	1.33		
		% mat loss during scan				1.7	4.73	6.56	
		2	31.56 95.45	95.45	94.64	94.2	93.91	90.39	
		weight - pan	63.89	63.08	62.64	62.35	58.83		
		diff from original weight	0	-0.81	-1.25	-1.54	-5.06		
		diff from previous weight	0	-0.81	-0.44	-0.29	-3.52		
		Est H2O loss				1.64	2.41		
		% mat loss during scan				1.7	5.51	7.92	
		3	31.7 109.6	109.6	109.03	108.67	108.4	104.97	
		weight - pan	77.9	77.33	76.97	76.7	73.27		
	diff from original weight	0	-0.57	-0.93	-1.2	-4.63			
	diff from previous weight	0	-0.57	-0.36	-0.27	-3.43			
	Est H2O loss				1.2	1.74			
	% mat loss during scan				1.7	4.48	5.94		
	4	30.86 101.7	101.7	101.12	100.7	100.43	97.2		
	weight - pan	70.84	70.26	69.84	69.57	66.34			
	diff from original weight	0	-0.58	-1	-1.27	-4.5			
	diff from previous weight	0	-0.58	-0.42	-0.27	-3.23			
	Est H2O loss				1.27	1.74			
	% mat loss during scan				1.7	4.56	6.35		
	5	31.51 116.49	116.49	116.08	115.69	115.45	111.8		
	weight - pan	84.98	84.57	84.18	83.94	80.29			
	diff from original weight	0	-0.41	-0.8	-1.04	-4.69			
	diff from previous weight	0	-0.41	-0.39	-0.24	-3.65			
	Est H2O loss				1.04	1.52			
	% mat loss during scan				1.7	4.38	5.52		
3 mm 100 µl pan reference wt ref pan weight	pan empty filled + cure		Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan	Total % loss	
	1	61.66 221.97	221.97	221.17	220.74	220.33	209.06		
		weight - pan	160.41	169.61	169.18	168.77	147.5		
		diff from original weight	0	-0.8	-1.23	-1.64	-12.91		
		diff from previous weight	0	-0.8	-0.43	-0.41	-11.27		
		Est H2O loss				1.64	1.02		
		% mat loss during scan				1.7	7.83	8.05	
		2	61.39 221.9	221.9	221.08	220.55	220.14	208.89	
		weight - pan	160.51	169.69	169.16	168.75	147.5		
		diff from original weight	0	-0.82	-1.35	-1.76	-13.01		
		diff from previous weight	0	-0.82	-0.53	-0.41	-11.25		
		Est H2O loss				1.76	1.10		
		% mat loss during scan				1.7	7.81	8.11	
		3	61.38 199.2	199.2	198.5	198.08	197.63	188.81	
		weight - pan	137.82	137.12	136.7	136.25	127.43		
	diff from original weight	0	-0.7	-1.12	-1.57	-10.39			
	diff from previous weight	0	-0.7	-0.42	-0.45	-8.82			
	Est H2O loss				1.57	1.14			
	% mat loss during scan				1.7	6.48	7.54		
	4	62.05 209.5	209.5	209.19	208.57	208.29	200.28		
	weight - pan	147.45	147.14	146.52	146.24	138.23			
	diff from original weight	0	-0.31	-0.93	-1.21	-9.22			
	diff from previous weight	0	-0.31	-0.62	-0.26	-8.01			
	Est H2O loss				1.21	0.82			
	% mat loss during scan				1.7	5.43	6.25		
	5	61.72 225.86	225.86	225.23	224.8	224.68	215.73		
	weight - pan	164.14	163.51	163.08	162.96	154.01			
	diff from original weight	0	-0.63	-1.06	-1.18	-10.13			
	diff from previous weight	0	-0.63	-0.43	-0.12	-8.95			
	Est H2O loss				1.18	0.72			
	% mat loss during scan				1.7	5.45	6.17		
4 mm	pan empty filled + cure		Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan	Total % loss	
	1	61.23 288.33	288.33	287.5	286.99	286.31	272.03		
		weight - pan	227.1	226.27	225.76	225.08	210.8		
		diff from original weight	0	-0.83	-1.34	-2.02	-16.3		
		diff from previous weight	0	-0.83	-0.51	-0.68	-14.23		
		Est H2O loss				2.02	0.83		
		% mat loss during scan				1.7	6.29	7.18	
		2	61.71 296.14	296.14	295.52	295.11	294.78	281.11	
		weight - pan	234.43	233.81	233.4	233.07	219.4		
		diff from original weight	0	-0.62	-1.03	-1.36	-15.03		
		diff from previous weight	0	-0.62	-0.41	-0.33	-13.67		
		Est H2O loss				1.36	0.58		
		% mat loss during scan				1.7	5.83	6.41	
		3	61.35 298.48	298.48	297.7	297.18	296.78	281.97	
		weight - pan	237.13	236.35	235.83	235.43	220.82		
	diff from original weight	0	-0.78	-1.3	-1.7	-16.61			
	diff from previous weight	0	-0.78	-0.52	-0.4	-14.81			
	Est H2O loss				1.7	0.72			
	% mat loss during scan				1.7	6.25	6.96		
	4	61.76 317.52	317.52	316.83	316.39	316.02	298.7		
	weight - pan	255.76	255.07	254.63	254.26	236.94			
	diff from original weight	0	-0.69	-1.13	-1.44	-18.82			
	diff from previous weight	0	-0.69	-0.44	-0.37	-17.32			
	Est H2O loss				1.5	0.59			
	% mat loss during scan				1.7	6.77	7.36		
	5	61.3 306.41	306.41	305.73	305.3	304.97	288.23		
	weight - pan	245.11	244.43	244	243.67	226.93			
	diff from original weight	0	-0.68	-1.11	-1.44	-18.18			
	diff from previous weight	0	-0.68	-0.43	-0.33	-16.74			
	Est H2O loss				1.44	0.59			
	% mat loss during scan				1.7	6.83	7.42		

Table 113. Vitremer 24-Hour Thermal Weight Data

Vitremer 24-Hour Thermal Weight Change			Weights in mg								
2mm	40 µl pan		Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan	Total% loss	Total/gain%	Scan/gain%	Scan/RetH2O%
	pan empty filled + cure										
1	31.72	105.76	106.67	105.49	104.96	104.56	100.56				
	weight - pan	74.04	74.95	73.77	73.24	72.84	68.84				
	diff from original weight		0.91	-0.27	-0.8	-1.2	-5.20				
	diff from previous weight		0.91	-1.18	-0.53	-2.11	-4.00				
	Est H2O loss										
	% mat loss during scan							8.15	671.43	439.56	-333.33
2	31.35	103.34	104.39	103.01	102.39	101.98	97.90				
	weight - pan	71.99	73.04	71.66	71.04	70.53	66.55				
	diff from original weight		1.05	-0.33	-0.96	-1.36	-5.44				
	diff from previous weight		1.05	-1.38	-0.82	-0.41	-4.03				
	Est H2O loss										
	% mat loss during scan							8.89	618.10	388.57	-300.00
3	31.16	106.38	107.16	105.88	105.25	104.93	101.06				
	weight - pan	75.22	76	74.72	74.09	73.77	69.90				
	diff from original weight		0.78	-0.5	-1.13	-1.45	-5.32				
	diff from previous weight		0.78	-1.28	-0.63	-0.32	-3.67				
	Est H2O loss										
	% mat loss during scan							8.03	782.05	496.15	-266.90
4	31.29	110.46	111.31	110.34	109.76	109.37	105.76				
	weight - pan	79.17	80.02	79.05	78.47	78.08	74.47				
	diff from original weight		0.85	-0.12	-0.7	-1.09	-4.70				
	diff from previous weight		0.85	-0.97	-0.50	-0.39	-3.61				
	Est H2O loss										
	% mat loss during scan							6.94	652.94	424.71	-331.19
5	31.47	107.65	108.66	107.56	107.22	106.8	103.46				
	weight - pan	76.18	77.19	76.09	75.75	75.33	71.99				
	diff from original weight		1.01	-0.09	-0.43	-0.86	-4.19				
	diff from previous weight		1.01	-1.1	-0.34	-0.42	-3.34				
	Est H2O loss										
	% mat loss during scan							6.74	514.85	330.69	-392.94
			63.76								
	ref pan weight		63.74								
	pan empty filled + cure										
1	61.55	215.54	216.7	215.47	214.8	214.22	204.75				
	weight - pan	153.99	155.15	153.92	153.25	152.67	143.2				
	diff from original weight		1.16	-0.07	-0.74	-1.32	-10.79				
	diff from previous weight		1.16	-1.23	-0.67	-0.58	-9.47				
	Est H2O loss										
	% mat loss during scan							6.10	1030.17	816.38	-717.42
2	61.14	228.66	229.81	228.82	228.3	227.89	218.68				
	weight - pan	167.52	168.67	167.68	167.16	166.75	157.54				
	diff from original weight		1.15	0.16	-0.36	-0.77	-9.98				
	diff from previous weight		1.15	-0.99	-0.52	-0.41	-9.21				
	Est H2O loss										
	% mat loss during scan							6.60	967.83	800.87	-1196.10
3	61.54	213.32	214.48	213.32	212.73	211.94	201.8				
	weight - pan	151.78	152.94	151.78	151.19	150.4	140.26				
	diff from original weight		1.16	0	-0.59	-1.38	-11.52				
	diff from previous weight		1.16	-1.16	-0.59	-0.79	-10.14				
	Est H2O loss										
	% mat loss during scan							8.29	1093.10	874.14	-734.78
4	61.47	224.31	225.73	224.72	224.11	223.63	212.99				
	weight - pan	162.84	164.26	163.25	162.64	162.16	151.52				
	diff from original weight		1.42	0.41	-0.2	-0.68	-11.32				
	diff from previous weight		1.42	-1.01	-0.61	-0.48	-10.64				
	Est H2O loss										
	% mat loss during scan							7.76	897.18	749.30	-1564.71
5	61.44	221.84	223.28	222.33	221.82	221.38	211.47				
	weight - pan	160.4	161.84	160.89	160.38	159.94	150.03				
	diff from original weight		1.44	0.49	-0.02	-0.46	-10.37				
	diff from previous weight		1.44	-0.95	-0.51	-0.44	-9.91				
	Est H2O loss										
	% mat loss during scan							6.12	820.14	688.19	-2154.35
	pan empty filled + cure										
1	61.56	310.07	311.58	310.78	310.13	309.62	292.82				
	weight - pan	248.51	250.02	249.22	248.57	248.06	231.26				
	diff from original weight		1.61	0.71	0.06	-0.45	-17.25				
	diff from previous weight		1.61	-0.9	-0.65	-0.51	-16.8				
	Est H2O loss										
	% mat loss during scan							7.54	1171.43	1043.48	-3733.33
2	61.21	314.71	316.92	315.82	315.23	314.72	298.28				
	weight - pan	253.5	255.71	254.61	254.02	253.51	237.07				
	diff from original weight		2.21	-1.1	-0.52	0.01	-16.43				
	diff from previous weight		2.21	-1.1	-0.59	-0.51	-16.44				
	Est H2O loss										
	% mat loss during scan							7.29	843.44	743.89	164400.00
3	62.03	307.54	309.21	308.22	307.67	307.2	289.72				
	weight - pan	245.51	247.18	246.19	245.64	245.17	227.68				
	diff from original weight		1.67	0.68	0.13	-0.34	-17.82				
	diff from previous weight		1.67	-0.99	-0.56	-0.47	-17.48				
	Est H2O loss										
	% mat loss during scan							7.88	1167.07	1046.71	-5141.18
4	61.57	338.92	341.01	339.78	339.13	338.4	321.96				
	weight - pan	277.35	279.44	278.21	277.56	276.83	260.39				
	diff from original weight		2.09	0.86	0.21	-0.52	-16.96				
	diff from previous weight		2.09	-1.23	-0.66	-0.73	-16.44				
	Est H2O loss										
	% mat loss during scan							6.82	911.48	786.60	-3161.54
5	61.76	335.77	338.05	336.62	336.07	335.61	319.28				
	weight - pan	274.01	276.29	274.86	274.31	273.85	257.52				
	diff from original weight		2.28	0.86	0.3	-0.16	-16.49				
	diff from previous weight		2.28	-1.43	-0.65	-0.46	-16.33				
	Est H2O loss										
	% mat loss during scan							6.79	823.25	716.23	-10206.25

