EDGEWOOD

CHEMICAL BIOLOGICAL CENTER

U.S. ARMY RESEARCH, DEVELOPMENT AND ENGINEERING COMMAND

ECBC-TR-699

EVAPORATION RATES OF CHEMICAL WARFARE AGENTS MEASURED USING 5 CM WIND TUNNELS II. MUNITIONS GRADE SULFUR MUSTARD FROM SAND

Carol A. S. Brevett
Christopher V. Giannaras
Erin L. Maloney
Joseph P. Myers
Robert G. Nickol
John J. Pence

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
Gunpowder, MD 21010-0068

Bruce E. King
Kenneth B. Sumpter
Seok H. Hong
H. Dupont Durst

RESEARCH AND TECHNOLOGY DIRECTORATE

July 2009

ABERDEEN PROVING GROUND, MD 21010-5424

Disclaimer

The findings in this report are not to be construed as an official Department of the Army position unless so designated by other authorizing documents.

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
XX-07-2008	Final	Jan 2006 - Jan 2009

4. TITLE AND SUBTITLE
Evaporation Rates of Chemical Warfare Agents Measured Using 5 cm Wind Tunnels II. Munitions Grade Sulfur Mustard from Sand

5a. CONTRACT NUMBER
DAAD13-03-D-0017

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
Brevett, Carol A. S.; Giannaras, Christopher V.; Maloney, Erin L.; Myers, Joseph P.; Nickol, Robert G.; Pence, John J. (SAIC); King, Bruce E.; Sumpter, Kenneth B.; Hong, Seok H.; and Durst, H. Dupont (ECBC)

5d. PROJECT NUMBER
BA07TAS041

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
SAIC, P.O. Box 68, Gunpowder, MD 21010-0068
DIR, ECBC, ATTN: RDCB-DRC-M, APG, MD 21010-5424

8. PERFORMING ORGANIZATION REPORT NUMBER
ECBC-TR-699

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Defense Threat Reduction Agency, 8725 John J Kingman Road., Fort Belvoir, VA 22060-6201

10. SPONSOR/MONITOR'S ACRONYM(S)
DTRA

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT
The evaporation of sulfur mustard from sand was studied as a function of temperature, drop size and air flow rate, using the same instrumentation as prior studies on glass. The evaporation rate increased with higher temperature, drop size, and wind speed; and an empirical equation was determined that would allow for the calculation of the evaporation rate given the environmental conditions.

15. SUBJECT TERMS
Sulfur mustard | Wind tunnel | Temperature
Drop size | Flow rate | Environmental

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Sandra J. Johnson
U	U	U	UL	180	19b. TELEPHONE NUMBER *(include area code)* (410) 436-2914

Blank

PREFACE

The work described in this report was authorized under Contract No. DAAD13-03-D-0017 and funded by DTRA through Project No. BA07TAS041. The work was started in January 2006 and completed in January 2009.

The use of either trade or manufacturers' names in this report does not constitute an official endorsement of any commercial products. This report may not be cited for purposes of advertisement.

This report has been approved for public release. Registered users should request additional copies from the Defense Technical Information Center; unregistered users should direct such requests to the National Technical Information Service.

Acknowledgments

The authors acknowledge Joseph B. Kiple and William Harrop for the supply of Saudi and Southwest sands, Dr. James Savage for programmatic support, and Christine Franklin for office support.

Blank

CONTENTS

1. INTRODUCTION 9

2. EXPERIMENTAL PROCEDURES 9

2.1 Wind Tunnel 9
2.2 Agent 10
2.3 GC/MS Detection 10
2.3.1 Vapors Generated in Wind Tunnel 10
2.3.2 Analysis of Liquid Extracts 10
2.4 Substrates 11
2.5 Experimental Design and Data Analysis 11

3. RESULTS 11

3.1 Evaporation Rate 11
3.2 Surface Area 17

4. DISCUSSION 20

5. CONCLUSIONS 21

LITERATURE CITED 23

APPENDIXES

A - EVAPORATION RATES FROM SAND A-1

B - REPORT SHEETS OF EVAPORATION DATA B-1

C – CHEMICAL ANALYSIS OF UK SAND C-1

D – SURFACE AREA OF UK SAND D-1

E - CHEMICAL ANALYSIS OF SW SAND E-1

F - SURFACE AREA OF SW SAND F-1

G – SURFACE AREA OF SAUDI SAND G-1

FIGURES

1. Concentration of sulfur mustard and Hyfed signal obtained during evaporation from sand 13

2. Mass of sulfur mustard obtained during evaporation from sand 13

3. Percentage vapor recovered for munitions H on UK sand 14

4. Raw evaporation rates for munitions H on UK sand 14

5. Histograms of (a) the %vapor recovered, (b) %mass extracted, and (c) sum of %vapor and %mass 15

6. Evaporation of munitions grade sulfur mustard from sand at 15 (-), 35 (□), and 50 (+) °C, 6 μL drop, 181 SLPM air flow: (a) plots of vapor concentration vs. time, (b) plots of major diameter vs. time 15

7. Plot of actual vs. predicted least squares fit for the $\log_{10}$(evaporation rate) for (a) data and (b) residuals 15

8. Plot of actual vs. predicted evaporation rates for combined UK and Saudi sand (a) data and (b) residuals 16

9. Calculated vs. raw evaporation rates for UK, Saudi, and SW sands 16

10. Photographs of a 6 μL droplet of mustard on sand at 35 °C at 4 and 285.3 min after impact 17

11. Spreading of a 6 μL droplet of mustard on sand at 35 °C as a function of time 18

12. Maximum droplet surface areas for munitions H on UK sand 18

13. Plot of actual vs. predicted least squares fit for the maximum surface area for H on UK sand: (a) data and (b) residuals 19

14. Plot of actual vs. predicted least squares fit for the time taken to reach the maximum surface area for H on UK sand (a) time to maximum area and (b) $\log_{10}$(time to maximum area) 20

TABLES

1. Statistical results for the %vapor recovered, %mass extracted, and sum of %vapor and %mass 14

2. Parameter estimates from the least squares fit of $\log_{10}$(evaporation rates) for H on UK and Saudi sands 16

3. Parameter estimates from the least squares fit of maximum drop areas for munitions H on UK and Saudi sands 19

4. Parameter estimates from the least squares fit for time to maximum drop area and $\log_{10}$(time to maximum drop area) for munitions H on UK sands 20

Blank

EVAPORATION RATES OF CHEMICAL WARFARE AGENTS MEASURED USING 5 CM WIND TUNNELS II. MUNITIONS GRADE SULFUR MUSTARD FROM SAND

1. INTRODUCTION

The evaporation rate of the vesicant chemical warfare agent sulfur mustard [bis(2-chloroethyl)sulfide, $(ClCH_2CH_2)_2S$] from glass has been previously determined. In this work, the evaporation of 77% pure munitions grade sulfur mustard (abbreviated H) from three types of sand was determined, in comparison to the evaporation of 97% pure Chemical Agent Standard Analytical Reference Material grade sulfur mustard (abbreviated HD) from glass.

The 5 cm laboratory-sized wind tunnels[1] and the wind tunnel characteristics' compared to other wind tunnels and outdoor measurements have been published.[2,3] The vapors of sulfur mustard were quantitatively collected using thermal desorption tubes. This report describes how the data were analyzed and demonstrates the robustness of the set of data that will be passed to the modelers for eventual incorporation into the software program VLSTRACK, which predicts the vapor hazard of chemical agents under various environmental conditions.

2. EXPERIMENTAL PROCEDURES

2.1 Wind Tunnel.

The 5 cm wind tunnels that were used in these experiments have been previously described, and were the same as those used for the studies on glass.[4,5] In order to expose the agent to the wind flow, the piston was removed, and the test substrate (sand in a cup that had a 240 mm diameter and 15 mm depth) with the droplet of agent on it was placed on the piston and inserted into the wind tunnel. The humidified, temperature-controlled air from a Miller-Nelson Environmental Control Unit (tunnel a) or Aalborg MFC (tunnels c, d, k, l) was then passed over the sample, and the vapors were collected on thermal desorption tubes at the vapor sampling inlet. The amount of agent on each tube was measured based upon a standard in the Gas Chromatography/Mass Spectrometry (GC/MS). The sample volume and tunnel air flow rate were known; thus, the agent concentration (mg/m^3) and evaporation rate (μg/min) could be calculated. The rates were not calculated for the initial 3 min of the experiment, before the instrumentation had reached equilibrium, nor at the end of the experiment, when the concentration of mustard was nearing a plateau. Hence, the middle of the concentration data was used to calculate the evaporation rates. The points for the rate were chosen such that $r^2 > 0.99$.

Air flows were 18, 181 and 405 standard liters per minute (SLPM), which corresponded to velocity values at a 1 cm height of 0.22, 1.7 and 3.6 m/s. The flow volume per thermal desorption tube was typically 2 to 10 L volume, and the tubes were automatically switched using a proprietary Versatile Tube Sampler. The rate at which the tubes were switched was adjusted based upon the evaporation rate of the agent. The air and substrate temperatures

were 15, 35, and 50 °C, and the droplet sizes were 1, 6, and 9 μL, corresponding to contamination densities of approximately 1.3, 7, and 11 g/m^2.

2.2 Agent.

Sulfur mustard, [bis(2-chloroethyl) sulfide, $(ClCH_2CH_2)_2S$], is commonly abbreviated H for munitions grade and HD for distilled. Impurities seen in the GC/MS that are commonly present in munitions grade mustard are Q [sesquimustard, bis(2-chloroethylthio) ethane, $(ClCH_2CH_2SCH_2)_2$, 10.1%] the cyclic ether 1,4-dithiane, $[S(CH_2CH_2)_2S$, 3.2%], 1,2-dichloroethane (2.6%) and 4-chlorobutyl 2-chloroethyl sulfide (1.0%), and 16 other analytes (totaling 3.9%). **Caution: sulfur mustard is a potent vesicant and care must be taken to prevent exposure to liquid or vapor. It should only be manipulated by trained personnel employing appropriate engineering controls and personal protective equipment.**

2.3 GC/MS Detection.

2.3.1 Vapors Generated in Wind Tunnel.

This protocol was the same as used for the studies of the evaporation of HD from glass. Gas Chromatography/Mass Spectrometric Detector (GC/MSD) analysis of the thermal desorption tubes was performed on a Markes UNITY/ULTRA Thermal Desorption system connected to an Agilent Technologies 6890N GC/5973 MSD equipped with a HP-5MS [30 m long, 0.25 mm i.d., 0.25 μm film thickness, (5%-phenyl)-methylpolysiloxane stationary phase] capillary column (Agilent Technologies, Wilmington, DE). The thermal desorption tubes used were Markes Tenax thermal desorption tubes (Markes International, Llantrisant, UK, Part #C0102S). Each sample was prepurged for 1 min then desorbed for 2.5 min at 250 °C. The transfer line to the GC was heated to 180 °C. The GC oven temperature profile was ramped from 75 °C for 2 min to 110 °C at 20/min, to 290 °C at 80 °C/min. The column flow rate at 75 °C was 1.6 mL/min (46 cm/s) at a constant pressure of 15 psi. The injection temperature was 250 °C; MSD transfer line 180 °C; MSD quad 150 °C; and MSD source at 230 °C. The sample extracts were analyzed in the electron impact (EI) mode scanning from 30 – 300 amu, with 2.78 scans/s. Under these conditions, HD eluted at ~2 min. Both sulfur mustard and a breakdown ion were seen in the mass spectrum.

2.3.2 Analysis of Liquid Extracts.

Gas Chromatography/Mass Spectrometric Detector analysis of the organic liquid extracts was performed on an Agilent Technologies 6890N GC/5973 MSD equipped with a 30 m X 0.25mm HP-5 capillary column (Agilent Technologies, Wilmington, DE). The oven temperature profile was ramped from 45 °C for 5 min to 265 °C at 10 °C/min. The injection temperature was 250 °C; MSD transfer line 280 °C; MSD quad 150 °C; and MSD source at 230 °C. The sample extracts were analyzed in the electron impact (EI) mode scanning from 40 – 350 amu. One microliter was injected on a split/splitless inlet with a purge time 0.5 min; purge flow rate 25 mL/min; with a constant helium column flow rate of 1 mL/min (average linear velocity of 36 cm/s). Gas Chromatography/Mass Spectrometry of the extracts detected

1,4-oxathianc, 2-hydroxyethyl vinyl sulfide (HOEVS), 2-chloroethyl vinyl sulfide (CEVS), and thiodiglycol (TDG).

2.4 Substrates.

The UK sand used was AFS-50 Fine Sand produced by Warmwell Quarry in the United Kingdom. The physical properties from the specifications sheet of the supplier indicate a predominant particle size of 0.25 to 0.5 mm; 98.6% SiO_2, 0.39% aluminum oxide and 0.09% ferric oxide, and a skeletal density of 2.65 g/cm^3. The sand had a surface area of 0.23 m^2/g, of which 0.0382 m^2/g were micropores* and the pH of 0.1 g sand in 2 mL water, measured after 24 hr using pH paper, was 6. The measured bulk and tapped densities of the sand were 1.34, and 1.48 g/cm^3, respectively, yielding void volumes of 50 and 44%, respectively. The sand was used at ambient conditions; oven drying indicated that ~2% water had adsorbed to the sand. Chemical analyses are in Appendix C, and surface area data are given in Appendix D.

The southwest sand was obtained from the back gate of Cannon AFB, New Mexico, and is a surface sample. Chemical analyses are in Appendix E, and surface area data are given in Appendix F.

The Saudi sand was obtained from the Torrispamments Plains, Dhahran Royal Saudi Air Base, and was comprised of 86% sand, 10% silt, and 4% clay, with a pH of 7.85.[6] Surface area data are given in Appendix G.

2.5 Experimental Design and Data Analysis.

The experimental design was generated and the data were analyzed using JMP® Statistical Discovery Software. There were three variables: temperature, drop size, and air flow rate at three levels each. Measuring all combinations of these levels would yield 27 conditions (3 x 3 x 3); the cubic composite design chosen required 9 conditions, which can be described as the vertices of a cube and the body mid-point. The data were collected in triplicate as two blocks of four vertices (chosen as the corners of a tetrahedron) and the mid-point. This collection of data would allow for the determination of the major contributing variables and cross-variables. The substrate temperature (°C), droplet mass (mg, based on HD only, already adjusted for impurities), air flow (SLPM), total percent sulfur mustard recovered from the vapor and tunnel identity (four similar 5 cm tunnels were available) were controlled as variables that may affect the raw evaporation rate. Cross factors between droplet mass, air flow and temperature were included in the initial numerical analysis. Factors that were determined not to be significant were deleted and the regression was re-calculated.