Table 114. Vitremer One-Week Thermal Weight Data

Vitremer One Week Thermal Weight Change				Weights in mg									
2mm	40 µl pan	ref pan weight	32.99										
		ref pan weight	33.09	29-Nov-05									
		pan empty/filled + cure			Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan	Total % loss	Total/Gain %	Scan/Gain %	Scan/RetH2O %
1	32.83	106.27			107.85	107.51	106.56	106.12	101.21				
	weight - pan	73.44			75.02	74.66	73.73	73.29	68.38				
	diff from original weight				1.58	1.24	0.29	-0.15	-5.06				
	diff from previous weight				1.58	0.34	-0.95	-0.44	-4.91				
	Est H2O loss							-1.73	2.31				
	% mat loss during scan								6.54	8.85	420.25	310.76	-3273.33
2	32.92	116.45			118.36	117.38	116.85	116.35	110.67				
	weight - pan	83.53			85.44	84.46	83.93	83.43	77.75				
	diff from original weight				1.91	0.93	0.4	-0.1	-5.78				
	diff from previous weight				1.91	-0.96	-0.53	-0.5	-5.68				
	Est H2O loss							-2.01	2.35				
	% mat loss during scan								6.69	9.80	402.62	297.38	-5680.00
3	32.44	110.06			111.85	110.86	110.37	109.88	104.96				
	weight - pan	77.62			79.41	78.42	77.93	77.44	72.52				
	diff from original weight				1.79	0.8	0.31	-0.18	-5.1				
	diff from previous weight				1.79	-0.99	-0.49	-0.49	-4.92				
	Est H2O loss							-1.97	2.48				
	% mat loss during scan								6.29	8.68	384.92	274.86	-2733.33
4	32.71	99.12			100.73	99.57	99.24	99.11	95.09				
	weight - pan	66.41			68.02	66.86	66.63	66.4	62.38				
	diff from original weight				1.61	0.45	0.12	-0.01	-4.03				
	diff from previous weight				1.61	-1.16	-0.33	-0.13	-4.02				
	Est H2O loss							-1.62	2.39				
	% mat loss during scan								5.91	8.29	350.31	249.69	-40200.00
5	32.68	110.21			112.31	111.04	110.3	110.04	105.89				
	weight - pan	77.53			79.63	78.36	77.62	77.36	73.21				
	diff from original weight				2.1	0.63	0.09	-0.17	-4.32				
	diff from previous weight				2.1	-1.27	-0.74	-0.26	-4.15				
	Est H2O loss							-2.27	2.65				
	% mat loss during scan								5.21	8.86	305.71	197.62	-2441.18
3 mm	100 µl pan	reference wt	63.88										
		ref pan weight	63.89	29-Nov-05									
		pan empty/filled + cure			Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan				
1	63.53	198.8			202.56	200.91	199.95	199.15	189.13				
	weight - pan	135.27			139.03	137.38	136.42	135.63	125.6				
	diff from original weight				3.76	2.11	1.15	0.36	-9.67				
	diff from previous weight				3.76	-1.65	-0.96	-0.79	-10.03				
	Est H2O loss							-3.4	2.45				
	% mat loss during scan								7.21	9.66	357.18	266.76	2786.11
2	61.17	220.32			224.38	222.6	221.67	221.24	209.19				
	weight - pan	159.15			163.21	161.43	160.5	160.07	148.02				
	diff from original weight				4.06	2.28	1.35	0.92	-11.13				
	diff from previous weight				4.06	-1.76	-0.93	-0.43	-12.05				
	Est H2O loss							-3.14	1.92				
	% mat loss during scan								7.38	9.31	374.14	296.80	1309.78
3	61.9	225.2			229.57	227.83	227.04	226.18	213.79				
	weight - pan	163.3			167.67	165.93	165.14	164.28	151.89				
	diff from original weight				4.37	2.63	1.84	0.98	-11.41				
	diff from previous weight				4.37	-1.74	-0.79	-0.66	-12.39				
	Est H2O loss							-3.99	2.62				
	% mat loss during scan								7.39	9.41	361.10	283.52	1264.29
4	61.55	229.2			233.2	231.81	230.98	230.18	218.21				
	weight - pan	167.65			171.65	170.26	169.43	168.63	156.66				
	diff from original weight				4	2.61	1.78	0.98	-10.99				
	diff from previous weight				4	-1.39	-0.63	-0.8	-11.97				
	Est H2O loss							-3.02	1.75				
	% mat loss during scan								6.97	8.73	374.75	299.25	1221.43
5	61.38	213.55			217.2	215.85	214.78	214.09	203.83				
	weight - pan	152.17			155.82	154.47	153.4	152.71	142.45				
	diff from original weight				3.65	2.3	1.23	0.54	-9.72				
	diff from previous weight				3.65	-1.35	-1.07	-0.69	-10.26				
	Est H2O loss							-3.11	2.00				
	% mat loss during scan								6.58	8.58	366.30	281.10	1900.00
4 mm													
		pan empty/filled + cure			Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan				
1	61.08	313.08			315.37	314.23	313.6	313.03	295.15				
	weight - pan	252			254.29	253.15	252.52	251.95	234.07				
	diff from original weight				2.29	1.15	0.52	-0.05	-17.93				
	diff from previous weight				2.29	-1.14	-0.63	-0.57	-17.88				
	Est H2O loss							-2.34	0.92				
	% mat loss during scan								7.83	7.95	882.97	780.79	-35760.00
2	61.34	292.25			294.69	293.12	292.44	291.94	272.8				
	weight - pan	230.91			233.35	231.78	231.1	230.6	211.46				
	diff from original weight				2.44	0.87	0.19	-0.31	-19.45				
	diff from previous weight				2.44	-1.57	-0.68	-0.5	-19.14				
	Est H2O loss							-2.75	1.19				
	% mat loss during scan								8.20	9.38	897.13	784.43	-6174.19
3	61.67	290.07			292.32	291.33	290.77	290.26	273.34				
	weight - pan	228.4			230.65	229.66	229.1	228.59	211.67				
	diff from original weight				2.25	1.26	0.7	0.19	-16.73				
	diff from previous weight				2.25	-0.99	-0.56	-0.51	-16.92				
	Est H2O loss							-2.05	0.89				
	% mat loss during scan								7.34	8.23	843.56	752.00	8905.26
4	61.69	316.89			319.54	318.55	317.87	317.43	300.36				
	weight - pan	255.2			257.85	256.86	256.18	255.74	238.67				
	diff from original weight				2.65	1.66	0.98	0.54	-16.53				
	diff from previous weight				2.65	-0.99	-0.68	-0.44	-17.07				
	Est H2O loss							-2.11	0.82				
	% mat loss during scan								6.62	7.44	723.77	644.15	3161.11
5	61.57	291.23			293.72	292.62	291.98	291.45	275.22				
	weight - pan	229.66			232.15	231.05	230.41	229.88	213.65				
	diff from original weight				2.49	1.39	0.75	0.22	-16.01				
	diff from previous weight				2.49	-1.1	-0.64	-0.53	-16.23				
	Est H2O loss							-2.22	0.86				
	% mat loss during scan								6.99	7.97	742.97	651.81	7377.27

Table 115. Vitremer One Month Thermal Weight Data

Vitremer 1 Month Thermal Weight Data				Weights in mg								
2mm	40 µl pan	ref pan weight	32.96	Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan	Total%loss	Total/Gain%	Total/Scan%	Scan/RetH2O%
		ref pan weight	33.03	21-Nov-05								
		pan empty/filled + cure										
	1	32.58	109.54	110.52	109.78	109.4	109.11	104.73				
		weight - pan	76.96	77.94	77.2	76.82	76.53	72.15				
		diff from original weight		0.98	0.24	-0.14	-0.43	-4.81				
		diff from previous weight		0.98	-0.74	-0.38	-0.29	-4.38				
		Est H2O loss					1.41	1.81				
		% mat loss during scan						5.62	7.43	590.82	446.94	-1018.60
	2	32.63	107.79	113.84	113.11	112.68	112.44	107.49				
		weight - pan	75.16	81.21	80.46	80.05	79.81	74.85				
		diff from original weight		6.05	5.32	4.89	4.65	-0.31				
		diff from previous weight		6.05	-0.73	-0.43	-0.24	-4.96				
		Est H2O loss					1.4	1.72				
		% mat loss during scan						6.11	7.83	105.12	81.98	106.67
	3	33.02	111.3	112.31	111.6	111.1	110.95	106.18				
		weight - pan	78.28	79.29	78.58	78.08	77.93	73.16				
		diff from original weight		1.01	0.3	-0.2	-0.35	-4.12				
		diff from previous weight		1.01	-0.71	-0.5	-0.15	-4.77				
		Est H2O loss					1.36	1.72				
		% mat loss during scan						6.02	7.73	606.93	472.28	-1362.86
	4	32.8	100.38	101.2	100.38	99.98	99.77	95.54				
		weight - pan	67.58	68.4	67.58	67.18	66.97	62.74				
		diff from original weight		0.82	0	-0.4	-0.61	-4.94				
		diff from previous weight		0.82	-0.92	-0.4	-0.21	-4.23				
		Est H2O loss					1.43	2.09				
		% mat loss during scan						6.18	8.27	690.24	515.05	-693.44
	5	32.9	97.15	97.85	97.16	97.16	96.54	92.29				
		weight - pan	64.25	64.95	64.26	64.26	63.64	59.99				
		diff from original weight		0.7	0.01	0.01	-0.61	-4.86				
		diff from previous weight		0.7	-0.69	0	-0.62	-4.25				
		Est H2O loss					1.31	2.02				
		% mat loss during scan						6.54	8.56	794.29	607.14	-696.72
		pan empty/filled + cure										
	1	63.79	205.2	209.29	207.5	206.28	205.69	195.36				
		weight - pan	141.41	145.5	143.71	142.49	141.9	131.57				
		diff from original weight		4.09	2.3	1.09	0.49	-9.84				
		diff from previous weight		4.09	-1.79	-1.22	-0.59	-10.33				
		Est H2O loss					3.5	2.47				
		% mat loss during scan						7.10	9.57	340.59	252.57	2108.16
	2	63.61	199.36	202.77	201.7	201.13	200.66	189.94				
		weight - pan	135.74	139.16	138.09	137.52	137.05	128.33				
		diff from original weight		3.42	2.35	1.79	1.31	-9.41				
		diff from previous weight		3.42	-1.07	-0.57	-0.47	-10.72				
		Est H2O loss					2.11	1.62				
		% mat loss during scan						7.70	9.22	375.15	313.45	818.32
	3	64.04	210.5	214.49	213.27	212.71	212.04	199.19				
		weight - pan	146.46	150.45	149.23	148.67	148	135.15				
		diff from original weight		3.99	2.77	2.21	1.54	-11.31				
		diff from previous weight		3.99	-1.22	-0.66	-0.67	-12.85				
		Est H2O loss					2.45	1.83				
		% mat loss during scan						8.54	10.17	383.46	322.06	834.42
	4	63.75	218.63	222.94	221.9	221.04	220.5	206.8				
		weight - pan	154.88	159.19	158.15	157.29	156.75	143.05				
		diff from original weight		4.31	3.27	2.41	1.87	-11.83				
		diff from previous weight		4.31	-1.04	-0.86	-0.54	-13.77				
		Est H2O loss					3.44	1.53				
		% mat loss during scan						8.61	10.14	374.48	317.87	732.62
	5	63.76	206.35	210.67	209.5	208.76	207.95	195.58				
		weight - pan	142.59	146.91	145.74	145	144.19	131.82				
		diff from original weight		4.32	3.15	2.41	1.6	-10.77				
		diff from previous weight		4.32	-1.17	-0.74	-0.81	-12.37				
		Est H2O loss					2.72	1.85				
		% mat loss during scan						8.42	10.27	349.31	286.34	773.13
		pan empty/filled + cure										
	1	64.09	280.74	292.7	287.37	286.33	285.6	263.16				
		weight - pan	216.65	226.61	223.28	222.24	221.51	199.07				
		diff from original weight		11.96	6.63	5.59	4.66	-17.59				
		diff from previous weight		11.96	-5.33	-1.04	-0.73	-22.44				
		Est H2O loss					7.1	3.11				
		% mat loss during scan						8.82	12.92	246.99	187.63	461.73
	2	63.9	293.53	299.2	295.3	293.63	293.53	269.53				
		weight - pan	229.63	235.3	231.63	229.63	229.63	205.63				
		diff from original weight		5.67	-293.53	-293.53	-293.53	-293.53				
		diff from previous weight		5.67	-299.2	0	0	0				
		Est H2O loss					299.2	299.2				
		% mat loss during scan						#DIV/0!				
	3	63.04	290.6	295.46	294.4	293.62	293.06	275.01				
		weight - pan	227.56	232.42	231.36	230.58	230.02	211.97				
		diff from original weight		4.86	3.8	3.02	2.46	-15.69				
		diff from previous weight		4.86	-1.06	-0.78	-0.56	-18.05				
		Est H2O loss					2.4	1.83				
		% mat loss during scan						7.77	8.80	420.78	371.40	733.74
	4	64.05	294.97	302.92	298.97	298.22	297.46	278.77				
		weight - pan	230.92	236.87	234.92	234.17	233.41	214.72				
		diff from original weight		7.95	4	3.25	2.49	-16.2				
		diff from previous weight		7.95	-3.95	-0.75	-0.76	-18.69				
		Est H2O loss					4.46	2.25				
		% mat loss during scan						7.82	10.11	303.77	235.09	790.60
	5	64.33	309.24	315.38	313.38	312.42	311.7	292.03				
		weight - pan	244.91	251.05	249.05	248.09	247.37	227.7				
		diff from original weight		6.14	4.14	3.18	2.46	-17.21				
		diff from previous weight		6.14	-2	-0.95	-0.72	-19.67				
		Est H2O loss					3.69	1.47				
		% mat loss during scan						7.84	9.30	380.29	320.36	799.59