* Surface areas were from 5 point BET measurements, and the micropore area was from an a dsorption t-plot, using nitrogen gas, collected by Micromeritics Inc., Norcross, GA.

3. RESULTS

3.1 Evaporation Rate.

A plot of H concentration versus time is shown in Figure 1; in this experiment a simultaneous measurement of H in the air was measured using a Hyfed. The Hyfed curve reached a plateau before the concentrations did, thus indicating the relative sensitivity of the two techniques. The concentrations were converted to mg H and plotted in Figure 2. The raw evaporation rate was calculated from the first set of points for 0 to 77 min; the r^2 was 0.99. For all samples, the evaporation rate was calculated from the first 5 to 20 points that had an r^2 of 0.99. For H evaporation from sand, the evaporation rate slowed with time; only the initial rate was calculated in this work. A more thorough analysis and interpretation of the evaporation curve will occur separately.[7] The %vapor recovered and raw evaporation rates are shown in cube plots (Figures 3 and 4); temperature, drop size and SLPM affected the evaporation rate, but no factors obviously affected the %vapor recovered.

The average %vapor recovered was 75%, (Figure 5a, Table 1) in comparison to HD on glass, for which the value was 86%. The %vapor collected was based upon the %sulfur mustard that was deposited after accounting for the purity of the munitions H. After the end of the reaction, the sand was extracted and analyzed for remaining sulfur mustard for 35 of the samples; the average %mass extracted was 8.6% (Figure 5b), these samples yielded a vapor and mass sum of 88% recovery (Figure 5c, Table 1).

The effect of only temperature on the evaporation rate is shown in Figure 6. The combined effects of temperature, drop size, air flow (SLPM), %relative humidity (RH), and %vapor recovered on the evaporation rate were calculated using a least squares method. Significant factors were identified as those with Prob > |t| of 0.05 or less. Analogously to the studies on glass, a straight-line regression was obtained for the $\log_{10}$(evaporation rate) (Figure 7, Table 2, $r^2 = 0.93$, n = 63, eq 1), compared to the curvature observed for the evaporation rate ($r^2 = 0.71$). The %vapor recovered was random, and did not show any statistically relevant trend with drop size, air flow, or temperature.

UK Sand only

$$\log_{10}(\text{evaporation rate}) = -0.41 + (0.025 * \text{Temp}) + (0.050 * \text{Drop Size}) + (0.0007 * \text{SLPM}) + (0.004 * \%\text{VaporRecovered}) \quad (1)$$

Since only eight wind tunnel experiments were performed with the Saudi sand, the least squares analysis was repeated by combining the Saudi data with the UK sand. For the evaporation rates, the same regression, $r^2 = 0.93$ was obtained for the least squares fit, the parameter estimates showed that the sand type was not a significant factor contributing to the evaporation rate (Figure 8, Table 2), and an equation that best fit the data was generated (eq 2).

UK and Saudi Sand

$$\log_{10}(\text{evaporation rate}) = -0.436 + (0.026 * \text{Temp}) + (0.051 * \text{Drop Size}) + (0.0007 * \text{SLPM}) + (0.0036 * \%\text{VaporRecovered}) \quad (2)$$

As only 4 southwest sand samples were available, eq 1 was used to predict the rate for the southwest (and Saudi) sands, and a plot of raw evaporation rate versus predicted evaporation rate was made (Figure 9). The southwest and Saudi sands fall on the same line, thus implying that there is little difference in evaporation rates between them.

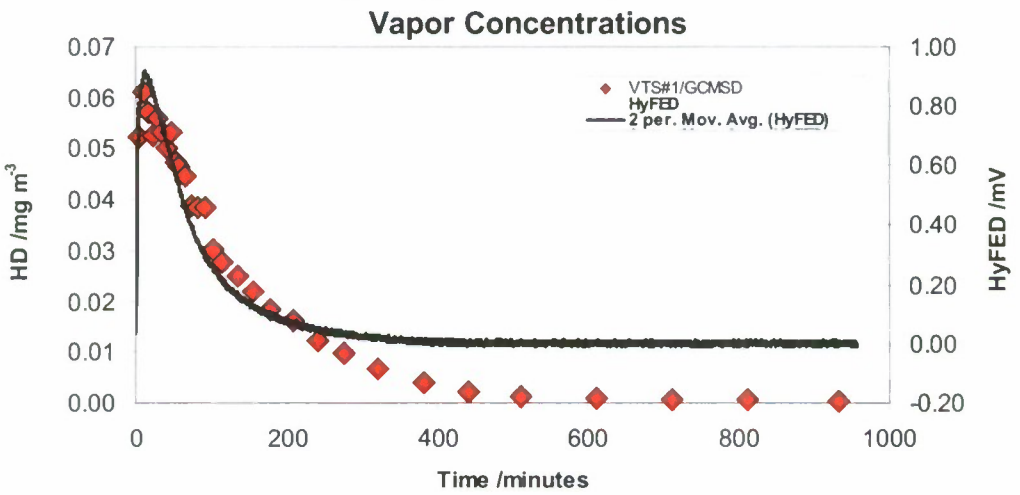


Figure 1. Concentration of sulfur mustard (◆) and Hyfed signal obtained during evaporation from sand.

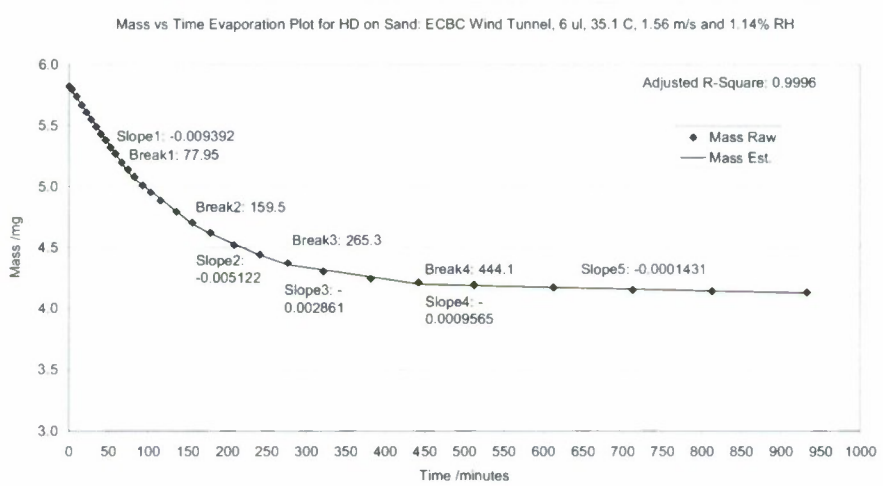


Figure 2. Mass of sulfur mustard (◆) obtained during evaporation from sand.

Table 1. Statistical results for the %vapor recovered, %mass extracted, and sum of %vapor and %mass.

	%Vapor Recovered	%Mass Extracted	Sum of Vapor and Mass
Mean	75	8.6	88
Std Dev	21	7.8	22
Std Err Mean	2.6	1.3	3.7
upper 95% Mean	80	11.3	96
lower 95% Mean	70	6.0	81
N	63	35	35

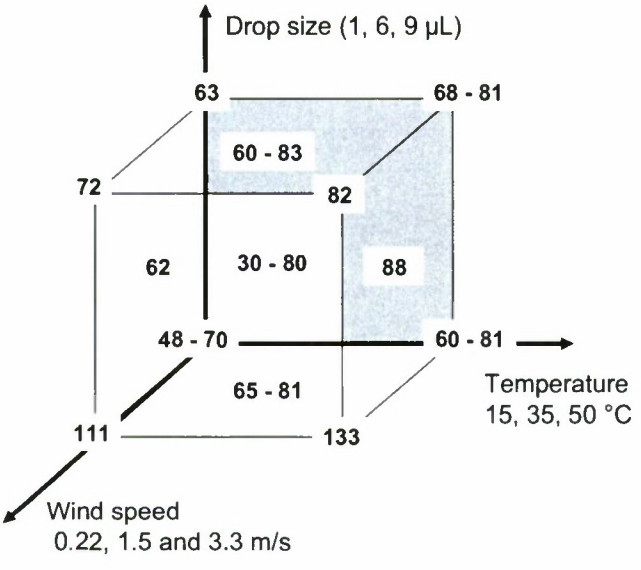


Figure 3. Percentage vapor recovered for munitions H on UK sand.

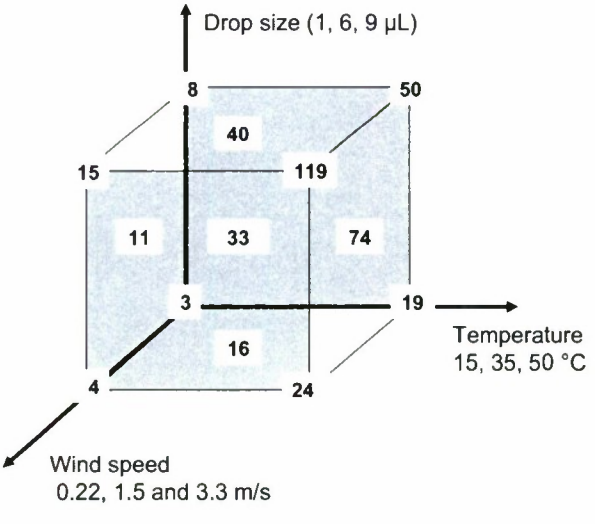
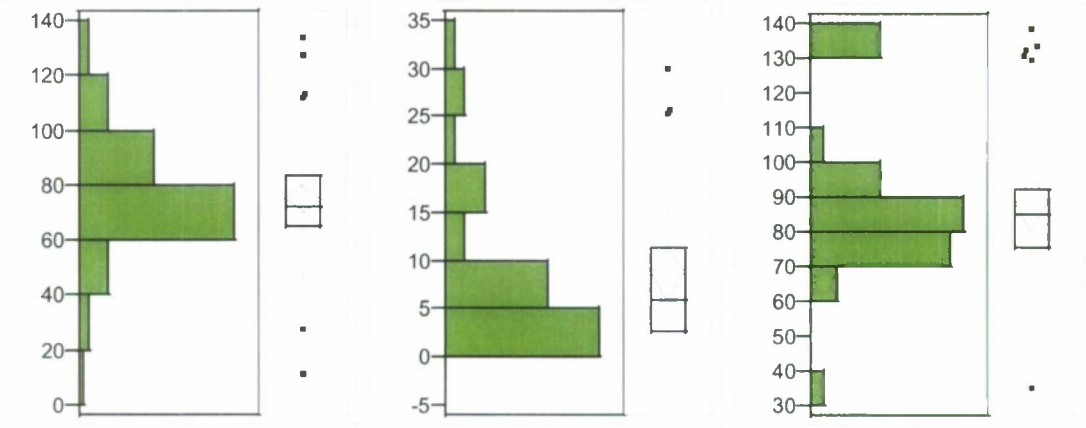
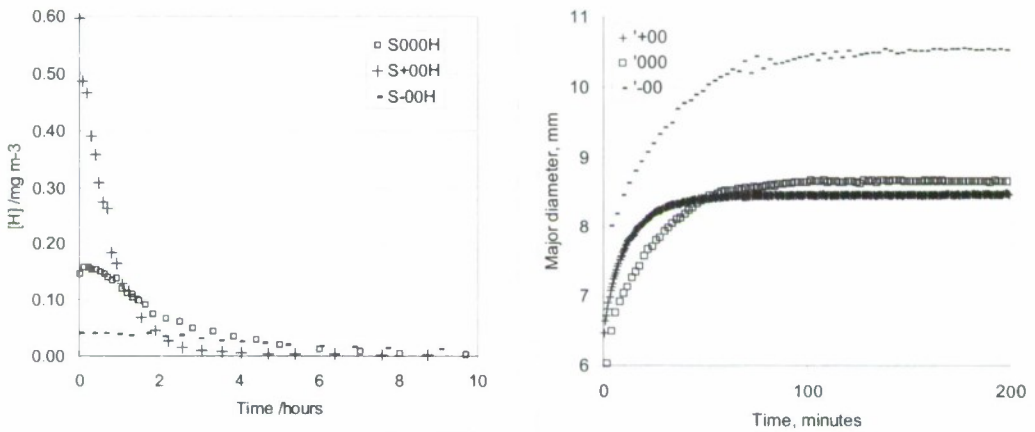


Figure 4. Raw evaporation rates (mg/m^3) for munitions H on UK sand.



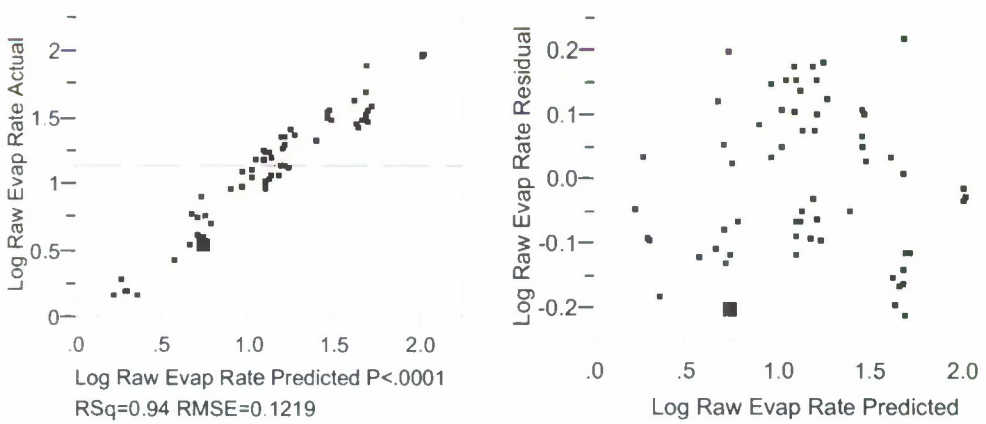
(a) (b) (c)

Figure 5. Histograms of (a) the %vapor recovered, (b) %mass extracted, and (c) sum of %vapor and %mass.



(a) (b)

Figure 6. Evaporation of munitions grade sulfur mustard from sand at 15 (-), 35 (□) and 50 (+) °C, 6 µL drop, 181 SLPM air flow: (a) plots of vapor concentration vs. time, (b) plots of major diameter vs. time.

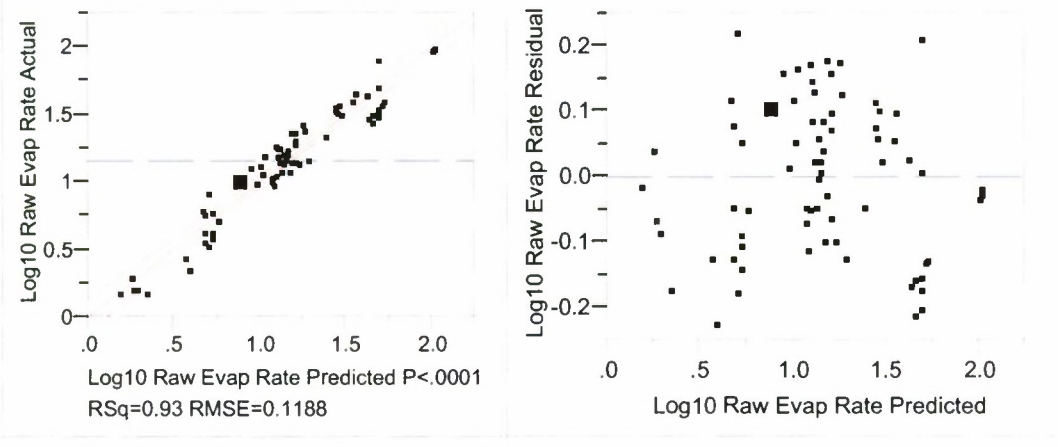


(a) (b)

Figure 7. Plot of actual vs. predicted least squares fit for the $\log_{10}$(evaporation rate) for (a) data and (b) residuals.

Table 2. Parameter estimates from the least squares fit of $\log_{10}$(evaporation rate) for H on UK and Saudi sands.

	UK Sand			Combined UK and Saudi Sands		
Term	Estimate	Std Err	Prob>|t|	Estimate	Std Err	Prob>|t|
Intercept	-0.41	0.10	0.0001	-0.44	0.07	<.0001
Temperature/°C	0.025	0.001	<.0001	0.026	0.001	<.0001
Drop Size/mg	0.050	0.004	<.0001	0.051	0.004	<.0001
SLPM (air flow rate)	0.0007	0.0001	<.0001	0.0007	0.0001	<.0001
%RH	-0.004	0.007	0.5883	n/a	n/a	n/a
%VaporRecovered	0.004	0.001	0.0019	0.0036	0.0001	0.0004
Sand type[Saudi]	n/a	n/a	n/a	0.009	0.025	0.7146



(a) (b)

Figure 8. Plot of actual vs. predicted evaporation rates for combined UK and Saudi sand (a) data and (b) residuals.

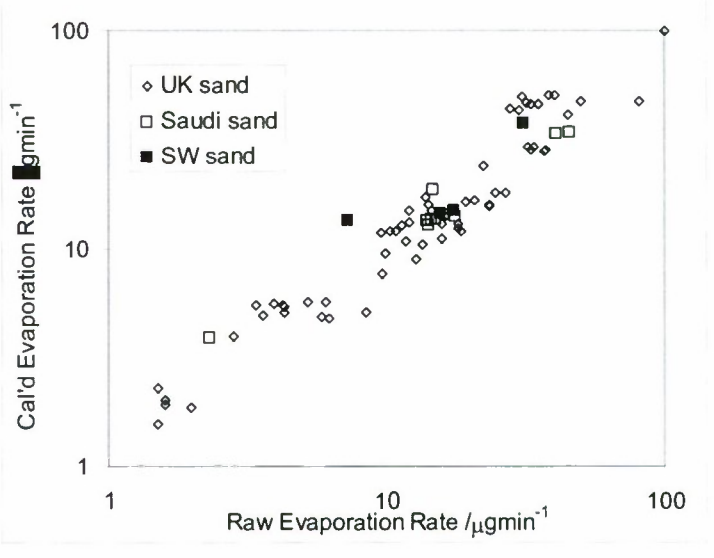


Figure 9. Calculated vs. raw evaporation rates for UK, Saudi, and SW sands.

3.2 Surface Area.

Video cameras were used to measure the surface area of the mustard droplets (Figures 10 and 11) and the time that each droplet took to reach the maximum surface area. The surface area of the droplet increased over time up to 800 min. The maximum surface area as a function of temperature, drop size, and flow rate is plotted in Figure 12. The larger droplets gave a greater spread than the smaller ones, as would be expected. The least squares analysis of the surface area on only the UK sand as a function of wind speed, temperature, and drop size had $r^2 = 0.94$ ($r^2_{adj} = 0.93$, n = 49, Figure 13, eq 3, Table 3); addition of the Saudi sand data lowered the r^2 to 0.89 ($r^2_{adj} = 0.88$, n = 55, eq 4, Table 3). Tunnel effects were not included, and %RH was not a significant factor.

Surface Area, UK only, no tunnel effect (3)
32.33 + (-0.574 * temp) + (4.98 * drop size) + (-0.022 * SLPM) + (0.128 * %vapor recovered)

Surface Area, UK & Saudi (4)
13.62 + (-0.678 * temp) + (5.49 * drop size) + (-0.036 * SLPM) + (0.293 * %RH) + (0.381 * %vapor recovered)

The time to reach the maximum area as a function of temperature, drop size, and flow rate for the combined UK and Saudi sands is summarized in Figure 14. The times were highly variable, by as much as a factor of ten. The least squares analysis of the spread time as a function of wind speed, temperature and drop size had a low $r^2 = 0.50$ ($r^2_{adj} = 0.43$, n = 49). Due to the curvature in the plot the logarithm was used; this also gave a low $r^2 = 0.53$ ($r^2_{adj} = 0.463$, n = 49). Not surprisingly, few significant factors were found (Table 4). An r^2 of 0.5 means that 50% of the source of the variance between the samples was not explained by the factors chosen; the underlying causes for the variation in the time taken to reach the maximum surface area are not well understood.

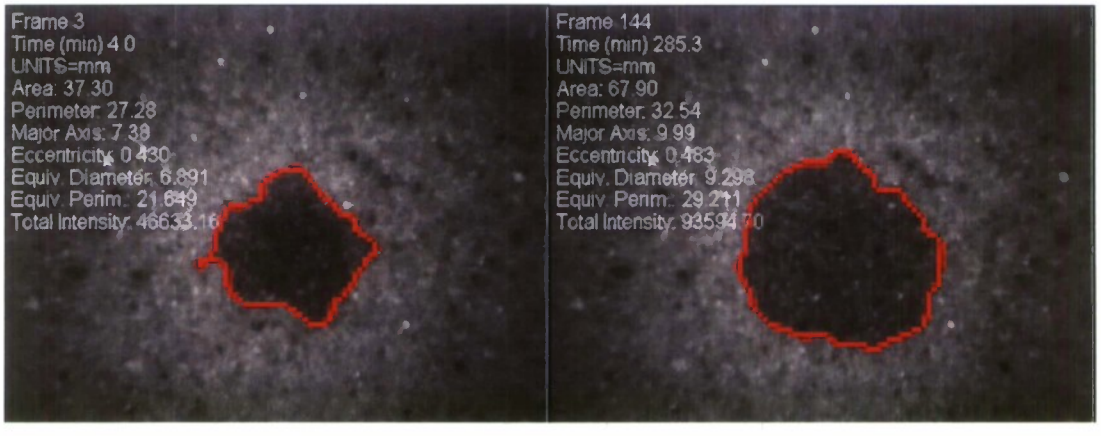


Figure 10. Photographs of a 6 μL droplet of mustard on sand at 35 °C at 4 and 285.3 min after impact.

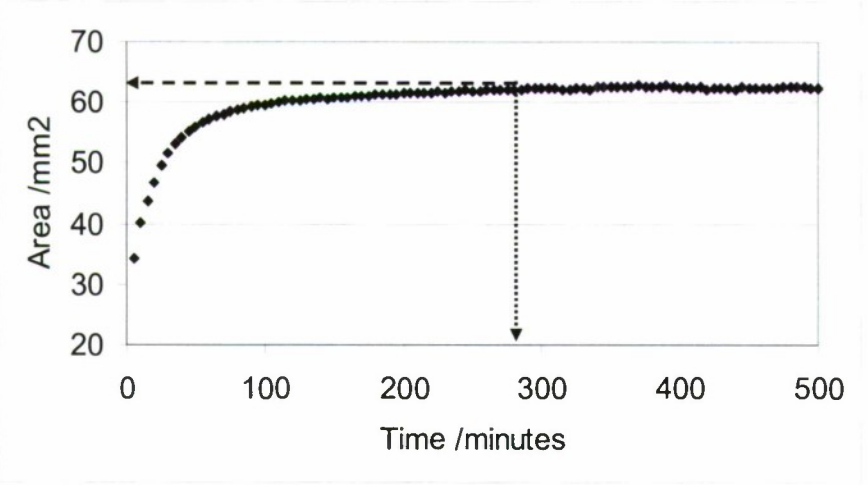


Figure 11. Spreading of a 6 µL droplet of mustard on sand at 35 °C as a function of time.

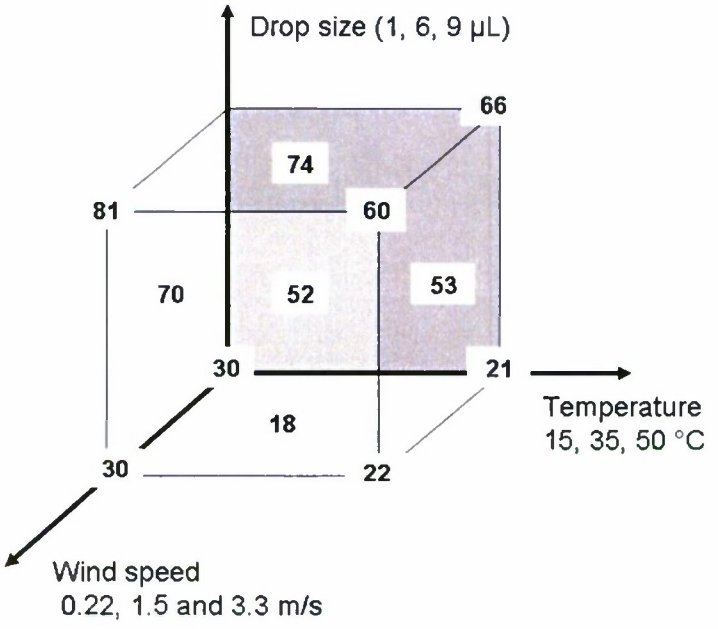
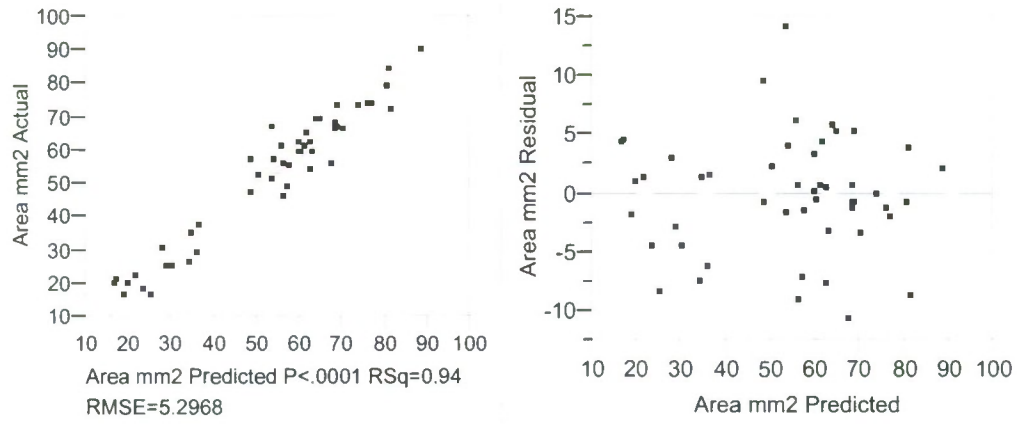


Figure 12. Maximum droplet surface areas for munitions H on UK sand.

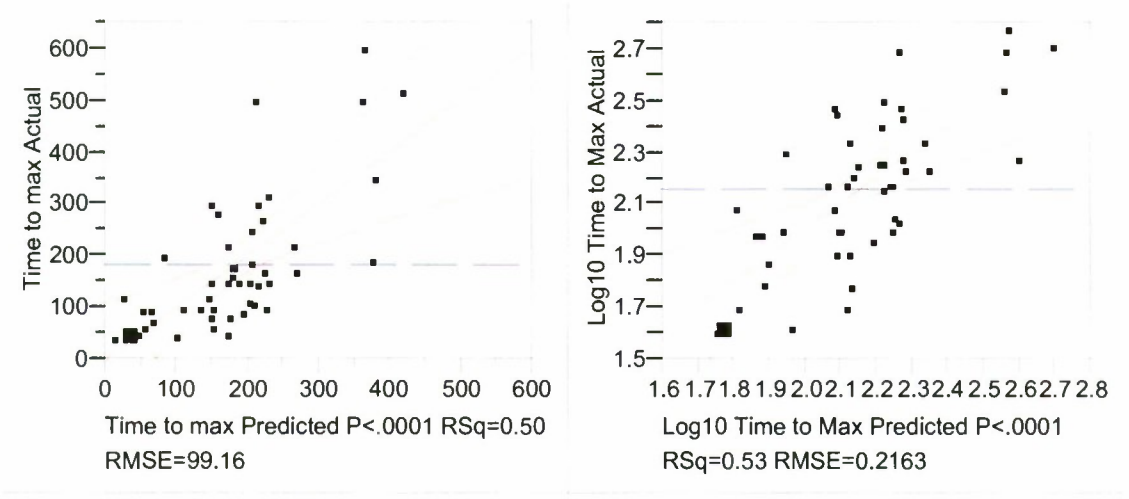


(a) (b)

Figure 13. Plot of actual vs. predicted least squares fit for the maximum surface area for H on UK sand: (a) data and (b) residuals.

Table 3. Parameter estimates from the least squares fit of maximum drop areas for munitions H on UK and Saudi sands.