Table 116. Vitremer Three-Month Thermal Weight Data

Vitremer 3 Month Thermal Weight Data				Weights in mg										
2mm	40 µl pan	ref pan weight	31.28	28-Dec-05										
		ref pan weight	31.3											
		pan empty/filled + cure		Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan	Total % loss	Total % gain	% Scan/Gain	% Scan/RetH2O		
2mm	40 µl pan	1	31.67	153.44	161.5	158.15	157.1	156.11	143.63					
		weight - pan		121.77	129.83	126.48	125.43	124.44	112.16					
		diff from original weight			8.06	4.71	3.56	2.67	-9.61					
		diff from previous weight				8.06	-3.35	-1.05	-0.99	-12.28				
		Est H2O loss							5.39	4.15				
		% mat loss during scan							9.46	13.61	219.23	152.36	459.93	
		2	31.52	136.95	141.74	136.6	137.75	137.21	129.19					
		weight - pan		105.43	110.22	107.08	106.23	106.69	97.57					
		diff from original weight			4.79	1.65	0.8	0.26	-7.76					
		diff from previous weight			4.79	-3.14	-0.95	-0.54	-3.02					
		Est H2O loss							4.53	4.11				
		% mat loss during scan							7.28	11.39	262.00	167.43	3084.62	
		3	31.9	136.62	140.44	139.01	138.27	137.62	128.41					
		weight - pan		104.92	108.54	107.11	106.37	105.72	96.51					
		diff from original weight			3.62	2.19	1.45	0.8	-8.41					
diff from previous weight			3.62	-1.43	-0.74	-0.65	-9.21							
Est H2O loss							2.82	3.81						
% mat loss during scan							8.49	11.08	332.32	254.42	1151.25			
4	31.65	129.98	134.8	132.46	131.6	130.79	120.94							
weight - pan		98.33	103.15	100.81	99.95	99.14	89.29							
diff from original weight			4.82	2.48	1.62	0.81	-9.04							
diff from previous weight			4.82	-2.34	-0.96	-0.81	-9.65							
Est H2O loss							3.89	3.81						
% mat loss during scan							9.59	13.44	287.55	204.36	1216.05			
5	32.09	143.63	145.82	144.67	143.93	143.38	133.78							
weight - pan		111.54	113.73	112.68	111.84	111.29	101.69							
diff from original weight			2.19	1.04	0.3	-0.25	-9.85							
diff from previous weight			2.19	-1.15	-0.74	-0.55	-9.6							
Est H2O loss							3.44	2.15						
% mat loss during scan							8.44	10.59	549.77	438.36	3840.00			
3 mm	100 µl pan	reference wt	63.76	28-Dec-05										
		ref pan weight	63.78											
		pan empty/filled + cure		Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan						
		1	64.16	204.94	214.03	211.1	210.25	209.37	191.65					
		weight - pan		140.78	149.87	146.94	146.09	145.21	127.49					
		diff from original weight			9.09	6.16	5.31	4.43	-13.29					
		diff from previous weight			9.09	-2.93	-0.95	-0.66	-17.72					
		Est H2O loss							4.66	3.11				
		% mat loss during scan							11.62	14.93	246.20	194.94	400.00	
		2	63.55	215.83	226.34	221	220.09	219.23	205.18					
		weight - pan		152.28	162.79	157.45	156.54	155.68	141.63					
		diff from original weight			10.51	5.17	4.26	3.4	-10.65					
		diff from previous weight			10.51	-5.34	-0.91	-0.66	-14.05					
		Est H2O loss							7.11	4.37				
		% mat loss during scan							8.63	13.00	201.33	133.68	413.24	
3	63.43	217.2	226.12	222.63	221.67	220.67	206.42							
weight - pan		153.77	162.69	159.2	158.24	157.24	142.99							
diff from original weight			8.92	5.43	4.47	3.47	-10.78							
diff from previous weight			8.92	-3.49	-0.96	-1	-14.25							
Est H2O loss							5.45	3.35						
% mat loss during scan							8.76	12.11	220.85	159.75	410.66			
4	64.33	226.45	229.7	228.42	227.87	227.15	215.29							
weight - pan		162.12	165.37	164.09	163.54	162.82	150.96							
diff from original weight			3.25	1.97	1.42	0.7	-11.15							
diff from previous weight			3.25	-1.28	-0.55	-0.72	-11.86							
Est H2O loss							2.65	1.54						
% mat loss during scan							7.17	8.71	443.38	364.92	1694.29			
5	63.36	209.71	215.95	211.8	211.24	210.56	199.47							
weight - pan		146.35	152.59	148.44	147.88	147.2	136.11							
diff from original weight			6.24	2.09	1.53	0.95	-10.24							
diff from previous weight			6.24	-4.15	-0.56	-0.68	-11.09							
Est H2O loss							4.39	3.53						
% mat loss during scan							7.27	10.80	264.10	177.72	1304.71			
4 mm	pan empty/filled + cure	Pre HC	274.47	272.53	271.84	271.31	249.8							
		Post HC 1	211.15	209.21	206.52	207.99	186.46							
		Post HC 2	9.64	7.7	7.01	6.48	-15.03							
		Post HC 3												
		Post Scan												
		1	63.32	264.83	274.47	272.53	271.84	271.31	249.8					
		weight - pan		201.51	211.15	209.21	206.52	207.99	186.46					
		diff from original weight			9.64	7.7	7.01	6.48	-15.03					
		diff from previous weight			9.64	-1.94	-0.63	-0.53	-21.51					
		Est H2O loss							3.16	1.50				
		% mat loss during scan							10.19	11.68	255.91	223.13	331.94	
		2	63.15	265.23	270.75	269.31	268.74	268.31	248.02					
		weight - pan		202.08	207.6	206.16	205.59	205.16	184.87					
		diff from original weight			5.52	4.08	3.51	3.08	-17.21					
		diff from previous weight			5.52	-1.44	-0.57	-0.43	-20.29					
Est H2O loss							3.44	1.16						
% mat loss during scan							9.77	10.95	411.78	367.57	658.77			
3	64.36	253.87	270.2	261.45	260.63	259.94	238.98							
weight - pan		189.51	205.84	197.09	196.27	195.58	174.62							
diff from original weight			16.33	7.58	6.76	6.07	-14.89							
diff from previous weight			16.33	-8.75	-0.82	-0.69	-20.56							
Est H2O loss							10.26	4.95						
% mat loss during scan							10.19	15.17	191.18	128.35	345.30			
4	64.35	236.66	246.5	243.85	243.13	242.52	223.1							
weight - pan		172.21	182.15	179.5	178.78	178.17	156.75							
diff from original weight			9.94	7.29	6.57	5.96	-13.46							
diff from previous weight			9.94	-2.65	-0.72	-0.61	-19.42							
Est H2O loss							3.98	2.19						
% mat loss during scan							10.08	12.85	235.41	195.37	325.84			
5	64.32	255.01	267.1	264.64	264.29	263.58	243.51							
weight - pan		191.69	202.78	200.32	199.97	199.26	179.19							
diff from original weight			11.09	8.63	8.26	7.57	-12.5							
diff from previous weight			11.09	-2.46	-0.35	-0.71	-20.07							
Est H2O loss							3.62	1.74						
% mat loss during scan							9.98	11.63	212.71	180.97	265.13			

Table 117. Fuji II LC Immediate Thermal Weight Data

Fuji II LC Immediate Thermal Weight Data										Weights in mg				
2mm	40 µl pan													
	pan empty	filled + cure	Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan	Total	% loss					
2mm	1	32.82	144.53	144.53	144.21	143.96	143.8	139.11						
		weight - pan	111.71	111.71	111.39	111.16	110.98	106.29						
		diff from original weight	0	-0.32	-0.55	-0.73	-5.42							
		diff from previous weight	0	-0.32	-0.23	-0.16	-4.69							
		Est H2O loss	%H2O loss				-0.73	0.65						
		% mat loss during scan					4.20	4.85						
		Mean start weight	(mg)					101.26			20.41			
		Mean H2O gain					0.00	0.00						
		Mean H2O loss					-0.60	0.09						
		Mean change HC1					-0.35	0.08						
		Mean change HC2					-0.17	0.08						
		Mean change HC3					-0.17	0.05						
		Mean change scan					-3.97	1.21						
		Mean % loss scan					3.86	0.50						
		Mean % total loss					4.56	0.40						
2mm	2	33.21	160.97	160.97	160.54	160.36	160.15	154.78						
		weight - pan	127.76	127.76	127.33	127.17	126.94	121.57						
		diff from original weight	0	-0.43	-0.69	-0.82	-5.19							
		diff from previous weight	0	-0.43	-0.16	-0.23	-5.37							
		Est H2O loss	%H2O loss				-0.82	0.64						
		% mat loss during scan					4.20	4.85						
		Mean H2O gain					0.00	0.00						
		Mean H2O loss					-0.60	0.09						
		Mean change HC1					-0.35	0.08						
		Mean change HC2					-0.17	0.08						
		Mean change HC3					-0.17	0.05						
		Mean change scan					-3.97	1.21						
		Mean % loss scan					3.86	0.50						
		Mean % total loss					4.56	0.40						
	2mm	3	32.83	136.21	136.21	136.98	136.71	136.62	131.24					
		weight - pan	103.38	103.38	103.15	102.88	102.79	98.41						
		diff from original weight	0	-0.23	-0.27	-0.59	-4.38							
		diff from previous weight	0	-0.23	-0.27	-0.59	-4.38							
		Est H2O loss	%H2O loss				-0.59	0.52						
		% mat loss during scan					4.24	4.81						
		Mean start weight	(mg)					101.26			20.41			
		Mean H2O gain					0.00	0.00						
		Mean H2O loss					-0.60	0.09						
		Mean change HC1					-0.35	0.08						
		Mean change HC2					-0.17	0.08						
		Mean change HC3					-0.17	0.05						
		Mean change scan					-3.97	1.21						
		Mean % loss scan					3.86	0.50						
		Mean % total loss					4.56	0.40						
2mm	4	32.91	108	108	107.6	107.53	107.35	104.74						
		weight - pan	75.09	75.09	74.69	74.62	74.44	71.83						
		diff from original weight	0	-0.4	-0.47	-0.65	-3.26							
		diff from previous weight	0	-0.4	-0.07	-0.18	-2.61							
		Est H2O loss	%H2O loss				-0.65	0.65						
		% mat loss during scan					3.48	4.34						
		Mean start weight	(mg)					101.26			20.41			
		Mean H2O gain					0.00	0.00						
		Mean H2O loss					-0.60	0.09						
		Mean change HC1					-0.35	0.08						
		Mean change HC2					-0.17	0.08						
		Mean change HC3					-0.17	0.05						
		Mean change scan					-3.97	1.21						
		Mean % loss scan					3.86	0.50						
		Mean % total loss					4.56	0.40						
2mm	5	32.73	121.11	121.11	120.76	120.62	120.43	117.62						
		weight - pan	88.38	88.38	88.03	87.89	87.7	84.89						
		diff from original weight	0	-0.35	-0.49	-0.68	-3.49							
		diff from previous weight	0	-0.35	-0.14	-0.19	-2.81							
		Est H2O loss	%H2O loss				-0.68	0.77						
		% mat loss during scan					3.16	3.95						
		Mean start weight	(mg)					101.26			20.41			
		Mean H2O gain					0.00	0.00						
		Mean H2O loss					-0.60	0.09						
		Mean change HC1					-0.35	0.08						
		Mean change HC2					-0.17	0.08						
		Mean change HC3					-0.17	0.05						
		Mean change scan					-3.97	1.21						
		Mean % loss scan					3.86	0.50						
		Mean % total loss					4.56	0.40						
3mm	100 µl pan reference wt	63.76												
	1	pan empty	filled + cure	Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan						
		60.8	231.59	231.59	231.28	231.03	230.79	223.45						
		weight - pan	170.79	170.79	170.48	170.23	169.99	162.65						
		diff from original weight	0	-0.31	-0.25	-0.59	-7.34							
		diff from previous weight	0	-0.31	-0.25	-0.59	-7.34							
		Est H2O loss	%H2O loss				-0.59	0.47						
		% mat loss during scan					4.30	4.77						
		Mean start weight	(mg)					170.87			17.95			
		Mean H2O gain					0.00	0.00						
		Mean H2O loss					-0.90	0.44						
		Mean change HC1					-0.54	0.46						
		Mean change HC2					-0.26	0.06						
		Mean change HC3					-0.21	0.06						
		Mean change scan					-7.58	1.03						
	Mean % loss scan					4.43	0.17							
	Mean % total loss					5.05	0.28							
3mm	2	61.54	251.15	251.15	250.79	250.43	250.3	241.60						
		weight - pan	189.61	189.61	189.25	188.89	188.76	180.06						
		diff from original weight	0	-0.36	-0.36	-0.13	-8.70							
		diff from previous weight	0	-0.36	-0.36	-0.13	-8.70							
		Est H2O loss	%H2O loss				-0.65	0.45						
		% mat loss during scan					4.59	5.04						
		Mean start weight	(mg)					170.87			17.95			
		Mean H2O gain					0.00	0.00						
		Mean H2O loss					-0.90	0.44						
		Mean change HC1					-0.54	0.46						
		Mean change HC2					-0.26	0.06						
		Mean change HC3					-0.21	0.06						
		Mean change scan					-7.58	1.03						
		Mean % loss scan					4.43	0.17						
		Mean % total loss					5.05	0.28						
3mm	3	61.82	236.14	236.14	236.76	236.56	236.28	227.63						
		weight - pan	174.32	174.32	173.94	173.74	173.46	165.81						
		diff from original weight	0	-0.38	-0.68	-0.86	-8.51							
		diff from previous weight	0	-0.38	-0.2	-0.26	-7.65							
		Est H2O loss	%H2O loss				-0.66	0.49						
		% mat loss during scan					4.35	4.68						
		Mean start weight	(mg)					170.87			17.95			
		Mean H2O gain					0.00	0.00						
		Mean H2O loss					-0.90	0.44						
		Mean change HC1					-0.54	0.46						
		Mean change HC2					-0.26	0.06						
		Mean change HC3					-0.21	0.06						
		Mean change scan					-7.58	1.03						
		Mean % loss scan					4.43	0.17						
		Mean % total loss					5.05	0.28						
3mm	4	61.56	202.91	202.91	201.54	201.29	201.12	195.12						
		weight - pan	141.35	141.35	139.98	139.73	139.56	133.56						
		diff from original weight	0	-1.37	-1.62	-1.79	-7.79							
		diff from previous weight	0	-1.37	-0.25	-0.17	-6.00							
		Est H2O loss	%H2O loss				-1.79	1.27						
		% mat loss during scan					4.24	5.51						
		Mean start weight	(mg)					170.87			17.95			
		Mean H2O gain					0.00	0.00						
		Mean H2O loss					-0.90	0.44						
		Mean change HC1					-0.54	0.46						
		Mean change HC2					-0.26	0.06						
		Mean change HC3					-0.21	0.06						
		Mean change scan					-7.58	1.03						
		Mean % loss scan					4.43	0.17						
		Mean % total loss					5.05	0.28						
3mm	5	61.68	239.95	239.95	239.65	239.42	239.2	230.98						
		weight - pan	178.27	178.27	177.97	177.74	177.52	169.30						
		diff from original weight	0	-0.3	-0.53	-0.75	-8.97							
		diff from previous weight	0	-0.3	-0.23	-0.22	-8.22							
		Est H2O loss	%H2O loss				-0.66	0.42						
		% mat loss during scan					4.61	5.03						
		Mean start weight	(mg)											

Table 118. Fuji II LC 24-Hour Thermal Weight Data

Fuji II LC 24 Hour Thermal Weight Data			Weights in mg										
2mm	40 µl pan	ref pan weight	33.03	06-Oct-05									
		ref pan weight	33.11	07-Nov-05									
		pan empty filled + cure	Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan	Total%loss	Total/Gain%	Scan/Gain%	Scan/RetH2O%		
	1	32.95 148.09	152.9	150.37	149.7	149.07	142.55						
		weight - pan	119.95	117.42	116.75	116.12	109.60						
		diff from original weight	4.81	2.26	1.61	0.96	-5.64						
		diff from previous weight	4.81	-2.53	-0.67	-0.63	-6.52						
		Est H2O loss				-3.83	3.19						
		% mat loss during scan					5.44	8.63	215.18	135.55	665.31		
	2	32.7 149.4	153.58	151.46	150.66	150.05	143.99						
		weight - pan	120.88	118.76	117.96	117.35	111.29						
		diff from original weight	4.18	2.06	1.26	0.65	-5.41						
		diff from previous weight	4.18	-2.12	-0.8	-0.61	-6.06						
		Est H2O loss				-3.63	2.92						
		% mat loss during scan					5.01	7.93	229.43	144.98	932.31		
	3	33.12 130.99	134.58	132.32	131.75	131.29	126.52						
		weight - pan	101.46	99.2	98.63	98.17	93.40						
		diff from original weight	3.59	1.33	0.76	0.3	-4.47						
		diff from previous weight	3.59	-2.26	-0.57	-0.46	-4.77						
		Est H2O loss				-3.26	3.24						
		% mat loss during scan					4.78	7.94	224.51	132.87	1590.00		
	4	32.94 122.61	125.75	123.61	123.06	122.6	117.93						
		weight - pan	92.81	90.67	90.12	89.66	84.59						
		diff from original weight	3.14	1	0.45	-0.01	-4.68						
		diff from previous weight	3.14	-2.14	-0.55	-0.46	-4.67						
		Est H2O loss				-3.15	3.59						
		% mat loss during scan					5.03	8.43	249.04	148.73	46700.00		
	5	32.59 117.92	119.98	118.84	118.3	117.84	113.58						
		weight - pan	87.39	86.25	85.71	85.25	80.59						
		diff from original weight	2.06	0.92	0.38	-0.08	-4.34						
		diff from previous weight	2.06	-1.14	-0.54	-0.46	-4.26						
		Est H2O loss				-3.14	2.45						
		% mat loss during scan					4.87	7.32	310.68	206.80	5325.00		
		pan empty filled + cure	63.76										
		ref pan weight	63.74										
				07-Nov-05									
	1	63.75 235.42	236.82	235.91	235.52	235.21	226.67						
		weight - pan	173.07	172.16	171.77	171.46	162.92						
		diff from original weight	1.4	0.49	0.1	-0.21	-8.75						
		diff from previous weight	1.4	-0.91	-0.39	-0.31	-8.54						
		Est H2O loss				-1.61	0.93						
		% mat loss during scan					4.93	5.86	725.00	610.00	4066.67		
	2	63.79 258.08	259.78	258.96	258.5	258.17	248.78						
		weight - pan	195.99	195.17	194.71	194.38	184.99						
		diff from original weight	1.7	0.88	0.42	0.09	-9.30						
		diff from previous weight	1.7	-0.82	-0.46	-0.33	-9.39						
		Est H2O loss				-1.61	0.62						
		% mat loss during scan					4.79	5.61	647.06	552.35	10433.33		
	3	61.56 228.4	230.26	229.31	228.98	228.5	219.97						
		weight - pan	168.7	167.75	167.42	166.94	158.41						
		diff from original weight	1.86	0.91	0.58	0.1	-8.43						
		diff from previous weight	1.86	-0.95	-0.33	-0.48	-8.53						
		Est H2O loss				-1.76	1.04						
		% mat loss during scan					5.86	6.10	553.23	458.60	8530.00		
	4	61.71 228.86	230.86	229.84	229.39	228.96	220.80						
		weight - pan	169.15	168.13	167.68	167.25	159.09						
		diff from original weight	2	0.98	0.53	0.1	-8.06						
		diff from previous weight	2	-1.02	-0.45	-0.43	-8.16						
		Est H2O loss				-1.9	1.12						
		% mat loss during scan					4.82	5.95	503.00	408.00	8160.00		
	5	61.42 258.52	260.63	259.71	259.28	258.85	248.94						
		weight - pan	199.21	198.29	197.86	197.43	187.52						
		diff from original weight	2.11	1.19	0.76	0.33	-9.58						
		diff from previous weight	2.11	-0.92	-0.43	-0.43	-9.91						
		Est H2O loss				-1.76	0.69						
		% mat loss during scan					4.97	5.87	554.83	469.67	3003.03		
		pan empty filled + cure											
	1	61.84 334.34	336.51	335.58	335.03	334.47	320.90						
		weight - pan	274.67	273.74	273.19	272.63	259.06						
		diff from original weight	2.17	1.24	0.69	0.13	-13.44						
		diff from previous weight	2.17	-0.93	-0.55	-0.56	-13.57						
		Est H2O loss				-2.04	0.74						
		% mat loss during scan					4.94	5.68	719.35	625.35	10438.46		
	2	61.48 322.86	325.55	324.58	323.95	323.49	309.77						
		weight - pan	264.07	263.1	262.47	262.01	248.29						
		diff from original weight	2.69	1.72	1.09	0.63	-13.09						
		diff from previous weight	2.69	-0.97	-0.63	-0.46	-13.72						
		Est H2O loss				-2.06	0.79						
		% mat loss during scan					5.29	5.98	586.62	510.04	2177.78		
	3	61.31 346.65	350.04	348.83	348.01	347.5	332.59						
		weight - pan	288.73	287.52	286.7	286.19	271.27						
		diff from original weight	3.39	2.18	1.36	0.95	-14.07						
		diff from previous weight	3.39	-1.21	-0.82	-0.51	-14.92						
		Est H2O loss				-2.54	0.88						
		% mat loss during scan					5.17	6.05	515.04	440.12	1755.29		
	4	62.07 348.96	352.01	350.62	349.87	349.26	335.74						
		weight - pan	290.94	289.55	288.7	288.19	273.67						
		diff from original weight	3.05	1.66	0.91	0.3	-13.22						
		diff from previous weight	3.05	-1.39	-0.75	-0.61	-13.52						
		Est H2O loss				-2.78	0.95						
		% mat loss during scan					4.68	5.61	533.44	443.28	4506.67		
	5	61.45 314.63	317.53	316.36	315.68	315.26	302.29						
		weight - pan	256.08	254.91	254.23	253.81	240.84						
		diff from original weight	2.9	1.73	1.05	0.63	-12.34						
		diff from previous weight	2.9	-1.17	-0.69	-0.42	-12.97						
		Est H2O loss				-2.27	0.69						
		% mat loss during scan					5.06	5.95	525.52	447.24	2058.73		

Table 119. Fuji II LC One-Week Thermal Weight Data

Fuji II LC 1 Week Thermal Weight Data		Weights in mg										
2mm	40 µl pan	ref pan weight	32.9	33.03	33.03	11-Jan-06						
			Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan	Total%loss	Total/Gain%	Scan/Gain%	Scan/H2Oret%	
pan empty filled + cure												
1	32.65	112.82	116.94	114.24	113.85	113.53	108.67					
	weight - pan	80.17	84.29	81.59	81.2	80.88	76.02					
	diff from original weight		4.12	1.42	1.03	0.71	-4.15					
	diff from previous weight											
	Est H2O loss		4.12	-2.7	-0.39	-0.32	-4.86					
	% H2O loss						-3.41					
	% mat loss during scan						4.28	9.81	200.73	117.96	684.51	
pan empty filled + cure												
2	33.12	125.34	126.28	127.07	126.68	126.36	121.00					
	weight - pan	92.22	95.16	93.95	93.56	93.24	87.88					
	diff from original weight		2.94	1.73	1.34	1.02	-4.34					
	diff from previous weight											
	Est H2O loss		2.94	-1.21	-0.39	-0.32	-5.36					
	% H2O loss						-1.92					
	% mat loss during scan						4.24	7.65	247.62	182.31	525.49	
pan empty filled + cure												
3	32.82	140.87	146.3	143.53	142.98	142.43	136.60					
	weight - pan	108.05	113.48	110.71	110.16	109.61	102.78					
	diff from original weight		5.43	2.66	2.11	1.56	-5.27					
	diff from previous weight											
	Est H2O loss		5.43	-2.77	-0.56	-0.55	-6.83					
	% H2O loss						-3.67					
	% mat loss during scan						4.80	9.43	197.05	125.78	437.82	
pan empty filled + cure												
4	33.03	136.92	141.27	139.4	138.78	138.26	131.94					
	weight - pan	103.89	108.24	106.37	105.75	105.23	98.91					
	diff from original weight		4.35	2.48	1.86	1.34	-4.98					
	diff from previous weight											
	Est H2O loss		4.35	-1.87	-0.62	-0.52	-6.32					
	% H2O loss						-3.01					
	% mat loss during scan						4.57	8.62	214.48	145.29	471.64	
pan empty filled + cure												
5	33.31	123.05	129.48	124.47	124.46	124.11	118.74					
	weight - pan	89.74	96.17	91.16	91.15	90.8	85.43					
	diff from original weight		6.43	1.42	1.41	1.06	-4.31					
	diff from previous weight											
	Est H2O loss		6.43	-5.01	-0.01	-0.35	-5.37					
	% H2O loss						-2.78					
	% mat loss during scan						4.33	11.17	167.03	83.51	506.60	
3 mm		100 µl pan reference wt	61.76	61.78	12-Jan-06							
pan empty filled + cure												
1	61.1	240.63	248.1	246.1	245.06	244.49	231.79					
	weight - pan	179.53	187	185	183.96	183.39	170.69					
	diff from original weight		7.47	5.47	4.43	3.86	-8.84					
	diff from previous weight											
	Est H2O loss		7.47	-2	-1.04	-0.57	-12.70					
	% H2O loss						-3.61					
	% mat loss during scan						5.19	8.72	218.34	170.01	329.02	
pan empty filled + cure												
2	61.55	222.16	229.6	226.54	225.92	225.4	214.31					
	weight - pan	160.61	168.05	164.99	164.37	163.85	152.76					
	diff from original weight		7.44	4.36	3.76	3.24	-7.95					
	diff from previous weight											
	Est H2O loss		7.44	-3.06	-0.62	-0.52	-11.05					
	% H2O loss						-4.2					
	% mat loss during scan						4.92	9.10	205.51	149.06	342.28	
pan empty filled + cure												
3	61.34	229.68	237.8	234.65	233.86	233.24	221.40					
	weight - pan	168.34	176.46	173.31	172.52	171.9	160.06					
	diff from original weight		8.12	4.97	4.18	3.56	-8.28					
	diff from previous weight											
	Est H2O loss		8.12	-3.15	-0.79	-0.62	-11.84					
	% H2O loss						-4.56					
	% mat loss during scan						5.08	9.29	201.97	145.81	332.58	
pan empty filled + cure												
4	61.22	249.4	258.64	254.2	253.62	253.09	240.06					
	weight - pan	188.18	197.42	192.98	192.4	191.87	178.84					
	diff from original weight		9.24	4.8	4.22	3.69	-8.34					
	diff from previous weight											
	Est H2O loss		9.24	-4.44	-0.58	-0.53	-13.03					
	% H2O loss						-4.55					
	% mat loss during scan						5.15	9.41	201.08	141.02	353.12	
pan empty filled + cure												
5	61.33	254.61	260.3	258.8	258.3	257.83	244.63					
	weight - pan	193.28	198.97	197.47	196.97	196.5	183.30					
	diff from original weight		5.69	4.19	3.69	3.22	-9.98					
	diff from previous weight											
	Est H2O loss		5.69	-1.5	-0.5	-0.47	-13.20					
	% H2O loss						-2.42					
	% mat loss during scan						5.12	7.88	275.40	231.99	409.94	
4 mm												
pan empty filled + cure												
1	61.37	327.09	334.8	333.36	332.57	331.83	313.36					
	weight - pan	265.72	273.43	271.99	271.2	270.46	251.99					
	diff from original weight		7.71	6.27	5.48	4.74	-13.73					
	diff from previous weight											
	Est H2O loss		7.71	-1.44	-0.79	-0.74	-16.77					
	% H2O loss						-2.97					
	% mat loss during scan						5.57	7.84	278.08	239.56	389.66	
pan empty filled + cure												
2	61.78	317.62	326.22	324.43	323.58	323.01	305.01					
	weight - pan	255.84	266.44	262.65	261.8	261.23	243.23					
	diff from original weight		10.6	6.81	5.96	5.39	-12.61					
	diff from previous weight											
	Est H2O loss		10.6	-3.79	-0.86	-0.57	-16.00					
	% H2O loss						-2.21					
	% mat loss during scan						5.37	8.71	218.96	169.81	333.95	
pan empty filled + cure												
3	61.69	305.1	317.93	310.4	309.77	309.27	293.38					
	weight - pan	243.41	256.24	248.71	248.08	247.58	231.69					
	diff from original weight		12.83	5.3	4.67	4.17	-11.72					
	diff from previous weight											
	Est H2O loss		12.83	-7.53	-0.63	-0.5	-15.88					
	% H2O loss						-4.66					
	% mat loss during scan						5.14	9.58	191.35	123.85	381.06	
pan empty filled + cure												
4	61.64	327.21	334.85	333.08	332.47	331.93	314.00					
	weight - pan	265.57	273.21	271.44	270.83	270.29	252.36					
	diff from original weight		7.64	5.87	5.26	4.72	-13.21					
	diff from previous weight											
	Est H2O loss		7.64	-1.77	-0.61	-0.54	-17.93					
	% H2O loss						-2.92					
	% mat loss during scan						5.49	7.63	272.91	234.69	379.87	
pan empty filled + cure												
5	61.76	314.65	322.46	319.88	319.2	318.62	302.12					
	weight - pan	252.89	260.7	258.12	257.44	256.86	240.36					
	diff from original weight		7.81	5.23	4.55	3.97	-12.53					
	diff from previous weight											
	Est H2O loss		7.81	-2.58	-0.68	-0.58	-16.50					
	% H2O loss						-3.04					
	% mat loss during scan						5.18	7.80	260.44	211.27	415.62	