	UK Sand			UK and Saudi Sand		
Term	Estimate	Std Error	Prob>|t|	Estimate	Std Error	Prob>|t|
Intercept	32	6	<.0001	14	6	0.0268
tunnel[c]	1.1	1.8	0.5484	n/a	n/a	n/a
temp	-0.6	0.1	<.0001	-0.68	0.09	<.0001
drop size	5.0	0.2	<.0001	5.5	0.3	<.0001
SLPM	-0.017	0.008	0.0388	-0.036	0.009	0.0002
%RH	0.6	0.6	0.2923	0.3	0.6	0.6580
%vapor recovered	0.13	0.07	0.0540	0.38	0.06	<.0001



(a) (b)

Figure 14. Plot of actual vs. predicted least squares fit for the time taken to reach the maximum surface area for H on UK sand (a) time to maximum area and (b) $\log_{10}$(time to maximum area).

Table 4. Parameter estimates from the least squares fit for time to maximum drop area and $\log_{10}$(time to maximum drop area) for munitions H on UK sands.

	Time to Maximum Drop Area			Log_{10}(Time to Maximum Drop Area)		
Term	Estimate	Std Error	Prob>|t|	Estimate	Std Err	Prob>|t|
Intercept	8	114	0.9458	1.6	0.2	<.0001
temp	-0.08	2.5	0.9757	0.001	0.005	0.8446
H mass only	21	6	0.0011	0.06	0.01	<.0001
SLPM	0.1	0.2	0.3736	0.0002	0.0003	0.6222
%RH	18	11	0.1081	0.03	0.02	0.1475
tunnel[c]	-77	35	0.0308	-0.19	0.08	0.0167
%vapor recovered	0.6	1.1	0.6205	0.003	0.003	0.3176

4. DISCUSSION

The evaporation rates given for the sand were the initial evaporation rates. The evaporation curves changed shape with time; methods to fit these curves and interpret the evaporation rate as a function of basic physical parameters, such as viscosity, porosity, and vapor pressures are being developed by Navaz et al.,[8] who have published interpretations for HD evaporation from glass. This work shows that the basic assumptions about which factors contribute to the evaporation rate (drop size, temperature, and air flow) were valid.

The reason for the high variability in the time taken to reach the maximum spread area on sand is not known.

5. CONCLUSIONS

The data collected indicated that the evaporation profiles of sulfur mustard from UK, SW, and Saudi sands were similar despite the fact that the three sands have different compositions and grain sizes. The generation of a least squares fit curve for the sand samples allows for a facile comparison of the evaporation rate of sulfur mustard from any other sand encountered to the UK sand.

Blank

LITERATURE CITED

1. Weber, D.J.; Scudder, M.K.; Moury, C.S.; Shuely, W.J.; Molnar, J.W.; Miller, M.C. *Development of the 5-cm Agent Fate Wind Tunnel*; ECBC-TR-327; U.S. Army Edgewood Chemical Biological Center: Aberdeen Proving Ground, MD, 2006; UNCLASSIFIED Report (AD-A462 884).

2. Danberg, J. *Evaluation of 5-cm Agent Fate Wind Tunnel Velocity Profiles*; ECBC-CR-091; U.S. Army Edgewood Chemical Biological Center: Aberdeen Proving Ground, MD, 2006; UNCLASSIFIED Report (AD-A472 909).

3. Weber, D.; Scudder, M.K.; Moury, C.; Shuely, W.; Molnar, J.; Danberg, J.F.; Miller, M. *Velocity Profile Characterization for 5-cm Agent Fate Wind Tunnel*; ECBC-TR-567; U.S. Army Edgewood Chemical Biological Center: Aberdeen Proving Ground, MD, 2007; UNCLASSIFIED Report (AD-A476 518).

4. Weber, D.J.; Scudder, M.K.; Moury, C.S.; Donnelly, T.; Park, K.; D'Onofrio, T. G.; Molnar, J.W.; Shuely, W.J.; Nickol, R.G.; King, B.; Danberg, J.; Miller, M.C. Micro Wind Tunnel for Hazardous Chemical Fate Studies. In *Proceedings of the 45th AIAA Aerospace Sciences Meeting and Exhibit*, Reno, Nevada, January 2007; AIAA-2007-0960; AIAA: Reston, VA, 2007.

5. Brevett, C.A.S.; Pence, J.; Nickol, R.G; Myers, J.P.; Maloney, E.; Giannaras, C.V.; Flowers, A; Sumpter, K.B.; Durst, H.D.; King, B.E. *Evaporation Rates of Chemical Warfare Agents Using 5-cm Wind Tunnels, I. Sulfur Mustard on Glass*; ECBC-TR-647, U.S. Army Edgewood Chemical Biological Center: Aberdeen Proving Ground, MD, 2008; UNCLASSIFIED Report (AD-A493 238).

6. Savage, J.; D'Onofrio, T; Durst, D.; Kilpatrick, W. *Environmental Fate of Chemical Agents*; ECBC-TR-532; U.S. Army Edgewood Chemical Biological Center: Aberdeen Proving Ground, MD, 2007; pp 81-82; UNCLASSIFIED Report (AD-B33 475).

7. Navaz, H.K.; Chan, E.; Markicevic, B. Convective Evaporation Model of Sessile Droplets in a Turbulent Flow – Comparison with Wind Tunnel Data. *Intl. J. Thermal Science* **2008,** 47, pp 963-971.

Blank

APPENDIX A
EVAPORATION RATES FROM SAND

Table A1. Summary of Evaporation Experiments of Sulfur Mustard from UK Sand

run #	Temp, °C	drop mass	mass H, mg	air flow, SLPM	%RH	raw evap rate µg/min	% vapor recovered	Type of sand	tunnel	Area, mm^2	Time to max, min	Log_{10} Raw Evap Rate
3c079	34.9	1.291	0.969	181	1.34	9.6	65.5	UK	c	19	40	0.98
3c081	35.3	1.291	0.969	181	1.4	12.8	81.1	UK	c	17	50	1.11
3c078	35.1	11.62	8.72	181	1.34	22.3	60.1	UK	c	74	90	1.35
3c082	35.2	11.62	8.72	182	1.15	37.3	80.1	UK	c	75	150	1.57
3c093	35.3	11.62	8.72	182	1.64	32.2	82.9	UK	c	75	500	1.51
3c084	35.2	7.746	5.816	405	0.99	36.7	83.9	UK	c	52	50	1.56
3c086	35.2	7.746	5.816	405	1.02	32.9	86.4	UK	c	58	220	1.52
3d044	15.1	7.746	5.816	182	0	5.8	60.1	UK	d	70	220	0.76
3d041	14.7	7.746	5.816	181	6.43	6.2	59.9	UK	d	69	350	0.79
3d038	15.1	7.746	5.82	182	0	8.4	64.8	UK	d	70	170	0.92
3c069	35.1	7.746	5.816	18	3.28	18.1	68.6	UK	c	60	80	1.26
3c070	34.9	7.746	5.816	18.1	3.27	18.6	66.4	UK	c	63	300	1.27
3c071	35	7.746	5.816	18.1	3.23	18.1	73.9	UK	c	60	100	1.26
3c080	34.6	7.62	5.72	181	1.32	23.3	68.5	UK	c	.	.	1.37
3c083	35.1	7.746	5.816	182	1.14	9.5	28.9	UK	c	53	100	0.98
3c085	34.8	7.746	5.817	182	1.37	24.6	80.1	UK	c	56	120	1.39
3c088	50.1	11.43	8.582	405	0.76	99.9	83.5	UK	c	63	170	2.00
3c091	49.9	11.619	8.724	404	0.17	98.8	83.8	UK	c	60	300	1.99
3c094	50	11.619	9.086	404	0.16	95.1	80.2	UK	c	55	270	1.98
3d040	15.2	11.62	8.72	406	0.63	11.3	75	UK	d	73	190	1.05
3d043	15.1	11.619	8.724	406	0	10.8	69.7	UK	d	80	500	1.03
3d046	14.7	11.619	8.724	406	0	10.2	71.7	UK	d	85	600	1.01
3c090	50.4	1.291	0.969	404	0.22	30.7	134.7	UK	c	.	.	1.49
3c092	50.1	1.291	0.969	405	0.16	31.9	128	UK	c	22	200	1.50
3c072	50.2	11.62	8.72	18.1	1.6	33.1	68.3	UK	c	68	180	1.52
3c074	50	11.619	8.724	18.1	1.63	40.4	81.1	UK	c	67	150	1.61
3c077	50.3	11.619	8.724	18.1	1.78	35.1	68.6	UK	c	68	180	1.55
3c073	50.3	1.291	0.969	18.1	1.53	14.2	81	UK	c	17	120	1.15
3c076	49.9	1.291	0.969	18.1	1.59	12.1	60.4	UK	c	21	40	1.08
3c075	50	1.291	0.969	18.1	1.68	14.4	75.3	UK	c	.	.	1.16
3d039	15.6	1.291	0.969	405	0	6	114	UK	d	36	100	0.78
3d042	14.9	1.291	0.969	405	0.37	4.3	107	UK	d	27	150	0.63
3d045	15.2	1.27	0.954	406	0	3.4	112.8	UK	d	.	.	0.53
3d029	15.2	11.43	8.58	18.1	0	5.2	62.8	UK	d	.	.	0.72

Table A1. Summary of Evaporation Experiments of Sulfur Mustard from UK Sand (continued)

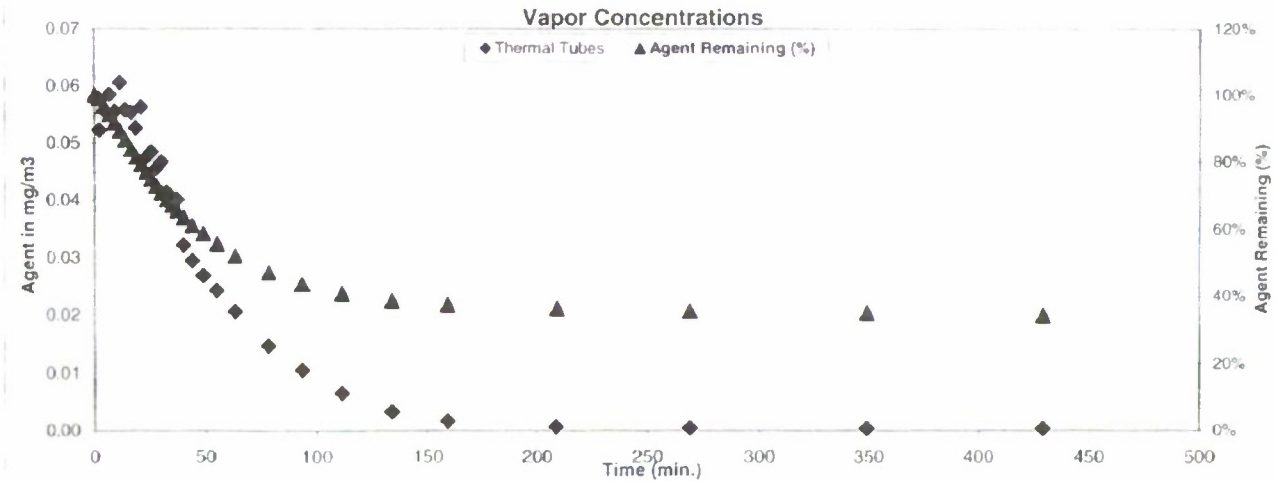
run #	Temp, °C	drop mass	mass H, mg	air flow, SLPM	%RH	raw evap rate µg/min	% vapor recovered	Type of sand	tunnel	Area, mm^2	Time to max, min	Log_{10} Raw Evap Rate
3d030	15.1	1.27	0.854	18.1	0.01	1.5	47.8	UK	d	.	.	0.18
3d047	15.1	1.291	1.01	18.1	0	1.6	69.8	UK	d	30	150	0.20
3c089	50.3	7.746	5.816	182	0.52	50.3	89.4	UK	c	58	100	1.70
3c087	50.6	7.746	5.82	182	1.6	80.8	88.1	UK	c	48	60	1.91
3d056	15.4	7.62	5.959	405	10.62	3.6	12.2	UK	d	.	.	0.56
3d055	15.6	1.27	0.993	405	9.06	2.8	71.8	UK	d	.	.	0.45
3d053	15.3	1.27	0.993	18	5.36	2	65.5	UK	d	.	.	0.30
3d052	14.8	11.43	8.938	18	6.38	3.9	55.7	UK	d	91	520	0.59
3d051	14.8	1.27	0.993	18	5.63	1.6	77.7	UK	d	.	.	0.20
3d050	14.4	11.43	8.938	18	7.05	4.3	56.5	UK	d	.	.	0.63
3d049	18.5	1.27	0.993	18	4.57	1.5	67.6	UK	d	38	315	0.18
3d048	15.1	11.43	8.938	18	1.07	4.2	53.1	UK	d	.	.	0.62
3c117	50.4	7.62	5.959	182	1.99	44.8	70.8	UK	c	.	.	1.65
3c111	34.9	7.62	5.959	182	3.1	20.6	67.7	UK	c	57	150	1.31
3c108	50.6	11.43	8.938	18.1	2.7	38.2	73.2	UK	c	74	187	1.58
3c107	49.5	1.27	0.993	18.1	2.78	13.8	94	UK	c	23	62	1.14
3c106	35.7	7.62	5.959	18.1	5.95	16.1	76.7	UK	c	66	250	1.21
3c105	49.4	11.43	8.938	18.1	2.89	29.9	62.6	UK	c	67	112	1.48
3c104	50.3	11.43	8.938	18.1	3.3	27.8	59.8	UK	c	57	108	1.44
3c103	35.3	7.62	5.959	18.1	6.64	15.8	69.9	UK	c	62	144	1.20
3c102	49.5	1.27	0.993	18.1	3.26	12.1	77.5	UK	c	21	96	1.08
3c101	35.4	7.62	5.959	181	3.47	26.8	74.5	UK	c	50	177	1.43
3c100	34.4	1.27	0.993	182	3.62	11.8	107.7	UK	c	26	42	1.07
3c099	35	7.62	5.959	182	3.42	19.1	65.4	UK	c	47	80	1.28
3c098	34.4	7.62	5.959	182	2.41	23.5	65.2	UK	c	62	285	1.37
3c097	35	1.27	0.993	182	1.76	15.8	107.4	UK	c	26	75	1.20
3c096	35	1.27	0.993	182	1.78	13.4	100	UK	c	31	96	1.13
3c095	34.9	7.62	5.959	404	1.03	33.7	89	UK	c	68	162	1.53
3a093	34.5	7.62	5.959	18.1	7.67	9.9	38.6	UK	a	.	.	1.00
3c154	35.3	7.75	6.06	181	0	15	40.1	Saudi	c	29	50	1.18
3a112	34.7	7.75	6.06	181	58.97	14.5	44.9	Saudi	a	.	.	1.16
3c118	50.4	7.62	5.959	182	1.32	40.6	46	Saudi	c	.	.	1.61
3d054	14.9	1.27	0.993	405	9.88	2.3	75.8	Saudi	d	.	.	0.36
3c116	49.7	7.62	5.959	182	2.24	45.5	53.2	Saudi	c	.	.	1.66
3c114	35.1	7.62	5.959	182	2.45	16.2	48.5	Saudi	c	38	85	1.21
3c113	34.7	7.62	5.959	182	3	14.1	39	Saudi	c	32	50	1.15
3c112	35.1	7.62	5.959	182	2.89	14	42.3	Saudi	c	30	35	1.15
3c110	34.8	7.62	5.959	182	3.47	17.7	48.6	Saudi	c	40	35	1.25
3c109	41.1	7.62	5.959	182	4.01	14.7	39.8	Saudi	c	29	48	1.17
3a132	35	7.75	6.06	182	36.82	17.3	53.1	SW	a	.	.	1.24
3a126	50.4	1.29	1.01	18	28.26	7.3	59.6	SW	a	.	.	0.86
3c168	50	11.62	9.09	18	0	31.1	40.5	SW	c	.	.	1.49
3a131	35.1	7.75	6.06	182	37.05	15.6	48	SW	a	.	.	1.19