Table 120. Fuji II LC One-Month Thermal Weight Data

Fuji II LC 1 Month Thermal Weight Data			Weights in mg										
2mm	40 µl pan	ref pan weight	33.03	06-Oct-05									
		ref pan weight	33.11	11-Nov-05									
		pan empty filled + cure	Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan	Total%loss	Total%Gain	%Scan/Gain	%Scan/H2Oret%		
	1	33.01	96.51	100.14	97.84	97.39	96.95	93.41					
		weight - pan	63.5	67.13	64.83	64.38	63.94	60.40					
		diff from original weight		3.63	1.33	0.88	0.44	-3.10					
		diff from previous weight		3.63	-2.3	-0.45	-0.44	-3.54					
		Est H2O loss						-3.19					
		% mat loss during scan						5.27	10.03	185.40	97.52	804.55	
	2	32.93	145.72	149.35	148.11	147.6	147.2	140.29					
		weight - pan	112.79	116.42	115.18	114.67	114.27	107.36					
		diff from original weight		3.63	2.39	1.88	1.48	-5.43					
		diff from previous weight		3.63	-1.24	-0.61	-0.4	-6.91					
		Est H2O loss						-2.16					
		% mat loss during scan						5.94	7.78	249.59	190.36	466.89	
	3	32.98	112.32	115.04	113.96	113.62	113.09	108.38					
		weight - pan	79.34	82.06	80.98	80.54	80.11	75.40					
		diff from original weight		2.72	1.64	1.3	0.77	-3.94					
		diff from previous weight		2.72	-1.09	-0.34	-0.53	-4.71					
		Est H2O loss						-1.95					
		% mat loss during scan						5.74	8.12	244.85	173.16	611.69	
	4	32.96	136.21	139.92	138.88	138.11	137.61	130.89					
		weight - pan	103.25	106.96	105.92	105.15	104.65	97.93					
		diff from original weight		3.71	2.67	1.9	1.4	-5.32					
		diff from previous weight		3.71	-1.04	-0.77	-0.5	-6.72					
		Est H2O loss						-2.31					
		% mat loss during scan						6.28	8.44	243.40	181.13	480.00	
	5	32.75	126.68	131.12	129.25	128.4	127.98	122.55					
		weight - pan	93.93	98.37	96.5	95.65	95.23	89.60					
		diff from original weight		4.44	2.57	1.72	1.3	-4.13					
		diff from previous weight		4.44	-1.87	-0.85	-0.42	-5.43					
		Est H2O loss						-3.14					
		% mat loss during scan						5.52	8.71	193.02	122.30	417.69	
	3 mm	100 µl pan reference wt	63.76	06-Oct-05									
		ref pan weight	63.74	07-Nov-05									
		pan empty filled + cure	Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan						
	1	63.26	258.29	264.8	263.65	263.1	262.34	248.04					
		weight - pan	195.03	201.54	200.38	199.84	199.08	184.42					
		diff from original weight		6.51	5.36	4.81	4.05	-10.25					
		diff from previous weight		6.51	-1.15	-0.55	-0.76	-14.30					
		Est H2O loss						-2.46					
		% mat loss during scan						7.10	8.32	257.45	219.66	353.89	
	2	62.62	235.92	243.35	240.75	240.21	239.58	227.04					
		weight - pan	173.3	180.73	178.13	177.59	176.95	164.42					
		diff from original weight		7.43	4.83	4.29	3.66	-8.89					
		diff from previous weight		7.43	-2.6	-0.54	-0.63	-12.54					
		Est H2O loss						-3.77					
		% mat loss during scan						6.94	9.02	219.52	168.78	342.62	
	3	64	247.68	254.37	252.03	251.48	250.86	238.07					
		weight - pan	183.68	190.37	188.03	187.48	186.86	174.07					
		diff from original weight		6.69	4.35	3.9	3.19	-9.61					
		diff from previous weight		6.69	-2.34	-0.55	-0.62	-12.79					
		Est H2O loss						-3.51					
		% mat loss during scan						6.72	8.56	243.65	191.18	402.20	
	4	63.25	257.45	264.43	263	262.18	261.77	247.67					
		weight - pan	194.2	201.18	199.75	198.93	198.52	184.42					
		diff from original weight		6.98	5.55	4.73	4.32	-9.78					
		diff from previous weight		6.98	-1.43	-0.82	-0.41	-14.10					
		Est H2O loss						-3.56					
		% mat loss during scan						7.01	8.33	240.11	202.01	326.39	
	5	64.26	261.87	268.33	267.2	266.64	266.11	251.31					
		weight - pan	197.61	204.07	202.94	202.38	201.85	187.05					
		diff from original weight		6.46	5.33	4.77	4.24	-10.56					
		diff from previous weight		6.46	-1.13	-0.56	-0.53	-14.60					
		Est H2O loss						-2.72					
		% mat loss during scan						7.25	8.34	263.47	229.10	349.06	
	4 mm												
		pan empty filled + cure	Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan						
	1	64.27	322.79	330.88	329.6	329.04	328.48	309.52					
		weight - pan	258.52	266.61	265.33	264.77	264.21	245.25					
		diff from original weight		8.09	6.81	6.25	5.69	-13.27					
		diff from previous weight		8.09	-1.28	-0.56	-0.55	-18.96					
		Est H2O loss						-2.4					
		% mat loss during scan						7.11	8.01	264.03	234.36	333.22	
	2	64.67	314.62	322.61	321.09	320.55	320.1	301.61					
		weight - pan	249.95	257.94	256.42	255.88	255.43	236.94					
		diff from original weight		7.99	6.47	5.93	5.48	-13.01					
		diff from previous weight		7.99	-1.52	-0.54	-0.45	-18.49					
		Est H2O loss						-2.51					
		% mat loss during scan						7.17	8.14	262.83	231.41	337.41	
	3	64.05	300.28	308.14	306.37	305.63	305.11	287.66					
		weight - pan	236.23	244.09	242.32	241.58	241.06	223.61					
		diff from original weight		7.86	6.09	5.35	4.83	-12.62					
		diff from previous weight		7.86	-1.77	-0.74	-0.52	-17.45					
		Est H2O loss						-3.09					
		% mat loss during scan						7.15	8.39	260.56	222.01	361.28	
	4	63.21	314.03	322.12	320.89	320.22	319.54	301.62					
		weight - pan	250.82	258.91	257.68	257.01	256.33	238.41					
		diff from original weight		8.09	6.86	6.19	5.61	-12.41					
		diff from previous weight		8.09	-1.23	-0.67	-0.68	-17.92					
		Est H2O loss						-2.58					
		% mat loss during scan						6.82	7.92	253.40	221.51	325.23	
	5	62.89	319.9	328.1	326.61	325.84	325.37	306.91					
		weight - pan	257.01	265.21	263.72	262.95	262.48	244.02					
		diff from original weight		8.2	6.71	5.94	5.47	-12.99					
		diff from previous weight		8.2	-1.49	-0.77	-0.47	-16.46					
		Est H2O loss						-2.73					
		% mat loss during scan						8.96	7.99	258.41	225.12	337.48	

Table 121. Fuji II LC Three-Month Thermal Weight Data

Fuji II LC 3 Month TIDSC DEPTH OF CURE				Weights in mg									
2mm	40 µl pan	ref pan weight	33.14	04-Oct-05									
		ref pan weight	33.13	04-Jan-06									
		pan empty filled + cure			Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan	Total%loss	Total/Gain%	Scan/Gain%	Scan/H2Oret%
	1	32.83	113.6		115.66	114.73	114.39	114.06	109.48				
		weight - pan	80.77		82.83	81.9	81.56	81.23	76.65				
		diff from original weight			2.06	1.13	0.79	0.46	-4.12				
		diff from previous weight			2.06	-0.93	-0.34	-0.33	-4.58				
		Est H2O loss	%H2O loss					-1.6	1.93				
		% mat loss during scan							4.62	7.46	300.00	222.33	995.65
	2	32.91	108.7		110.52	109.85	109.47	109.19	105.16				
		weight - pan	75.79		77.61	76.94	76.56	76.28	72.25				
		diff from original weight			1.82	1.15	0.77	0.49	-3.54				
		diff from previous weight			1.82	-0.67	-0.38	-0.28	-4.03				
		Est H2O loss	%H2O loss					-1.33	1.71				
		% mat loss during scan							3.69	6.91	294.51	221.43	822.45
	3	32.95	108.77		110.12	109.32	108.99	108.62	104.77				
		weight - pan	75.82		77.17	76.37	76.04	75.67	71.82				
		diff from original weight			1.35	0.55	0.22	-0.15	-4.00				
		diff from previous weight			1.35	-0.8	-0.33	-0.37	-3.95				
		Est H2O loss	%H2O loss					-1.5	1.94				
		% mat loss during scan							3.54	6.93	396.30	285.19	2566.67
	4	33.42	115.58		117.6	116.87	116.68	116.23	111.47				
		weight - pan	82.16		84.18	83.45	83.26	82.81	78.05				
		diff from original weight			2.02	1.29	1.1	0.65	-4.11				
		diff from previous weight			2.02	-0.73	-0.19	-0.45	-4.76				
		Est H2O loss	%H2O loss					-1.37	1.63				
		% mat loss during scan							4.30	7.28	303.47	235.64	732.31
	5	32.81	126.35		128.7	127.95	127.55	127.29	121.77				
		weight - pan	93.54		95.89	95.14	94.74	94.48	88.96				
		diff from original weight			2.35	1.6	1.2	0.94	-4.58				
		diff from previous weight			2.35	-0.75	-0.4	-0.26	-5.52				
		Est H2O loss	%H2O loss					-1.41	1.47				
		% mat loss during scan							4.34	7.23	294.89	234.89	587.23
	100 µl pan reference wt		63.45	04-Oct-05									
		ref pan weight	63.47	04-Jan-06									
		pan empty filled + cure			Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan				
	1	64.19	216.01		219.63	218.96	218.5	218.14	208.24				
		weight - pan	151.82		155.44	154.77	154.31	153.95	144.05				
		diff from original weight			3.62	2.95	2.49	2.13	-7.77				
		diff from previous weight			3.62	-0.67	-0.46	-0.36	-9.90				
		Est H2O loss	%H2O loss					-1.45	0.85				
		% mat loss during scan							4.54	7.33	314.64	273.48	464.79
	2	63.95	233.64		238.22	237.2	236.54	236.2	225.00				
		weight - pan	169.69		174.27	173.25	172.59	172.25	161.05				
		diff from original weight			4.58	3.56	2.9	2.56	-8.64				
		diff from previous weight			4.58	-1.02	-0.66	-0.34	-11.20				
		Est H2O loss	%H2O loss					-1.22	0.85				
		% mat loss during scan							4.74	7.59	288.65	244.54	437.50
	3	64.06	208.48		212.03	211.29	211.01	210.56	201.01				
		weight - pan	144.42		147.97	147.23	146.95	146.5	136.95				
		diff from original weight			3.55	2.81	2.53	2.08	-7.47				
		diff from previous weight			3.55	-0.74	-0.28	-0.45	-9.55				
		Est H2O loss	%H2O loss					-1.47	0.85				
		% mat loss during scan							4.54	7.45	310.42	269.01	459.13
	4	64.24	245.48		250.2	249.4	248.91	248.4	236.26				
		weight - pan	181.24		185.96	185.16	184.67	184.16	172.02				
		diff from original weight			4.72	3.92	3.43	2.92	-9.22				
		diff from previous weight			4.72	-0.8	-0.49	-0.51	-12.14				
		Est H2O loss	%H2O loss					-1.8	0.97				
		% mat loss during scan							4.89	7.50	295.34	257.20	415.75
	5	64.64	237.05		241.35	240.56	240.03	239.7	228.39				
		weight - pan	172.41		176.71	175.92	175.39	175.06	163.75				
		diff from original weight			4.3	3.51	2.98	2.65	-8.66				
		diff from previous weight			4.3	-0.79	-0.53	-0.33	-11.31				
		Est H2O loss	%H2O loss					-1.65	0.93				
		% mat loss during scan							4.72	7.33	301.40	263.02	426.79
		pan empty filled + cure			Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan				
	1	63.61	301.06		308.5	307.71	307.24	306.8	289.98				
		weight - pan	238.25		244.89	244.1	243.63	243.19	226.37				
		diff from original weight			6.64	5.85	5.38	4.94	-11.88				
		diff from previous weight			6.64	-0.79	-0.47	-0.44	-16.02				
		Est H2O loss	%H2O loss					-1.7	0.68				
		% mat loss during scan							5.48	7.56	278.92	253.31	340.49
	2	63.82	305.74		311.67	310.92	310.59	310.22	293.84				
		weight - pan	241.92		247.85	247.1	246.77	246.4	230.02				
		diff from original weight			5.93	5.18	4.85	4.48	-11.90				
		diff from previous weight			5.93	-0.75	-0.33	-0.37	-16.38				
		Est H2O loss	%H2O loss					-1.45	0.68				
		% mat loss during scan							5.28	7.19	308.67	276.22	365.63
	3	64.01	312.58		318.12	317.4	317.04	316.72	301.40				
		weight - pan	248.57		254.11	253.39	253.03	252.71	237.39				
		diff from original weight			5.54	4.82	4.46	4.14	-11.18				
		diff from previous weight			5.54	-0.72	-0.36	-0.32	-15.32				
		Est H2O loss	%H2O loss					-1.4	0.65				
		% mat loss during scan							4.84	6.58	301.81	276.53	370.05
	4	63.59	304.05		310.39	309.36	308.74	308.25	292.23				
		weight - pan	240.46		246.8	245.77	245.15	244.66	228.64				
		diff from original weight			6.34	5.31	4.69	4.2	-11.82				
		diff from previous weight			6.34	-1.03	-0.62	-0.49	-16.02				
		Est H2O loss	%H2O loss					-2.14	0.87				
		% mat loss during scan							5.20	7.36	286.44	252.68	381.43
	5	63.56	289.38		295.56	294.68	294.16	293.74	277.28				
		weight - pan	225.82		232	231.12	230.6	230.18	213.72				
		diff from original weight			6.18	5.3	4.78	4.36	-12.10				
		diff from previous weight			6.18	-0.88	-0.52	-0.42	-16.46				
		Est H2O loss	%H2O loss					-1.82	0.78				
		% mat loss during scan							5.88	7.88	295.79	266.34	377.52

Table 122. Photac-Fil Quick Immediate Thermal Weight Data

Photac-Fil Quick Immediate Thermal Weight Data Weights in mg															
2mm	40 µl pan	ref pan weight	33.1												
			pan empty filled + cure	Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan	Total % loss						
2mm	40 µl pan	ref pan weight	33.1	1	30.98	106.04	106.04	105.71	105.45	105.19	102.05				
				weight - pan	75.06	75.06	74.73	74.47	74.21	71.07					
				diff from original weight	0	0	-0.33	-0.59	-0.85	-3.99					
				diff from previous weight	0	0	-0.33	-0.26	-0.26	-3.14					
				Est H2O loss	0	0	0	0	0.85	1.13					
				% mat loss during scan						4.18	5.32				
				2	31.3	113.59	113.59	113.26	113.02	112.85	109.48				
				weight - pan	82.29	82.29	81.98	81.72	81.55	78.18					
				diff from original weight	0	0	-0.31	-0.57	-0.74	-4.11					
				diff from previous weight	0	0	-0.31	-0.26	-0.17	-3.37					
				Est H2O loss	0	0	0	0	0.74	0.90					
				% mat loss during scan						4.19	4.99				
				3	32.85	104.16	104.16	101.2	100.97	100.78	97.82				
				weight - pan	71.31	68.61	68.35	68.12	67.93	64.97					
				diff from original weight	-2.7	-2.96	-3.19	-3.38	-3.38	-6.34					
diff from previous weight	-2.7	-2.7	-0.26	-0.23	-0.19	-2.96									
Est H2O loss	0	0	0	0	0.66	0.99									
% mat loss during scan						4.31	5.31								
4	33.44	109.23	109.23	108.74	108.53	108.38	105.44								
weight - pan	75.79	75.79	75.3	75.09	74.94	72.00									
diff from original weight	0	0	-0.49	-0.7	-0.85	-3.79									
diff from previous weight	0	0	-0.49	-0.21	-0.15	-2.94									
Est H2O loss	0	0	0	0	0.85	1.12									
% mat loss during scan						3.68	5.00								
5	31.54	123.95	123.95	123.59	123.42	123.26	118.67								
weight - pan	92.41	92.41	92.04	91.88	91.72	87.13									
diff from original weight	0	0	-0.37	-0.53	-0.69	-5.28									
diff from previous weight	0	0	-0.37	-0.16	-0.16	-4.59									
Est H2O loss	0	0	0	0	0.69	0.75									
% mat loss during scan						4.97	5.71								
3mm	100 µl pan reference wt	ref pan weight	63.74	1	61.26	259.12	259.12	258.61	258.36	258.1	248.24				
				weight - pan	197.86	197.86	197.35	197.1	196.84	186.98					
				diff from original weight	0	0	-0.51	-0.76	-1.02	-10.88					
				diff from previous weight	0	0	-0.51	-0.25	-0.26	-9.86					
				Est H2O loss	0	0	0	0	1.02	0.52					
				% mat loss during scan						4.98	5.50				
				2	61.25	268.09	268.09	267.53	267.22	267.04	256.50				
				weight - pan	206.84	206.84	206.28	205.97	205.79	195.25					
				diff from original weight	0	0	-0.66	-0.87	-1.05	-11.59					
				diff from previous weight	0	0	-0.66	-0.31	-0.18	-10.54					
				Est H2O loss	0	0	0	0	1.05	0.51					
				% mat loss during scan						5.19	5.60				
				3	61.3	254.46	254.46	253.9	253.68	253.44	247.64				
				weight - pan	193.16	193.16	192.6	192.38	192.14	186.34					
				diff from original weight	0	0	-0.66	-0.78	-1.02	-6.82					
diff from previous weight	0	0	-0.66	-0.22	-0.24	-5.80									
Est H2O loss	0	0	0	0	1.02	0.53									
% mat loss during scan						3.90	3.53								
4	61.31	246.11	246.11	245.62	245.33	245.15	239.40								
weight - pan	184.8	184.8	184.31	184.02	183.84	178.09									
diff from original weight	0	0	-0.49	-0.78	-0.96	-6.71									
diff from previous weight	0	0	-0.49	-0.29	-0.18	-5.75									
Est H2O loss	0	0	0	0	0.96	0.52									
% mat loss during scan						3.11	3.63								
5	61.33	289.3	289.3	288.65	288.5	288.31	276.34								
weight - pan	227.97	227.97	227.52	227.17	226.98	215.01									
diff from original weight	0	0	-0.45	-0.8	-0.98	-12.96									
diff from previous weight	0	0	-0.45	-0.35	-0.19	-11.97									
Est H2O loss	0	0	0	0	0.98	0.43									
% mat loss during scan						5.23	5.68								
4mm	100 µl pan reference wt	ref pan weight	63.74	1	61.73	364.49	364.49	364.03	363.84	363.64	346.67				
				weight - pan	302.76	302.76	302.3	302.11	301.91	284.94					
				diff from original weight	0	0	-0.46	-0.65	-0.85	-17.82					
				diff from previous weight	0	0	-0.46	-0.19	-0.2	-16.97					
				Est H2O loss	0	0	0	0	0.85	0.78					
				% mat loss during scan						5.61	5.89				
				2	61.15	346.35	346.35	345.96	345.68	345.48	329.29				
				weight - pan	285.2	285.2	284.83	284.53	284.33	268.14					
				diff from original weight	0	0	-0.37	-0.67	-0.87	-17.06					
				diff from previous weight	0	0	-0.37	-0.3	-0.2	-16.19					
				Est H2O loss	0	0	0	0	0.87	0.31					
				% mat loss during scan						5.68	5.98				
				3	61.8	363.51	363.51	363.16	362.82	362.58	346.10				
				weight - pan	301.71	301.71	301.36	301.02	300.78	284.30					
				diff from original weight	0	0	-0.35	-0.69	-0.93	-17.41					
diff from previous weight	0	0	-0.35	-0.34	-0.24	-16.46									
Est H2O loss	0	0	0	0	0.93	0.31									
% mat loss during scan						5.46	5.77								
4	61.11	376.56	376.56	376.08	375.58	375.33	356.99								
weight - pan	315.45	315.45	314.97	314.47	314.22	296.88									
diff from original weight	0	0	-0.48	-0.98	-1.23	-19.57									
diff from previous weight	0	0	-0.48	-0.5	-0.25	-18.34									
Est H2O loss	0	0	0	0	1.23	0.39									
% mat loss during scan						5.81	6.20								
5	62.15	358.75	358.75	358.37	358.18	357.93	341.41								
weight - pan	296.6	296.6	296.22	296.03	295.78	279.26									
diff from original weight	0	0	-0.38	-0.57	-0.82	-17.34									
diff from previous weight	0	0	-0.38	-0.19	-0.25	-16.52									
Est H2O loss	0	0	0	0	0.82	0.29									
% mat loss during scan						5.57	5.85								