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 2 (2006-05-01)\(0-0a)HS\20060131_3c_79(0-0a1)HS\20060131_3c_79v.xls

Data Evaluation Grade: **Test Grade (requires further evaluation)**

Tunnel:	3c		
Instruments:	VTS#1/GCMSD		
Date/Experiment #:	01/31/06	79	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	75.1%	
Number of drops:	1		
Nominal drop volume:	1 µL		
Mass of agent disseminated:	1.29 mg		
Corrected mass on 100% agent purity:	0.97 mg		
Average substrate temperature:	34.86 °C		
Average air temperature above drop:	35.01 °C		
Average air flow rate:	181.38 SLPM		
Test section air flow speed:	1.56 m/s		
Crude Evap Rate:	9.6 ug/min		
Mass % recovery in vapor:	65.5 %		
Mass % recovery by extraction:	5.7 %		
Total agent % mass recovery:	71.2 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.3	1.00%	Go
0.2	0.43%	Go
2.7	1.46%	Flag
-	-	Go



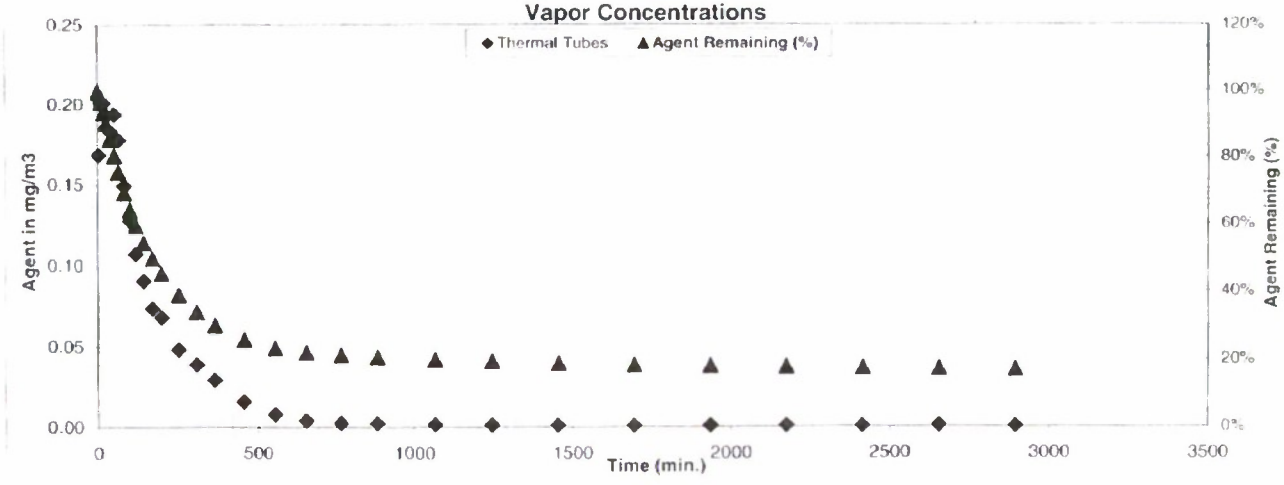
Time (min)	Conc. mg/m^3	HD rem. (%)
1.95	5.22E-02	99.05%
4.28	5.57E-02	96.69%
6.60	5.85E-02	94.22%
8.92	5.54E-02	91.75%
11.23	6.06E-02	89.23%
13.57	5.58E-02	86.69%
16.27	5.53E-02	83.89%
18.58	5.26E-02	81.55%
20.92	5.62E-02	79.17%
23.23	4.74E-02	76.92%
25.55	4.84E-02	74.84%
27.87	4.55E-02	72.81%
30.18	4.67E-02	70.81%
32.52	4.14E-02	68.89%
34.83	3.92E-02	67.14%
37.17	4.01E-02	65.41%
40.23	3.22E-02	63.33%
44.05	2.95E-02	61.13%
48.87	2.69E-02	58.59%
54.93	2.43E-02	55.68%
63.52	2.06E-02	52.08%
78.58	1.48E-02	47.08%
93.65	1.06E-02	43.50%
111.23	6.56E-03	40.68%
133.81	3.28E-03	38.60%
158.89	1.69E-03	37.43%
208.95	7.12E-04	36.30%
269.04	4.84E-04	35.63%
349.12	3.72E-04	34.99%
429.20	3.04E-04	34.48%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 1 (2006-04-24)\(0+0a)HS\20060224_3c_93(0+0a3)HS\20060224_3c_93v.xls

Data Evaluation Grade: **Modeling Grade**

Tunnel:	3c		
Instruments:	VTS#1/GCMSD		
Date/Experiment #:	02/24/06	93	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	75.1%	
Number of drops:	1		
Nominal drop volume:	9 µL		
Mass of agent disseminated:	11.62 mg		
Corrected mass on 100% agent purity:	8.72 mg		
Average substrate temperature:	35.27 °C		
Average air temperature above drop:	34.85 °C		
Average air flow rate:	181.88 SLPM		
Test section air flow speed:	1.58 m/s		
Crude Evap Rate:	32.2 ug/min		
Mass % recovery in vapor:	82.9 %		
Mass % recovery by extraction:	2.7 %		
Total agent % mass recovery:	85.6 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation			
	SD	%SD	Status
	0.2	0.65%	Go
	0.1	0.35%	Go
	1.0	0.57%	Go
	-	-	Go

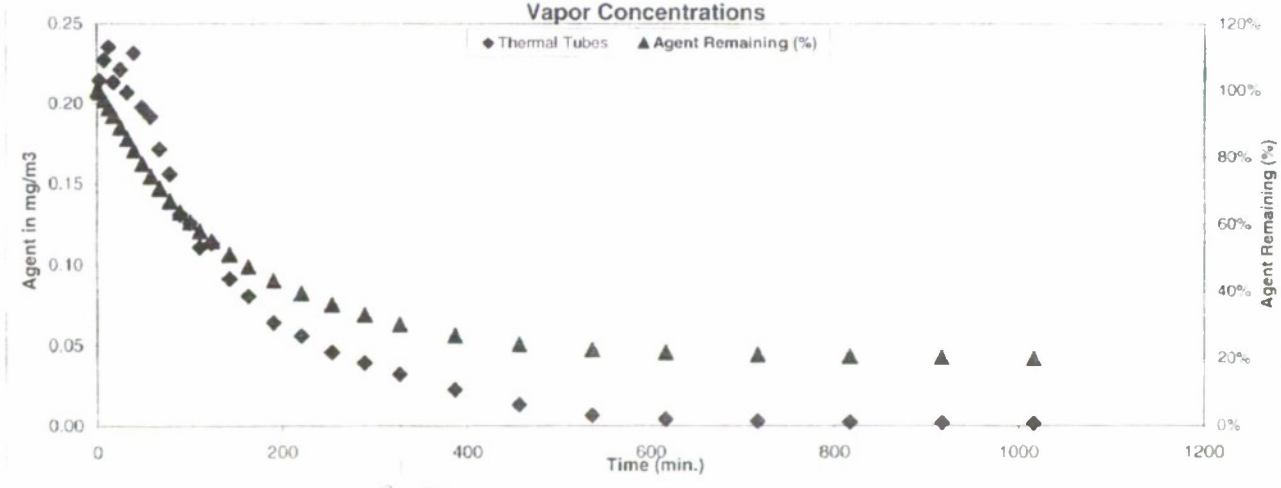


Time (min)	Conc. mg/m³	HD rem. (%)
2.42	1.68E-01	99.58%
9.98	2.01E-01	96.66%
17.57	2.01E-01	93.48%
25.13	1.93E-01	90.38%
37.70	1.83E-01	85.45%
50.27	1.94E-01	80.51%
62.83	1.78E-01	75.65%
80.40	1.49E-01	69.67%
97.98	1.28E-01	64.59%
116.80	1.07E-01	59.98%
141.87	9.05E-02	54.81%
169.43	7.37E-02	50.09%
199.52	6.81E-02	45.64%
252.08	4.80E-02	39.28%
307.15	3.89E-02	34.29%
364.73	2.93E-02	30.20%
454.80	1.57E-02	25.97%
554.87	7.84E-03	23.51%
654.93	4.17E-03	22.26%
765.00	2.57E-03	21.48%
885.07	2.44E-03	20.86%
1065.15	1.68E-03	20.08%
1245.22	1.34E-03	19.52%
1455.28	1.03E-03	19.00%
1695.35	8.49E-04	18.53%
1935.42	7.02E-04	18.14%
2175.50	5.86E-04	17.82%
2415.57	5.22E-04	17.54%
2655.63	4.15E-04	17.31%
2895.72	3.68E-04	17.11%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 1 (2006-04-24)\(0+0a)HS\20060206_3c_82(0+0a2)HS\20060206_3c_82v.xls

Data Evaluation Grade: Modeling Grade

			Data Evaluation		
			SD	%SD	Status
Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Experiment #:	02/06/06	82			
Type of substrate:	Sand	Punty			
Test agent/purity:	H	75.1%			
Number of drops:	1				
Nominal drop volume:	9 µL				
Mass of agent disseminated:	11.62 mg				
Corrected mass on 100% agent purity:	8.72 mg		0.2	0.62%	Go
Average substrate temperature:	35.23 °C		0.2	0.57%	Go
Average air temperature above drop:	35.08 °C		0.2	0.57%	Go
Average air flow rate:	181.77 SLPM		1.8	1.01%	Go
Test section air flow speed:	1.56 m/s		-	-	Go
Crude Evap Rate:	37.3 ug/min				
Mass % recovery in vapor:	80.1 %				
Mass % recovery by extraction:	11.3 %				
Total agent % mass recovery:	91.4 %				
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				

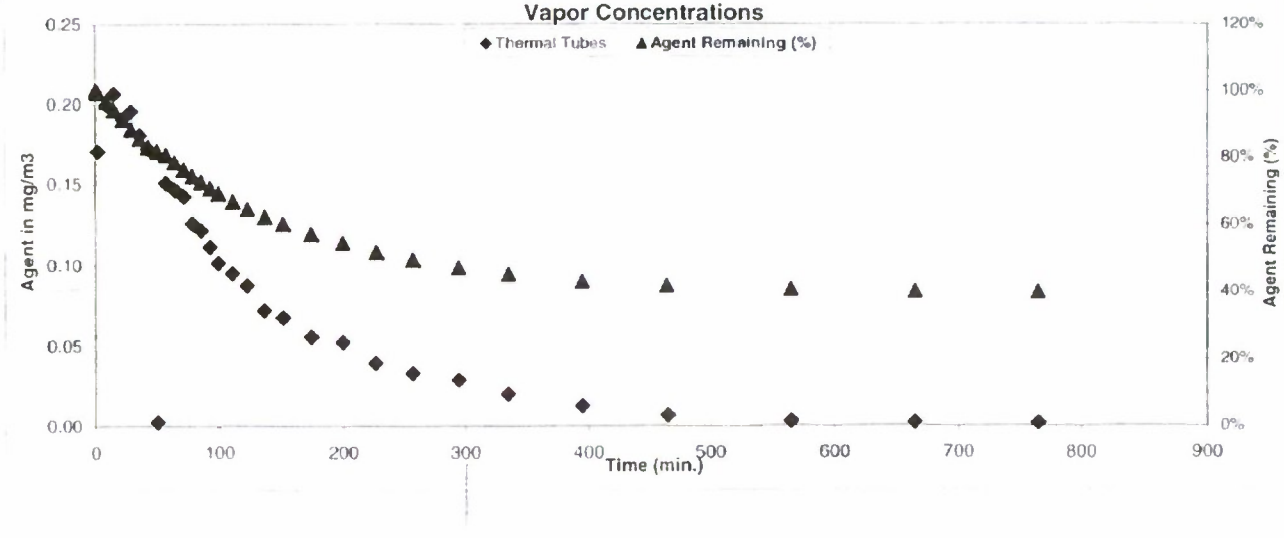


Time (min)	Conc. mg/m³	HD rem. (%)
2.45	2.15E-01	99.45%
7.52	2.27E-01	97.12%
12.58	2.35E-01	94.68%
17.65	2.13E-01	92.31%
25.22	2.21E-01	88.89%
32.80	2.07E-01	85.50%
40.37	2.31E-01	82.05%
49.60	1.98E-01	77.92%
58.83	1.92E-01	74.18%
68.07	1.72E-01	70.68%
78.97	1.56E-01	66.96%
89.87	1.31E-01	63.70%
100.77	1.26E-01	60.77%
111.67	1.11E-01	58.08%
124.25	1.13E-01	55.14%
143.07	9.14E-02	51.12%
163.13	8.06E-02	47.53%
190.71	6.40E-02	43.37%
220.78	5.58E-02	39.62%
253.35	4.56E-02	36.18%
288.42	3.90E-02	33.08%
325.98	3.21E-02	30.30%
386.05	2.24E-02	26.89%
456.12	1.29E-02	24.32%
536.20	6.41E-03	22.70%
616.27	3.98E-03	21.84%
716.33	2.77E-03	21.13%
816.40	2.08E-03	20.63%
916.47	1.66E-03	20.24%
1016.55	1.44E-03	19.91%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 2 (2006-05-01)\(0+0a)HS\20060130_3c_78(0+0a1)HS\20060130_3c_78v.xls