Table 123. Photac-Fil Quick 24-Hour Thermal Weight Data

Photac-Fil Quick 24 Hour Thermal Weight Data		Weights in mg										
2mm	40 µl pan	ref pan weight	33.1									
		pan empty filled + cure	Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan	Total % loss	Total % Gain	% Scan/Gain	% Scan/RetH2O	%
1		31.71 106.75	107.31	106.29	105.9	105.55	101.27					
	weight - pan	75.04	75.6	74.58	74.19	73.84	69.51					
	diff from original weight		0.56	-0.46	-0.85	-1.2	-5.63					
	diff from previous weight		0.56	-1.02	-0.39	-0.35	-4.33					
	Est H2O loss					1.75	2.33					
	% mat loss during scan						5.73	8.06	1087.50	773.21	360.83	
2		30.92 107.73	109.02	108.23	107.74	107.48	103.25					
	weight - pan	76.81	78.1	77.31	76.82	76.56	72.33					
	diff from original weight		1.29	0.5	0.01	-0.25	-4.48					
	diff from previous weight		1.29	-0.75	-0.49	-0.25	-4.23					
	Est H2O loss					1.54	1.37					
	% mat loss during scan						5.42	7.39	447.29	327.91	1692.00	
3		32.13 104.39	105.7	104.8	104.42	104.14	100.04					
	weight - pan	72.26	73.57	72.67	72.29	72.01	67.91					
	diff from original weight		1.31	0.41	0.03	-0.25	-4.35					
	diff from previous weight		1.31	-0.9	-0.38	-0.28	-4.10					
	Est H2O loss					1.56	2.12					
	% mat loss during scan						3.57	7.69	432.06	312.98	1640.00	
4		31.98 127.82	129.23	128.28	127.87	127.5	122.27					
	weight - pan	95.84	97.25	96.3	95.89	95.52	90.29					
	diff from original weight		1.41	0.46	0.05	-0.32	-5.55					
	diff from previous weight		1.41	-0.95	-0.41	-0.37	-5.23					
	Est H2O loss					1.73	1.78					
	% mat loss during scan						3.38	7.16	493.62	370.92	1634.38	
5		31.45 110.65	112	111.23	110.8	110.51	106.91					
	weight - pan	79.21	80.55	79.78	79.35	79.06	75.45					
	diff from original weight		1.34	0.57	0.14	-0.15	-3.75					
	diff from previous weight		1.34	-0.77	-0.43	-0.29	-3.60					
	Est H2O loss					1.49	1.56					
	% mat loss during scan						4.47	6.32	379.85	268.66	2400.00	
3 mm	100 µl pan	reference wt	63.74									
		pan empty filled + cure	Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan					
1		61.69 252.68	255.13	254.03	253.43	252.89	239.91					
	weight - pan	190.99	193.44	192.34	191.74	191.2	178.22					
	diff from original weight		2.45	1.35	0.75	0.21	-12.77					
	diff from previous weight		2.45	-1.1	-0.5	-0.54	-12.98					
	Est H2O loss					2.24	1.15					
	% mat loss during scan						6.71	7.87	621.22	529.80	6180.95	
2		61.45 242.27	247.6	244.46	243.75	243.14	229.54					
	weight - pan	180.82	186.15	183.01	182.3	181.69	168.09					
	diff from original weight		5.33	2.19	1.48	0.67	-12.73					
	diff from previous weight		5.33	-3.14	-0.71	-0.61	-13.60					
	Est H2O loss					4.46	2.40					
	% mat loss during scan						7.31	9.70	338.84	255.16	1563.22	
3		62.08 247.55	251.48	249.78	249.09	248.64	235.16					
	weight - pan	185.47	189.4	187.7	187.01	186.56	173.08					
	diff from original weight		3.93	2.23	1.54	1.09	-12.39					
	diff from previous weight		3.93	-1.7	-0.69	-0.45	-13.48					
	Est H2O loss					2.64	1.50					
	% mat loss during scan						7.12	8.62	415.27	343.00	1236.70	
4		61.85 248.78	253.62	251.67	250.89	250.32	235.99					
	weight - pan	186.93	191.77	189.82	189.04	188.47	174.14					
	diff from original weight		4.84	2.89	2.11	1.54	-12.79					
	diff from previous weight		4.84	-1.95	-0.78	-0.57	-14.33					
	Est H2O loss					3.3	1.72					
	% mat loss during scan						7.47	9.19	364.26	296.07	930.52	
5		61.12 262.42	266.1	264.34	263.71	263.23	248.82					
	weight - pan	201.3	204.98	203.22	202.59	202.11	187.70					
	diff from original weight		3.68	1.92	1.29	0.81	-13.60					
	diff from previous weight		3.68	-1.76	-0.63	-0.48	-14.41					
	Est H2O loss					2.97	1.40					
	% mat loss during scan						7.03	8.43	469.57	391.58	1779.01	
4mm		pan empty filled + cure	Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan					
1		61.63 386.52	389.91	388.14	387.34	386.68	367.86					
	weight - pan	324.89	328.28	326.51	325.71	325.05	306.23					
	diff from original weight		3.39	1.62	0.82	0.16	-18.86					
	diff from previous weight		3.39	-1.77	-0.6	-0.66	-18.82					
	Est H2O loss					3.23	0.38					
	% mat loss during scan						5.73	6.72	650.44	555.16	11762.50	
2		60.99 375.78	379.55	377.83	376.73	376.12	356.88					
	weight - pan	314.79	318.56	316.84	315.74	315.13	295.89					
	diff from original weight		3.77	2.05	0.95	0.34	-18.90					
	diff from previous weight		3.77	-1.72	-1.1	-0.61	-19.24					
	Est H2O loss					3.43	1.03					
	% mat loss during scan						6.84	7.12	601.33	510.34	5658.82	
3		61.31 334.76	341.2	337.99	336.94	336.24	316.96					
	weight - pan	273.45	279.89	276.68	275.63	274.93	255.65					
	diff from original weight		6.44	3.23	2.18	1.48	-17.80					
	diff from previous weight		6.44	-3.21	-1.05	-0.7	-19.28					
	Est H2O loss					4.98	1.77					
	% mat loss during scan						6.89	8.66	376.40	299.38	1302.70	
4		62.03 335.89	340.01	338.65	337.65	336.96	317.13					
	weight - pan	273.86	277.98	276.52	275.62	274.93	255.10					
	diff from original weight		4.12	2.66	1.76	1.07	-18.76					
	diff from previous weight		4.12	-1.46	-0.9	-0.69	-19.83					
	Est H2O loss					3.05	1.10					
	% mat loss during scan						7.13	8.23	555.34	481.31	1853.27	
5		61.39 355.21	358.87	357.2	356.32	355.77	337.26					
	weight - pan	293.82	297.48	295.81	294.93	294.38	275.87					
	diff from original weight		3.66	1.99	1.11	0.56	-17.95					
	diff from previous weight		3.66	-1.67	-0.88	-0.55	-18.51					
	Est H2O loss					3.1	1.04					
	% mat loss during scan						6.22	7.26	590.44	505.74	3305.36	

Table 124. Photac-Fil Quick One-Week Thermal Weight Data

Photac-Fil Quick 1 Week Thermal Weight Data		Weights in mg													
2mm	40 µl pan	ref pan weight	33.1	13-Oct-05											
		ref pan weight	33.07	20-Oct-05											
		pan empty filled + cure		Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan	Total%loss	Total/Gain%	Scan/Gain%	Scan/RetH2O			
	1	32.62	125.49	126.76	126.14	125.88	126.15	120.12							
		weight - pan	92.87	94.14	93.52	93.26	93.53	87.5							
		diff from original weight		1.27	0.65	0.39	0.66	-5.37							
		diff from previous weight		1.27	-0.62	-0.26	0.27	-6.03							
		Est H2O loss					0.61	0.65							
		% mat loss during scan						6.41	7.05	522.83	474.80	913.64			
	2	32.96	140.04	141.82	140.89	140.55	140.2	133.57							
		weight - pan	107.08	108.66	107.93	107.59	107.24	100.61							
		diff from original weight		1.78	0.85	0.51	0.16	-6.47							
		diff from previous weight		1.78	-0.93	-0.34	-0.35	-6.63							
		Est H2O loss					1.82	1.49							
		% mat loss during scan						6.09	7.58	463.48	372.47	4143.75			
3	32.8	127.3	128.93	127.93	127.62	127.27	121.92								
	weight - pan	94.5	96.13	95.13	94.62	94.47	89.12								
	diff from original weight		1.63	0.63	0.32	-0.03	-5.38								
	diff from previous weight		1.63	-1	-0.31	-0.35	-5.35								
	Est H2O loss					1.86	1.73								
	% mat loss during scan						5.57	7.29	430.06	328.22	-17833.33				
4	32.93	127.61	129.12	128.36	128.02	127.73	121.91								
	weight - pan	94.68	96.19	95.43	95.09	94.8	88.98								
	diff from original weight		1.51	0.75	0.41	0.12	-5.70								
	diff from previous weight		1.51	-0.76	-0.34	-0.25	-6.02								
	Est H2O loss					1.39	1.45								
	% mat loss during scan						6.05	7.50	477.48	385.43	4850.00				
5	32.64	122.31	123.84	122.91	122.51	122.12	116.78								
	weight - pan	89.67	91.2	90.27	89.87	89.48	84.14								
	diff from original weight		1.53	0.6	0.2	-0.19	-5.53								
	diff from previous weight		1.53	-0.93	-0.4	-0.39	-5.34								
	Est H2O loss					1.72	1.85								
	% mat loss during scan						5.86	7.74	461.44	349.02	-2810.53				
3 mm	100 µl pan reference wt	ref pan weight	63.74	13-Oct-05											
		ref pan weight	63.88	20-Oct-05											
		pan empty filled + cure		Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan	Total%loss	Total/Gain%	Scan/Gain%	Scan/RetH2O			
	1	63.26	236.38	239.36	238.48	237.98	237.51	226.03							
		weight - pan	173.12	176.1	175.22	174.72	174.25	162.77							
		diff from original weight		2.98	2.1	1.6	1.13	-10.35							
		diff from previous weight		2.98	-0.88	-0.5	-0.47	-11.48							
		Est H2O loss					1.85	1.05							
		% mat loss during scan						6.52	7.57	447.32	385.23	1015.93			
	2	63.71	261.84	264.76	264.12	263.55	263.19	250.46							
		weight - pan	198.13	201.05	200.41	199.84	199.48	186.75							
		diff from original weight		2.92	2.28	1.71	1.35	-11.38							
		diff from previous weight		2.92	-0.64	-0.57	-0.36	-12.73							
		Est H2O loss					1.57	0.78							
		% mat loss during scan						6.33	7.11	489.73	435.96	942.96			
3	64.58	250.03	252.82	252.04	251.46	251.11	238.60								
	weight - pan	185.45	188.24	187.46	186.88	186.53	174.02								
	diff from original weight		2.79	2.01	1.43	1.08	-11.43								
	diff from previous weight		2.79	-0.78	-0.58	-0.35	-12.51								
	Est H2O loss					1.71	0.91								
	% mat loss during scan						6.65	7.55	509.68	448.39	1158.33				
4	63.52	254.51	257.79	256.61	256.28	255.77	243.53								
	weight - pan	190.99	194.27	193.09	192.76	192.25	180.01								
	diff from original weight		3.28	2.1	1.77	1.26	-10.96								
	diff from previous weight		3.28	-1.18	-0.33	-0.51	-12.24								
	Est H2O loss					2.02	1.04								
	% mat loss during scan						6.38	7.34	434.76	373.17	971.43				
5	62.96	248.61	252.09	251.05	250.6	250.14	237.90								
	weight - pan	185.65	189.13	188.09	187.64	187.18	174.94								
	diff from original weight		3.48	2.44	1.99	1.53	-10.71								
	diff from previous weight		3.48	-1.04	-0.45	-0.46	-12.24								
	Est H2O loss					1.96	1.01								
	% mat loss during scan						6.47	7.50	407.76	351.72	800.00				
4MM		pan empty filled + cure		Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan	Total%loss	Total/Gain%	Scan/Gain%	Scan/RetH2O			
	1	63.49	301.34	305.51	304.52	304.03	303.58	287.01							
		weight - pan	237.85	242.02	241.03	240.54	240.09	223.52							
		diff from original weight		4.17	3.18	2.69	2.24	-14.33							
		diff from previous weight		4.17	-0.99	-0.49	-0.45	-16.57							
		Est H2O loss					1.93	0.80							
		% mat loss during scan						6.89	7.64	443.65	397.36	739.73			
	2	64.36	296.24	300.1	299.21	298.66	298.25	282.70							
		weight - pan	231.88	235.74	234.85	234.3	233.89	218.34							
		diff from original weight		3.86	2.97	2.42	2.01	-13.54							
		diff from previous weight		3.86	-0.89	-0.55	-0.41	-15.55							
		Est H2O loss					1.86	0.78							
		% mat loss during scan						6.68	7.38	450.78	402.85	773.63			
	3	63.94	294.26	298.04	297.13	296.59	296.12	279.93							
		weight - pan	230.32	234.1	233.19	232.65	232.18	215.98							
	diff from original weight		3.78	2.87	2.33	1.86	-14.33								
	diff from previous weight		3.78	-0.91	-0.54	-0.47	-16.19								
	Est H2O loss					1.92	0.82								
	% mat loss during scan						6.92	7.74	479.10	428.31	870.43				
4	63.2	302.01	305.78	304.8	304.18	303.79	288.36								
	weight - pan	238.81	242.58	241.6	240.98	240.58	225.16								
	diff from original weight		3.77	2.79	2.17	1.78	-13.65								
	diff from previous weight		3.77	-0.98	-0.62	-0.39	-15.43								
	Est H2O loss					1.99	0.82								
	% mat loss during scan						6.38	7.18	462.07	409.28	866.85				
5	63.45	300.19	303.72	302.73	302.35	301.92	286.22								
	weight - pan	236.74	240.27	239.28	238.9	238.47	222.77								
	diff from original weight		3.53	2.54	2.16	1.73	-13.97								
	diff from previous weight		3.53	-0.99	-0.39	-0.43	-15.70								
	Est H2O loss					1.74	0.75								
	% mat loss during scan						6.53	7.28	495.75	444.76	907.51				