Data Evaluation Grade: **Modeling Grade**

Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Experiment #:	01/30/06	78			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		75.1%		
Number of drops:	1				
Nominal drop volume:	9	µL			
Mass of agent disseminated:	11.62	mg	Data Evaluation		
Corrected mass on 100% egent purity:	8.72	mg	SD	%SD	Status
Average substrate temperature:	35.08	°C	0.2	0.48%	Go
Average air temperature above drop:	35.09	°C	0.1	0.27%	Go
Average air flow rate:	181.68	SLPM	1.9	1.04%	Go
Test section air flow speed:	1.56	m/s	-	-	Go
Crude Evap Rate:	22.3	ug/min			
Mass % recovery in vapor:	60.1	%			
Mass % recovery by extraction:	6.6	%			
Total agent % mass recovery:	66.7	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				



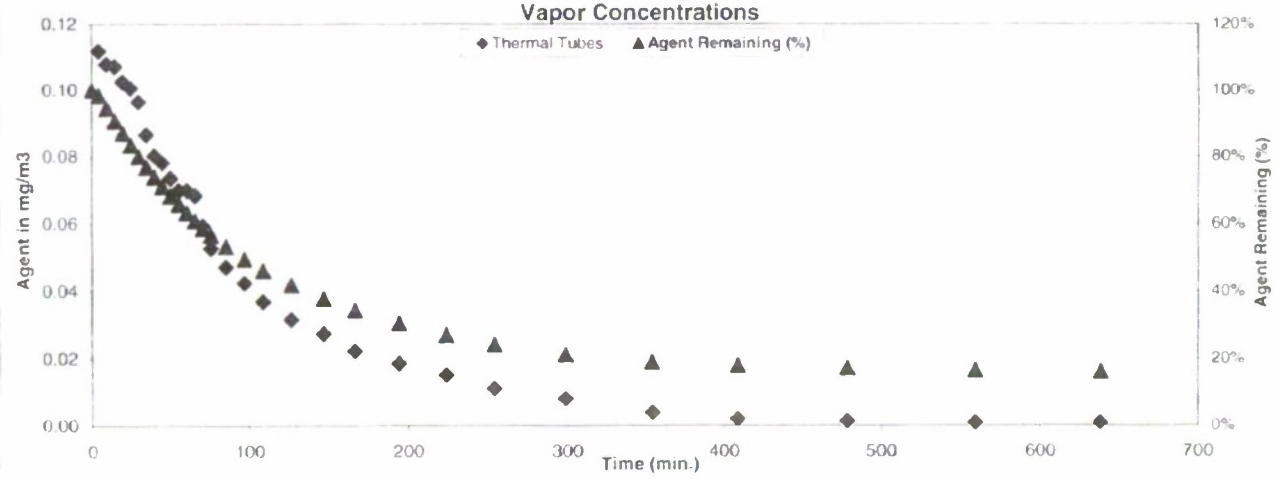
Time (min)	Conc. mg/m^3	HD rem. (%)
1.97	1.71E-01	99.65%
9.03	2.00E-01	96.92%
15.03	2.07E-01	94.38%
22.10	1.91E-01	91.45%
29.17	1.96E-01	88.61%
36.23	1.81E-01	85.84%
43.30	1.72E-01	83.24%
50.37	2.81E-03	81.95%
57.43	1.51E-01	80.82%
64.50	1.47E-01	78.63%
71.57	1.43E-01	76.50%
78.63	1.26E-01	74.52%
85.70	1.22E-01	72.70%
92.77	1.12E-01	70.98%
99.83	1.02E-01	69.41%
111.40	9.52E-02	67.04%
123.47	8.79E-02	64.74%
137.03	7.22E-02	62.48%
152.10	6.75E-02	60.28%
174.65	5.56E-02	57.39%
199.72	5.24E-02	54.57%
227.27	3.92E-02	51.95%
257.33	3.30E-02	49.69%
294.88	2.86E-02	47.28%
334.93	1.97E-02	45.26%
394.98	1.28E-02	43.23%
465.01	6.40E-03	41.82%
565.02	3.09E-03	40.83%
665.06	2.11E-03	40.29%
765.07	1.79E-03	39.89%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 1 (2006-04-24)\(00+a)HS\20060208_3c_84(00+a1)HS\20060208_3c_84v.xls

Data Evaluation Grade: **Test Grade (requires further evaluation)**

Tunnel:	3c		
Instruments:	VTS#1/GCMSD		
Date/Experiment #	02/08/06	84	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	75.1%	
Number of drops:	1		
Nominal drop volume:	6 µL		
Mass of agent disseminated:	7.75 mg		
Corrected mass on 100% agent purity:	5.82 mg		
Average substrate temperature:	35.25 °C		
Average air temperature above drop:	35.30 °C		
Average air flow rate:	404.92 SLPM		
Test section air flow speed:	3.30 m/s		
Crude Evap Rate:	36.7 ug/min		
Mass % recovery in vapor:	83.9 %		
Mass % recovery by extraction:	8.5 %		
Total agent % mass recovery:	92.4 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.1	0.30%	Go
0.1	0.39%	Go
5.0	1.23%	Flag
-	-	Go

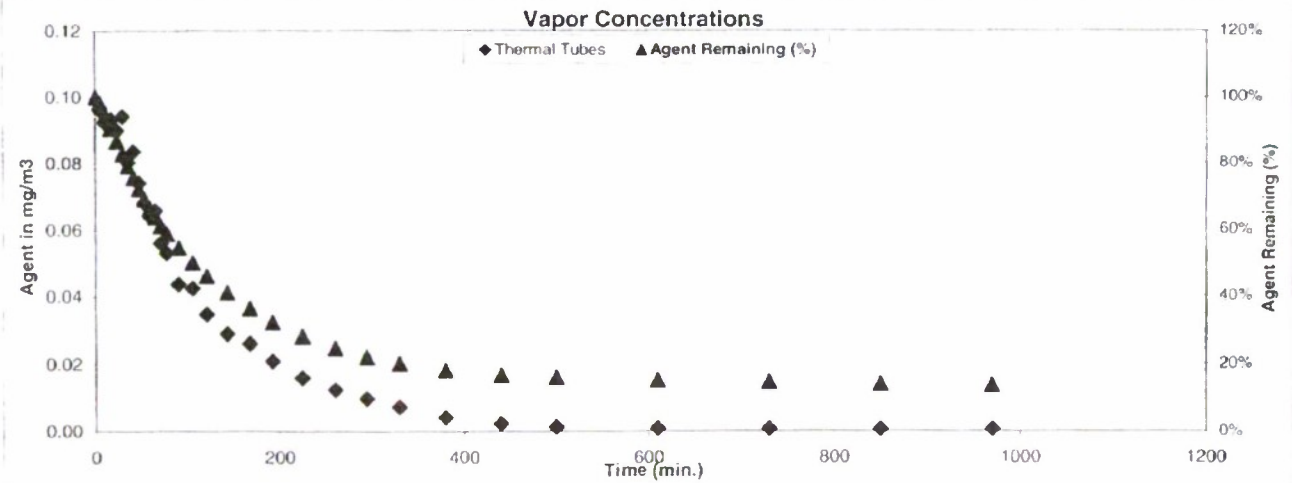


Time (min)	Conc. mg/m³	HD rem. (%)
4.16	1.12E-01	98.38%
9.23	1.08E-01	94.50%
14.31	1.07E-01	90.69%
19.38	1.03E-01	86.99%
24.46	1.01E-01	83.40%
29.53	9.64E-02	79.92%
34.61	8.65E-02	76.69%
39.68	8.01E-02	73.75%
44.75	7.80E-02	70.96%
49.83	7.34E-02	68.28%
54.90	6.98E-02	65.75%
59.98	6.99E-02	63.28%
65.05	6.83E-02	60.84%
70.11	5.94E-02	58.59%
75.20	5.27E-02	56.61%
84.74	4.71E-02	53.29%
96.77	4.24E-02	49.54%
108.82	3.69E-02	46.21%
126.35	3.16E-02	42.02%
146.36	2.74E-02	37.91%
166.38	2.23E-02	34.44%
193.88	1.86E-02	30.53%
223.88	1.51E-02	27.01%
253.88	1.11E-02	24.27%
298.83	8.02E-03	21.28%
353.77	3.72E-03	19.04%
408.70	1.92E-03	17.96%
478.60	1.23E-03	17.19%
558.61	8.89E-04	16.60%
638.68	7.76E-04	16.13%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 1 (2006-04-24)\(00+a)HS\20060210_3c_86(00+a1)HS\20060210_3c_86v.xls

Data Evaluation Grade: **Test Grade (requires further evaluation)**

Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Expenment #:	02/10/06	86			
Type of substrate :	Sand		Purity		
Test agent/purity:	H		75.1%		
Number of drops:	1				
Nominal drop volume:	6	µL			
Mass of agent disseminated:	7.75	mg	Data Evaluation		
Corrected mass on 100% agent purity:	5.82	mg	SD	%SD	Status
Average substrate temperature:	35.19	°C	0.2	0.44%	Go
Average air temperature above drop:	35.11	°C	0.1	0.29%	Go
Average air flow rate:	405.38	SLPM	4.7	1.16%	Flag
Test section air flow speed:	3.30	m/s	-	-	Go
Crude Evap Rate:	32.9	ug/min			
Mass % recovery in vapor:	86.4	%			
Mass % recovery by extraction:	1.2	%			
Total agent % mass recovery:	87.5	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				



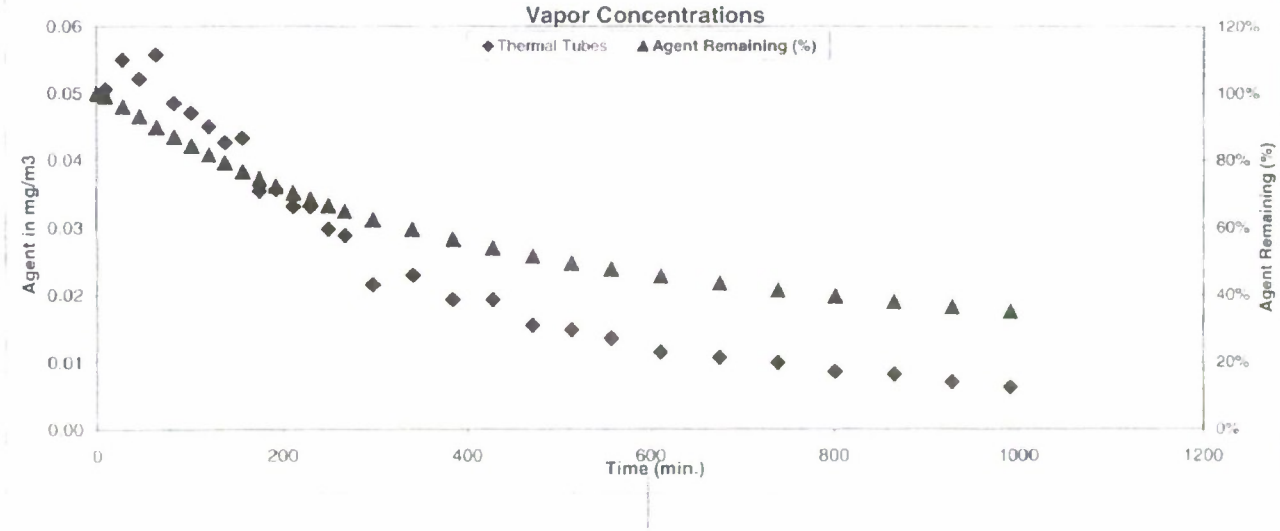
Time (min)	Conc. mg/m^3	HD rem. (%)
4.48	9.62E-02	98.50%
10.53	9.23E-02	94.52%
16.58	9.33E-02	90.61%
22.65	8.99E-02	86.74%
28.70	9.42E-02	82.86%
34.75	8.02E-02	79.18%
40.80	8.36E-02	75.72%
46.86	7.41E-02	72.39%
52.91	6.82E-02	69.39%
58.96	6.41E-02	66.60%
65.03	6.58E-02	63.85%
71.08	5.62E-02	61.28%
77.13	5.31E-02	58.98%
89.67	4.37E-02	54.74%
104.71	4.24E-02	50.23%
119.74	3.47E-02	46.19%
142.25	2.89E-02	41.21%
167.26	2.60E-02	36.42%
192.27	2.09E-02	32.34%
224.76	1.58E-02	28.18%
259.73	1.23E-02	24.76%
294.71	9.66E-03	22.09%
329.69	7.16E-03	20.03%
379.63	4.02E-03	18.09%
439.55	2.30E-03	16.77%
499.58	1.31E-03	16.01%
609.65	8.43E-04	15.18%
729.72	6.39E-04	14.56%
849.78	5.47E-04	14.07%
969.85	4.79E-04	13.64%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 2 (2006-05-01)\(-00a)HS\20060208_3d_38(-00a1)HS\20060208_3d_38v.xls

Data Evaluation Grade: **Modeling Grade**

Tunnel:	3d		
Instruments:	VTS#2/GCMSD		
Date/Experiment #:	02/08/06	38	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	75.1%	
Number of drops:	1		
Nominal drop volume:	6 µL		
Mass of agent disseminated:	7.75 mg		
Corrected mass on 100% agent purity:	5.82 mg		
Average substrate temperature:	15.12 °C		
Average air temperature above drop:	15.16 °C		
Average air flow rate:	181.21 SLPM		
Test section air flow speed:	1.55 m/s		
Crude Evap Rate:	8.4 ug/min		
Mass % recovery in vapor:	64.8 %		
Mass % recovery by extraction:	25.6 %		
Total agent % mass recovery:	90.4 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

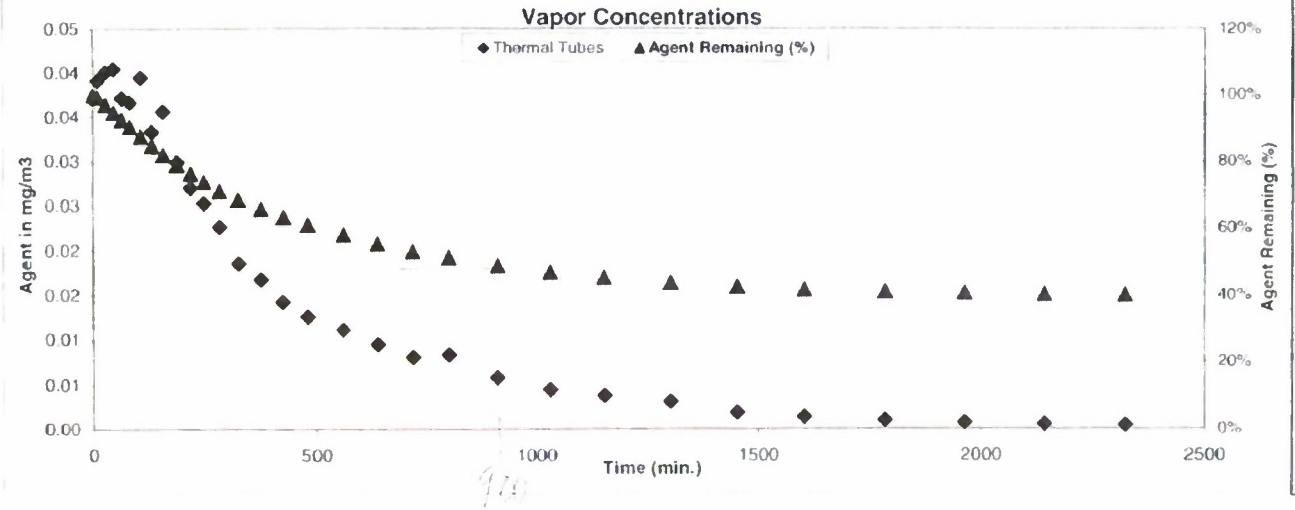
Data Evaluation		
SD	%SD	Status
0.3	2.26%	Go
0.1	0.59%	Go
0.7	0.39%	Go
-	-	Go



Time (min)	Conc. mg/m³	HD rem. (%)
10.16	5.07E-02	99.20%
28.51	5.51E-02	96.18%
46.86	5.22E-02	93.11%
65.21	5.58E-02	90.02%
83.55	4.85E-02	87.04%
101.90	4.71E-02	84.31%
120.25	4.51E-02	81.67%
138.60	4.26E-02	79.17%
156.95	4.33E-02	76.71%
175.28	3.55E-02	74.46%
193.63	3.57E-02	72.42%
211.98	3.32E-02	70.45%
230.33	3.32E-02	68.55%
248.68	2.99E-02	66.75%
267.03	2.89E-02	65.07%
297.85	2.16E-02	62.64%
341.13	2.31E-02	59.63%
384.42	1.94E-02	56.77%
427.70	1.94E-02	54.15%
470.98	1.56E-02	51.79%
514.32	1.48E-02	49.75%
557.70	1.36E-02	47.83%
611.10	1.15E-02	45.74%
674.48	1.07E-02	43.54%
737.88	9.93E-03	41.50%
801.28	8.54E-03	39.68%
864.67	8.17E-03	38.03%
928.07	6.98E-03	36.53%
991.45	6.31E-03	35.22%
0.00	0.00E+00	0.00%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 1 (2006-04-24)\(-00a)HS\20060213_3d_41(-00a2)HS\20060213_3d_41v.xls

Tunnel:	3d				
Instruments:	VTS#3/GCMSD				
Date/Experiment #:	02/13/06	41			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		75.1%		
Number of drops:	1				
Nominal drop volume:	6	µL			
Mass of agent disseminated:	7.75	mg	Data Evaluation		
Corrected mass on 100% agent purity:	5.82	mg	SD	%SD	Status
Average substrate temperature:	14.74	°C	0.2	1.49%	Go
Average air temperature above drop:	14.94	°C	0.1	0.52%	Go
Average air flow rate:	181.38	SLPM	0.8	0.42%	Go
Test section air flow speed:	1.56	m/s	-	-	Go
Crude Evap Rate:	6.2	ug/min			
Mass % recovery in vapor:	59.9	%			
Mass % recovery by extraction:	15.7	%			
Total agent % mass recovery:	75.6	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				



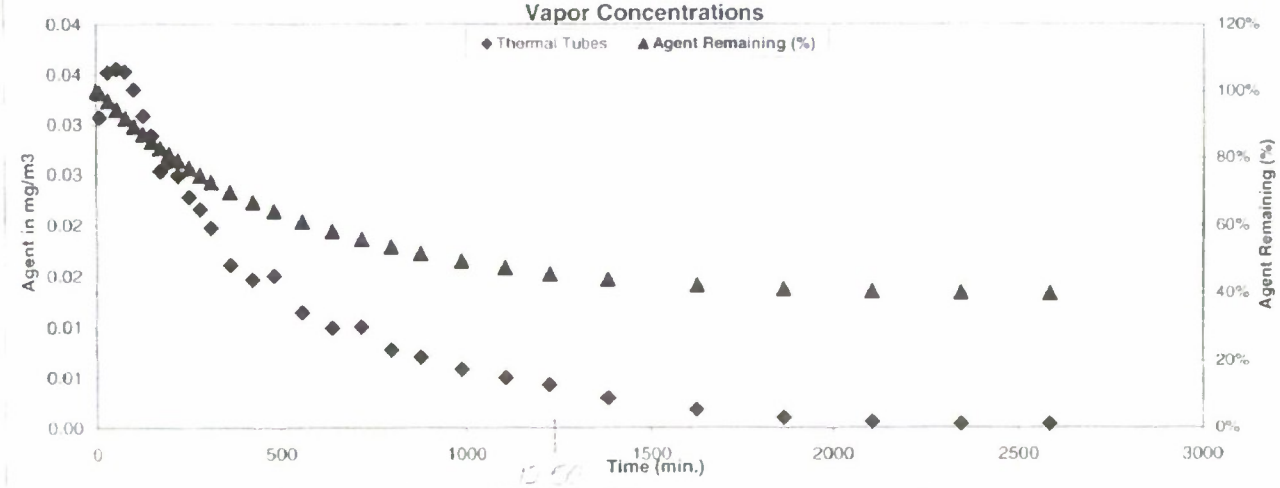
Time (min)	Conc. mg/m³	HD rem. (%)
9.83	3.91E-02	99.40%
28.22	4.01E-02	97.13%
46.62	4.04E-02	94.82%
65.00	3.71E-02	92.60%
83.40	3.67E-02	90.48%
108.45	3.95E-02	87.51%
133.52	3.33E-02	84.66%
158.58	3.57E-02	81.96%
188.63	2.99E-02	78.89%
218.70	2.70E-02	76.22%
248.75	2.53E-02	73.78%
283.82	2.26E-02	71.16%
326.38	1.85E-02	68.42%
376.43	1.67E-02	65.67%
426.50	1.43E-02	63.26%
481.57	1.26E-02	60.95%
561.62	1.11E-02	58.00%
641.68	9.48E-03	55.42%
721.75	8.08E-03	53.23%
801.80	8.33E-03	51.18%
911.87	5.76E-03	48.77%
1031.99	4.42E-03	46.86%
1152.34	3.77E-03	45.32%
1302.77	3.13E-03	43.71%
1453.21	1.87E-03	42.54%
1603.66	1.34E-03	41.78%
1784.16	9.26E-04	41.14%
1964.33	6.98E-04	40.69%
2144.40	5.32E-04	40.34%
2324.45	4.43E-04	40.07%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 2 (2006-05-01)\(+00a)HS\20060221_3d_44(-00a3)HS\20060221_3d_44v.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3d		
Instruments:	VTS#3/GCMSD		
Date/Experiment #:	02/21/06	44	
Type of substrate:	Sand		Purity
Test agent/purity:	H		75.1%
Number of drops:	1		
Nominal drop volume:	6	µL	
Mass of agent disseminated:	7.75	mg	
Corrected mass on 100% agent purity:	5.82	mg	
Average substrate temperature:	15.06	°C	
Average air temperature above drop:	15.05	°C	
Average air flow rate:	181.70	SLPM	
Test section air flow speed:	1.56	m/s	
Crude Evap Rate:	5.8	ug/min	
Mass % recovery in vapor:	60.1	%	
Mass % recovery by extraction:	17.5	%	
Total agent % mass recovery:	77.6	%	
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.2	1.18%	Go
0.1	0.88%	Go
0.8	0.41%	Go
-	-	Go

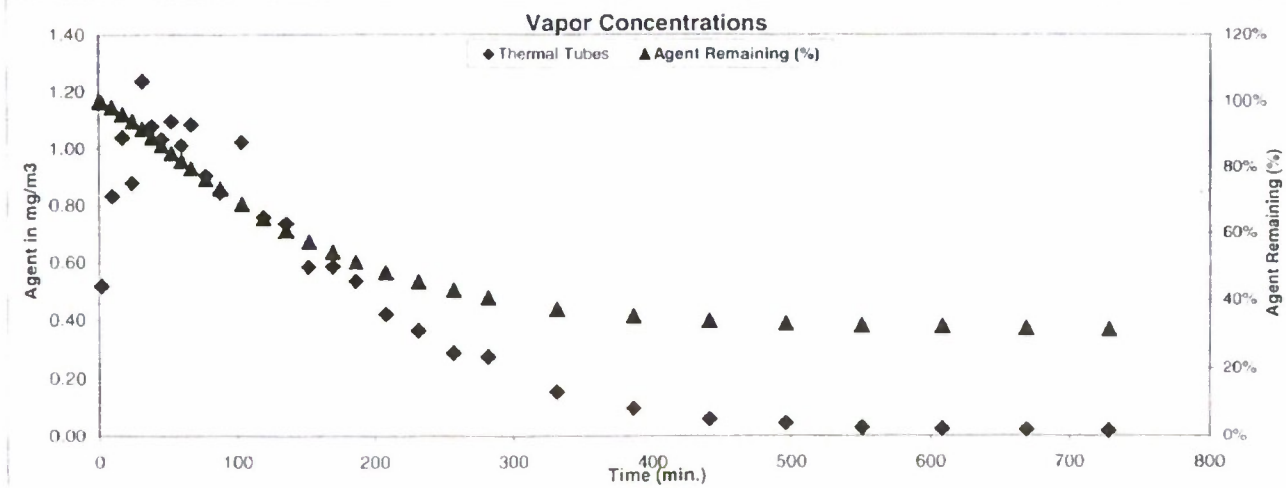


Time (min)	Conc. mg/m³	HD rem. (%)
8.80	3.07E-02	99.58%
32.20	3.52E-02	97.17%
55.60	3.56E-02	94.58%
78.98	3.53E-02	91.99%
102.38	3.35E-02	89.48%
125.77	3.09E-02	87.12%
149.17	2.89E-02	84.94%
172.57	2.53E-02	82.95%
195.95	2.63E-02	81.07%
219.35	2.49E-02	79.20%
249.40	2.28E-02	76.96%
279.47	2.16E-02	74.87%
309.53	1.98E-02	72.92%
362.08	1.62E-02	69.97%
422.15	1.47E-02	67.08%
482.22	1.51E-02	64.29%
557.27	1.14E-02	61.18%
637.33	9.96E-03	58.51%
717.38	1.00E-02	56.01%
797.45	7.84E-03	53.78%
877.52	7.07E-03	51.91%
987.57	5.84E-03	49.69%
1107.63	5.04E-03	47.65%
1227.68	4.28E-03	45.90%
1384.42	3.01E-03	44.12%
1624.48	1.83E-03	42.30%
1864.53	1.06E-03	41.22%
2104.60	6.16E-04	40.59%
2344.65	4.69E-04	40.18%
2584.72	3.61E-04	39.87%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 2 (2006-05-01)\(00-a)HS\20060111_3c_69(00-a1)HS\20060111_3c_69v.xls

Data Evaluation Grade: Modeling Grade

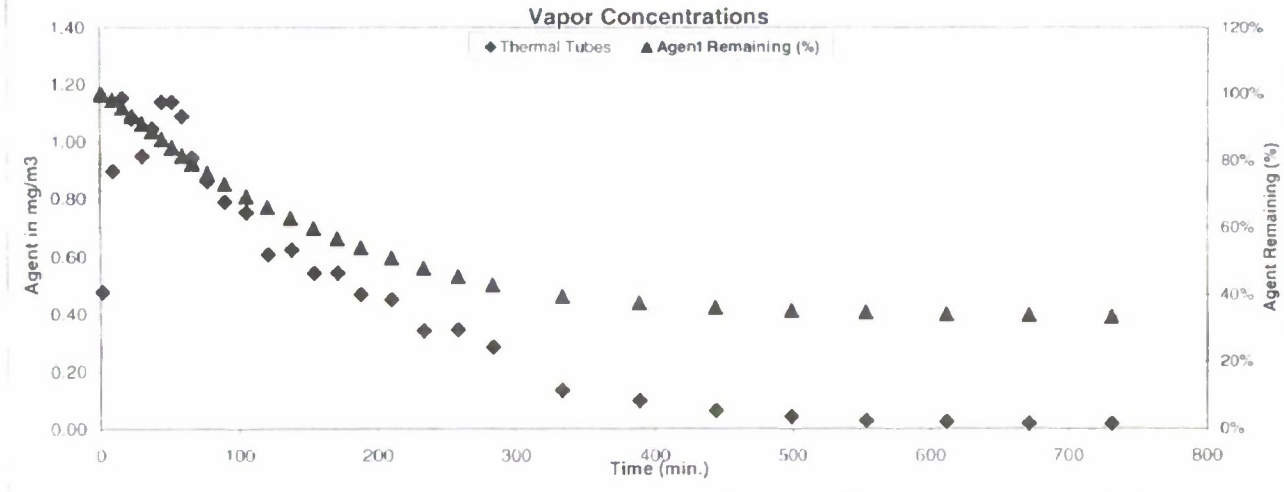
Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Experiment #:	01/11/06	69			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		75.1%		
Number of drops:	1				
Nominal drop volume:	6 µL				
Mass of agent disseminated:	7.75 mg		Data Evaluation		
Corrected mass on 100% agent purity:	5.82 mg		SD	%SD	Status
Average substrate temperature:	35.06 °C		0.1	0.41%	Go
Average air temperature above drop:	35.02 °C		0.1	0.39%	Go
Average air flow rate:	18.06 SLPM		0.2	0.94%	Go
Test section air flow speed:	0.23 m/s				Go
Crude Evap Rate:	18.1 ug/min				
Mass % recovery in vapor:	68.6 %				
Mass % recovery by extraction:	10.7 %				
Total agent % mass recovery:	79.3 %				
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				