**Table 125. Photac-Fil Quick One-Month Thermal Weight Data**

Photac-Fil Quick 1 Month Thermal Weight Data		Weights in mg											
2mm	40 µl pan	ref pan weight	33.12 mg	13-Oct-05									
		ref pan weight	33.13	13-Nov-05									
pan empty/illed + cure		Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan	Total%loss	Total/Gain%	Scan/Gain%	Scan/RetH2O%			
1	33.21	130.15	131.28	130.59	130.23	129.97	123.87						
weight - pan	96.94		98.07	97.96	97.02	96.78	90.66						
diff from original weight			1.13	0.44	0.08	-0.18	-6.28						
diff from previous weight			1.13	-0.69	-0.36	-0.26	-6.10						
Est H2O loss						-1.31	1.34						
% mat loss during scan							6.22	7.56	655.75	539.82	3388.89		
2	32.56	123.81	125.48	124.54	124.02	123.78	118.54						
weight - pan	91.25		92.92	91.96	91.46	91.22	85.98						
diff from original weight			1.67	0.73	0.21	-0.03	-5.27						
diff from previous weight			1.67	-0.94	-0.52	-0.24	-5.24						
Est H2O loss						-1.7	1.83						
% mat loss during scan							5.64	7.47	415.57	313.77	17466.67		
3	32.74	123.73	125.4	124.57	124.14	123.77	118.23						
weight - pan	90.99		92.66	91.83	91.4	91.03	86.49						
diff from original weight			1.67	0.84	0.41	0.04	-5.50						
diff from previous weight			1.67	-0.83	-0.43	-0.37	-5.54						
Est H2O loss						-1.63	1.78						
% mat loss during scan							5.98	7.74	429.34	331.74	13850.00		
4	33.4	141.69	143.81	142.82	142.38	142.1	134.90						
weight - pan	108.29		110.41	109.42	108.98	108.7	101.50						
diff from original weight			2.12	1.13	0.69	0.41	-6.79						
diff from previous weight			2.12	-0.99	-0.44	-0.28	-7.20						
Est H2O loss						-1.71	1.85						
% mat loss during scan							6.52	8.07	420.28	339.62	1756.10		
5	33.3	144.2	146.56	145.59	145.15	144.82	137.62						
weight - pan	110.9		113.26	112.29	111.85	111.52	104.32						
diff from original weight			2.36	1.39	0.95	0.62	-6.58						
diff from previous weight			2.36	-0.97	-0.44	-0.33	-7.20						
Est H2O loss						-1.74	1.84						
% mat loss during scan							6.36	7.89	378.81	305.08	1161.29		
3 mm	100 µl pan	reference wt	63.45	15-Oct-05									
		ref pan weight	63.47	15-Nov-05									
pan empty/illed + cure		Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan							
1	64.98	242.47	246.06	244.99	244.41	243.96	231.42						
weight - pan	177.49		181.08	180.01	179.43	178.98	166.44						
diff from original weight			3.59	2.52	1.94	1.49	-11.05						
diff from previous weight			3.59	-1.07	-0.58	-0.46	-12.54						
Est H2O loss						-2.1	1.16						
% mat loss during scan							6.93	8.08	407.80	349.30	841.61		
2	62.37	243.25	246.73	245.8	245.24	244.91	232.29						
weight - pan	180.88		184.36	183.43	182.87	182.54	169.92						
diff from original weight			3.48	2.55	1.99	1.66	-10.96						
diff from previous weight			3.48	-0.93	-0.56	-0.33	-12.62						
Est H2O loss						-1.82	0.93						
% mat loss during scan							6.85	7.83	414.94	362.64	760.24		
3	64.07	246.88	250.38	249.43	249	248.75	236.97						
weight - pan	182.81		186.31	185.36	184.93	184.68	171.90						
diff from original weight			3.5	2.55	2.12	1.87	-10.91						
diff from previous weight			3.5	-0.95	-0.43	-0.26	-12.78						
Est H2O loss						-1.83	0.87						
% mat loss during scan							6.86	7.73	411.71	365.14	683.42		
4	63.4	259.55	263.13	262.26	261.76	261.41	248.12						
weight - pan	196.15		199.73	198.86	198.36	198.01	184.72						
diff from original weight			3.58	2.71	2.21	1.86	-11.43						
diff from previous weight			3.58	-0.87	-0.5	-0.35	-13.28						
Est H2O loss						-1.72	0.93						
% mat loss during scan							6.69	7.52	419.27	371.23	714.52		
5	62.93	249.33	253.05	252.12	251.75	251.42	238.52						
weight - pan	186.4		190.12	189.19	188.82	188.49	175.59						
diff from original weight			3.72	2.79	2.42	2.09	-10.81						
diff from previous weight			3.72	-0.93	-0.37	-0.33	-12.90						
Est H2O loss						-1.63	0.85						
% mat loss during scan							6.79	7.64	390.59	346.77	617.22		
4mm													
pan empty/illed + cure		Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan							
1	64.32	307.44	313.54	312	311.55	311.11	292.97						
weight - pan	243.12		249.22	247.68	247.23	246.79	226.85						
diff from original weight			6.1	4.56	4.11	3.67	-14.47						
diff from previous weight			6.1	-1.54	-0.45	-0.44	-18.14						
Est H2O loss						-2.43	0.99						
% mat loss during scan							7.28	8.25	337.21	297.38	494.28		
2	64.12	304.29	309.23	307.79	307.33	306.93	289.03						
weight - pan	240.17		245.11	243.67	243.21	242.81	224.91						
diff from original weight			4.94	3.5	3.04	2.64	-15.26						
diff from previous weight			4.94	-1.44	-0.46	-0.4	-17.90						
Est H2O loss						-1.3	0.84						
% mat loss during scan							7.30	8.24	408.91	362.35	678.03		
3	64.09	307.15	311.87	310.97	310.43	310.03	292.72						
weight - pan	243.06		247.78	246.88	246.34	245.94	228.63						
diff from original weight			4.72	3.82	3.26	2.88	-14.43						
diff from previous weight			4.72	-0.9	-0.54	-0.4	-17.31						
Est H2O loss						-1.84	0.74						
% mat loss during scan							6.99	7.73	405.72	366.74	601.04		
4	63.53	307.53	312.42	311.45	310.89	310.44	292.76						
weight - pan	244		248.89	247.92	247.36	246.91	229.23						
diff from original weight			4.89	3.92	3.36	2.91	-14.77						
diff from previous weight			4.89	-0.97	-0.56	-0.45	-17.68						
Est H2O loss						-1.98	0.80						
% mat loss during scan							7.18	7.90	402.04	361.55	607.56		
5	63.75	303.05	306.44	305.99	305.63	305.23	287.95						
weight - pan	239.3		242.69	242.24	241.88	241.48	224.20						
diff from original weight			3.39	2.94	2.58	2.18	-15.10						
diff from previous weight			3.39	-0.45	-0.36	-0.4	-17.28						
Est H2O loss						-1.21	0.60						
% mat loss during scan							7.12	7.62	545.43	509.73	792.66		

Table 126. Photac-Fil Quick Three-Month Thermal Weight Data

Photac-Fil Quick 24 Hour Thermal Weight Data		Weights in mg									
2mm	40 µl pan	ref pan weight	33.1								
pan empty filled + cure		Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan	Total%loss	Total/Gain%	Scan/Gain%	Scan/RetH2O%	
1	31.71	106.75	107.31	106.29	105.9	105.55	101.22				
weight - pan	75.04	75.6	74.58	74.19	73.84	69.61					
diff from original weight		0.56	-0.46	-0.85	-1.2	-5.53					
diff from previous weight			0.56	-1.02	-0.39	-0.35	-4.33				
Est H2O loss						-1.78					
% mat loss during scan						5.73	8.06	1087.50	773.21	360.83	
2	30.92	107.73	109.02	108.23	107.74	107.48	103.25				
weight - pan	76.81	78.1	77.31	76.82	76.96	72.33					
diff from original weight		1.29	0.5	0.01	-0.25	-4.48					
diff from previous weight		1.29	-0.79	-0.49	-0.26	-4.23					
Est H2O loss						-1.54					
% mat loss during scan						5.42	7.39	447.29	327.91	1692.00	
3	32.13	104.39	105.7	104.8	104.42	104.14	100.04				
weight - pan	72.26	73.57	72.67	72.29	72.01	67.91					
diff from original weight		1.31	0.41	0.03	-0.25	-4.35					
diff from previous weight		1.31	-0.9	-0.38	-0.28	-4.10					
Est H2O loss						-1.56					
% mat loss during scan						5.57	7.69	432.06	312.98	1640.00	
4	31.98	127.82	129.23	128.28	127.87	127.5	122.27				
weight - pan	95.84	97.25	96.3	95.89	95.52	90.29					
diff from original weight		1.41	0.46	0.05	-0.32	-5.55					
diff from previous weight		1.41	-0.95	-0.41	-0.37	-5.23					
Est H2O loss						-1.73					
% mat loss during scan						5.38	7.16	493.62	370.92	1634.38	
5	31.45	110.66	112	111.23	110.8	110.51	106.91				
weight - pan	79.21	80.55	79.78	79.35	79.06	75.46					
diff from original weight		1.34	0.57	0.14	-0.15	-3.75					
diff from previous weight		1.34	-0.77	-0.43	-0.29	-3.60					
Est H2O loss						-1.49					
% mat loss during scan						4.47	6.32	379.85	268.66	2400.00	
3 mm	100 µl pan reference wt	63.74									
pan empty filled + cure		Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan					
1	61.69	252.68	255.13	254.03	253.43	252.89	239.91				
weight - pan	190.99	193.44	192.34	191.74	191.2	178.22					
diff from original weight		2.45	1.36	0.75	0.21	-12.77					
diff from previous weight		2.45	-1.1	-0.6	-0.54	-12.98					
Est H2O loss						-2.24					
% mat loss during scan						6.71	7.87	621.22	529.80	6180.95	
2	61.45	242.27	247.6	244.46	243.75	243.14	229.54				
weight - pan	180.82	186.15	183.01	182.3	181.69	168.09					
diff from original weight		5.33	2.19	1.48	0.87	-12.73					
diff from previous weight		5.33	-3.14	-0.71	-0.61	-13.60					
Est H2O loss						-4.48					
% mat loss during scan						7.31	9.70	338.84	255.16	1563.22	
3	62.08	247.55	251.48	249.78	249.09	248.64	235.16				
weight - pan	185.47	189.4	187.7	187.01	186.56	173.08					
diff from original weight		3.93	2.23	1.54	1.09	-12.39					
diff from previous weight		3.93	-1.7	-0.69	-0.45	-13.48					
Est H2O loss						-2.04					
% mat loss during scan						7.12	8.62	415.27	343.00	1236.70	
4	61.85	248.78	253.62	251.67	250.89	250.32	235.99				
weight - pan	186.93	191.77	189.82	189.04	188.47	174.14					
diff from original weight		4.84	2.89	2.11	1.54	-12.79					
diff from previous weight		4.84	-1.95	-0.78	-0.57	-14.33					
Est H2O loss						-3.3					
% mat loss during scan						7.47	9.19	364.26	296.07	930.52	
5	61.12	262.42	266.1	264.34	263.71	263.23	248.82				
weight - pan	201.3	204.98	203.22	202.59	202.11	187.70					
diff from original weight		3.68	1.92	1.29	0.81	-13.60					
diff from previous weight		3.68	-1.76	-0.63	-0.48	-14.41					
Est H2O loss						-2.07					
% mat loss during scan						7.83	8.43	469.57	391.58	1779.01	
4mm	pan empty filled + cure		Pre HC	Post HC 1	Post HC 2	Post HC 3	Post Scan				
1	61.63	386.52	389.91	388.14	387.34	386.68	367.86				
weight - pan	324.89	326.28	326.51	325.71	325.05	306.23					
diff from original weight		3.39	1.62	0.82	0.16	-18.66					
diff from previous weight		3.39	-1.77	-0.9	-0.66	-18.82					
Est H2O loss						-3.29					
% mat loss during scan						5.73	6.72	650.44	555.16	11762.50	
2	60.99	375.78	379.55	377.83	376.73	376.12	356.88				
weight - pan	314.79	318.56	316.84	315.74	315.13	295.89					
diff from original weight		3.77	2.05	0.95	0.34	-18.90					
diff from previous weight		3.77	-1.72	-1.1	-0.61	-19.24					
Est H2O loss						-3.43					
% mat loss during scan						6.04	7.12	601.33	510.34	5658.82	
3	61.31	334.76	341.2	337.99	336.94	336.24	316.96				
weight - pan	273.45	279.89	276.88	275.63	274.93	265.85					
diff from original weight		6.44	3.23	2.19	1.48	-17.80					
diff from previous weight		6.44	-3.21	-1.05	-0.7	-19.28					
Est H2O loss						-4.95					
% mat loss during scan						6.89	8.66	376.40	299.38	1302.70	
4	62.03	335.89	340.01	338.55	337.65	336.96	317.13				
weight - pan	273.86	277.98	276.52	275.62	274.93	255.10					
diff from original weight		4.12	2.66	1.76	1.07	-18.76					
diff from previous weight		4.12	-1.46	-0.9	-0.69	-19.83					
Est H2O loss						-3.85					
% mat loss during scan						7.13	8.23	555.34	481.31	1853.27	
5	61.39	355.21	358.87	357.2	356.32	355.77	337.26				
weight - pan	293.82	297.48	295.81	294.93	294.38	275.87					
diff from original weight		3.66	1.99	1.11	0.56	-17.95					
diff from previous weight		3.66	-1.67	-0.88	-0.55	-18.51					
Est H2O loss						-3.1					
% mat loss during scan						6.22	7.26	590.44	505.74	3305.36	