Time (min)	Conc. mg/m³	HD rem. (%)
1.83	5.18E-01	99.85%
9.07	8.33E-01	98.33%
16.28	1.04E+00	96.24%
23.50	8.75E-01	94.09%
30.72	1.24E+00	91.72%
37.93	1.08E+00	89.12%
45.15	1.03E+00	86.76%
52.37	1.10E+00	84.37%
59.58	1.01E+00	82.01%
66.80	1.09E+00	79.66%
77.35	9.03E-01	76.40%
87.88	8.45E-01	73.54%
103.42	1.02E+00	69.04%
119.20	7.58E-01	64.68%
135.22	7.35E-01	60.97%
151.77	5.83E-01	57.58%
168.78	5.85E-01	54.49%
185.82	5.32E-01	51.54%
207.83	4.18E-01	48.30%
231.35	3.62E-01	45.45%
256.36	2.85E-01	42.93%
281.36	2.73E-01	40.77%
331.31	1.52E-01	37.47%
386.25	9.52E-02	35.36%
441.18	5.79E-02	34.05%
496.12	4.36E-02	33.19%
SS1.05	2.85E-02	32.57%
608.48	2.38E-02	32.10%
668.41	2.01E-02	31.70%
728.33	1.63E-02	31.36%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 1 (2006-04-24)\(00-a)HS\20060112_3c_70(00-a2)HS\20060112_3c_70v.xls

Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Experiment #:	01/12/06	70			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		75.1%		
Number of drops:	1				
Nominal drop volume:	6	µL			
Mass of agent disseminated:	7.75	mg	Data Evaluation		
Corrected mass on 100% agent purity:	5.82	mg	SD	%SD	Status
Average substrate temperature:	34.92	°C	0.1	0.22%	Go
Average air temperature above drop:	35.11	°C	0.2	0.43%	Go
Average air flow rate:	18.06	SLPM	0.0	0.21%	Go
Test section air flow speed:	0.23	m/s	-	-	Go
Crude Evap Rate:	18.6	ug/min			
Mass % recovery in vapor:	66.4	%			
Mass % recovery by extraction:	7.5	%			
Total agent % mass recovery:	73.9	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				



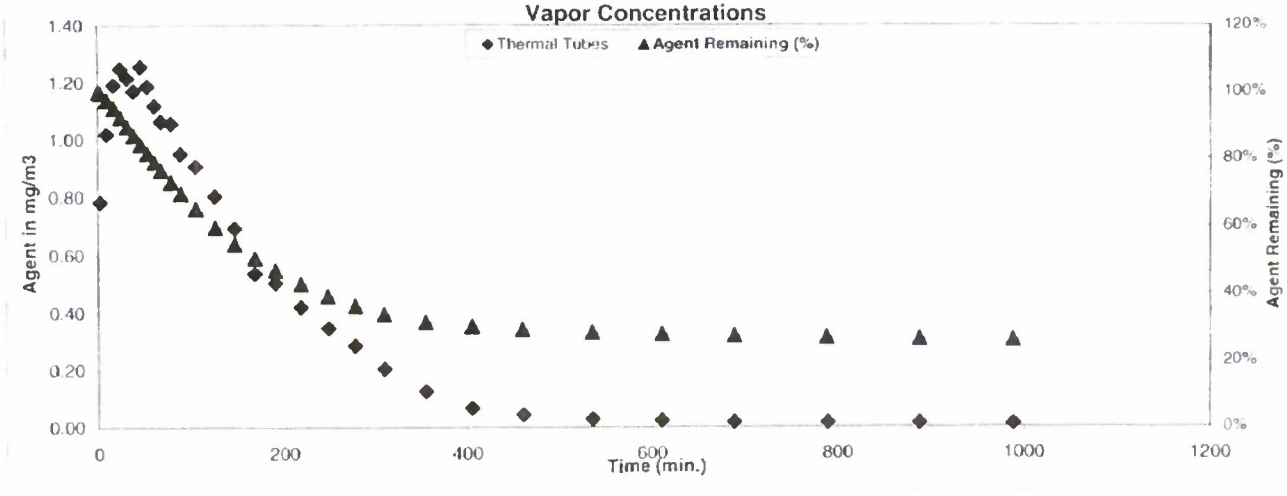
Time (min)	Conc. mg/m³	HD rem. (%)
1.48	4.80E-01	99.89%
8.72	8.97E-01	98.34%
15.95	1.15E+00	96.04%
23.18	1.08E+00	93.53%
30.42	9.50E-01	91.25%
37.67	1.05E+00	89.00%
44.90	1.14E+00	86.55%
52.13	1.14E+00	83.99%
59.37	1.09E+00	81.49%
66.60	9.44E-01	79.20%
77.17	8.61E-01	76.24%
89.80	7.89E-01	73.00%
105.37	7.53E-01	69.27%
121.20	6.08E-01	65.92%
137.25	6.28E-01	62.84%
153.83	5.45E-01	59.82%
170.90	5.45E-01	56.93%
187.97	4.71E-01	54.24%
210.05	4.50E-01	51.08%
233.62	3.44E-01	48.17%
258.68	3.46E-01	45.49%
283.75	2.86E-01	43.03%
333.82	1.36E-01	39.75%
388.88	9.90E-02	37.74%
443.95	6.25E-02	36.36%
499.03	4.29E-02	35.46%
554.10	3.02E-02	34.83%
611.67	2.36E-02	34.35%
671.73	2.05E-02	33.94%
731.80	1.71E-02	33.59%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 1 (2006-04-24)\(00-a)HS\20060113_3c_71(00-a3)HS\20060113_3c_71v.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3c		
Instruments:	VTS#1/GCMSD		
Date/Expenment #:	01/13/06	71	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	75.1%	
Number of drops:	1		
Nominal drop volume:	6 µL		
Mass of agent disseminated:	7.75 mg		
Corrected mass on 100% agent purity:	5.82 mg		
Average substrate temperature:	35.04 °C		
Average air temperature above drop:	35.06 °C		
Average air flow rate:	18.07 SLPM		
Test section air flow speed:	0.23 m/s		
Crude Evap Rate:	19.6 ug/min		
Mass % recovery in vapor:	73.9 %		
Mass % recovery by extraction:	1.9 %		
Total agent % mass recovery:	75.7 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.1	0.21%	Go
0.1	0.31%	Go
0.0	0.20%	Go
-	-	Go

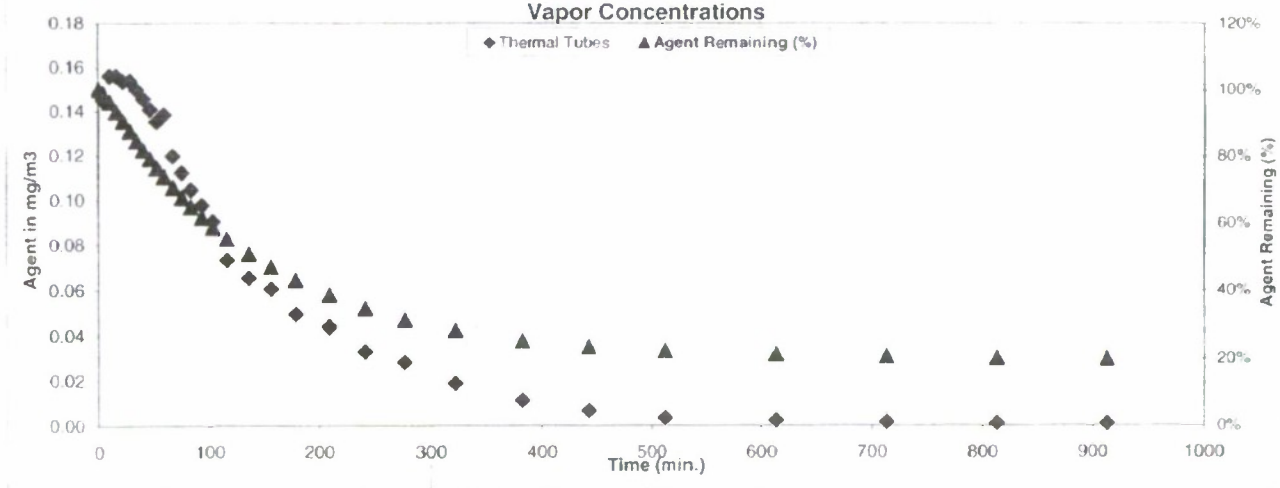


Time (min)	Conc. mg/m³	HD rem. (%)
2.45	7.82E-01	99.70%
9.70	1.02E+00	97.67%
16.97	1.19E+00	95.18%
24.22	1.25E+00	92.43%
31.47	1.22E+00	89.66%
38.72	1.17E+00	86.97%
45.97	1.25E+00	84.24%
53.22	1.19E+00	81.49%
60.48	1.12E+00	78.89%
67.73	1.06E+00	76.44%
78.34	1.06E+00	72.94%
88.92	9.49E-01	69.65%
104.53	9.05E-01	65.15%
125.41	8.03E-01	59.61%
146.53	6.93E-01	54.70%
168.16	5.37E-01	50.58%
190.29	5.04E-01	47.00%
219.09	4.20E-01	42.87%
247.91	3.47E-01	39.43%
278.21	2.86E-01	36.45%
310.02	2.04E-01	34.03%
355.21	1.26E-01	31.71%
405.40	6.56E-02	30.22%
460.60	4.24E-02	29.29%
535.87	2.80E-02	28.47%
611.12	2.15E-02	27.89%
688.89	1.75E-02	27.42%
789.10	1.44E-02	26.92%
889.17	1.27E-02	26.50%
989.26	1.01E-02	26.15%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 1 (2006-04-24)\(000a)HS\20060209_3c_85(000a2)HS\20060209_3c_85V.xls

Data Evaluation Grade: Modeling Grade

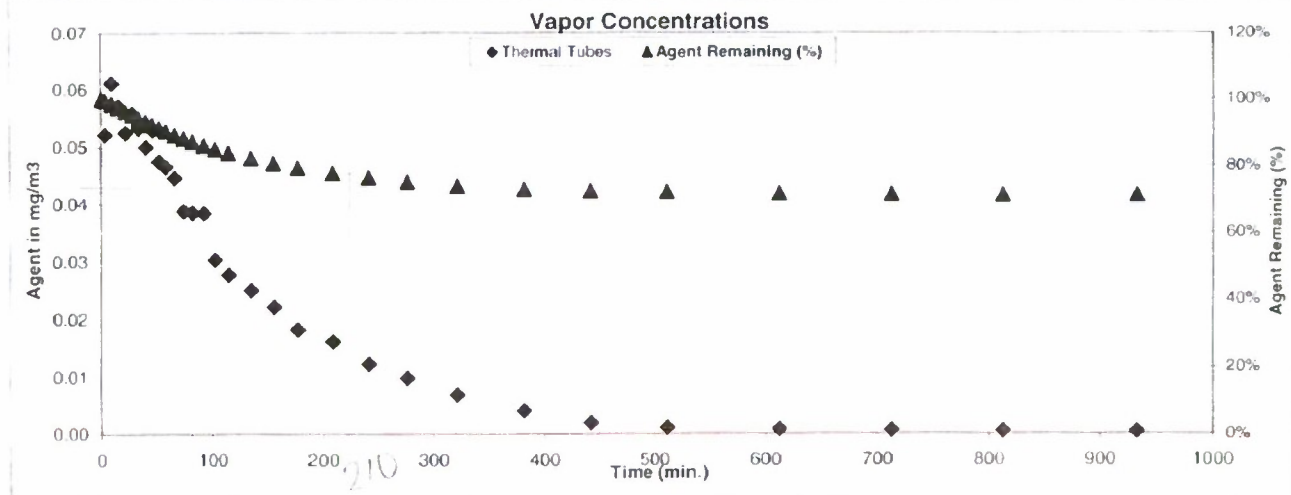
Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Experiment #:	02/09/06	85			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		75.1%		
Number of drops:	1				
Nominal drop volume:	6 µL				
Mass of agent disseminated:	7.75 mg		Data Evaluation		
Corrected mass on 100% agent purity:	5.82 mg		SD	%SD	Status
Average substrate temperature:	34.82 °C		0.2	0.54%	Go
Average air temperature above drop:	34.80 °C		0.2	0.47%	Go
Average air flow rate:	181.86 SLPM		1.3	0.71%	Go
Test section air flow speed:	1.57 m/s		-	-	Go
Crude Evap Rate:	24.6 ug/min				
Mass % recovery in vapor:	80.1 %				
Mass % recovery by extraction:	0.9 %				
Total agent % mass recovery:	81.0 %				
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				



Time (min)	Conc. mg/m³	HD rem. (%)
4.07	1.45E-01	99.08%
10.16	1.56E-01	96.21%
16.24	1.56E-01	93.24%
22.32	1.54E-01	90.29%
28.40	1.54E-01	87.36%
34.49	1.50E-01	84.47%
40.57	1.46E-01	81.66%
46.66	1.41E-01	78.93%
52.74	1.35E-01	76.31%
58.82	1.38E-01	73.70%
66.93	1.20E-01	70.43%
75.00	1.12E-01	67.50%
83.10	1.05E-01	64.76%
93.19	9.78E-02	61.57%
103.29	9.06E-02	58.59%
115.90	7.34E-02	55.36%
136.01	6.56E-02	50.99%
156.13	6.06E-02	47.02%
178.75	4.95E-02	43.13%
208.90	4.40E-02	38.73%
241.56	3.32E-02	34.79%
276.71	2.82E-02	31.42%
321.90	1.89E-02	28.09%
382.12	1.14E-02	25.24%
442.33	6.92E-03	23.52%
512.57	3.59E-03	22.36%
612.89	2.55E-03	21.40%
713.12	1.88E-03	20.71%
813.18	1.22E-03	20.22%
913.25	1.03E-03	19.87%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 2 (2006-05-01)\(000a)HS\20060207_3c_83(000a2)HS(R)\20060207_3c_83v.xls

Tunnel:	3c				
Instruments:	VTS#1/GCMS0				
Date/Experiment #:	02/07/06	83			
Type of substrate :	Sand		Purity		
Test agent/purity:	H		75.1%		
Number of drops:	1				
Nominal drop volume:	6	µL			
Mass of agent disseminated:	7.75	mg	Data Evaluation		
Corrected mass on 100% agent purity:	5.82	mg	SD	%SD	Status
Average substrate temperature:	35.11	°C	0.3	0.91%	Go
Average air temperature above drop:	35.09	°C	0.2	0.48%	Go
Average air flow rate:	181.82	SLPM	1.7	0.91%	Go
Test section air flow speed:	1.56	m/s	-	-	Go
Crude Evap Rate:	9.5	ug/min			
Mass % recovery in vapor:	28.9	%			
Mass % recovery by extraction:	7.2	%			
Total agent % mass recovery:	36.1	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				

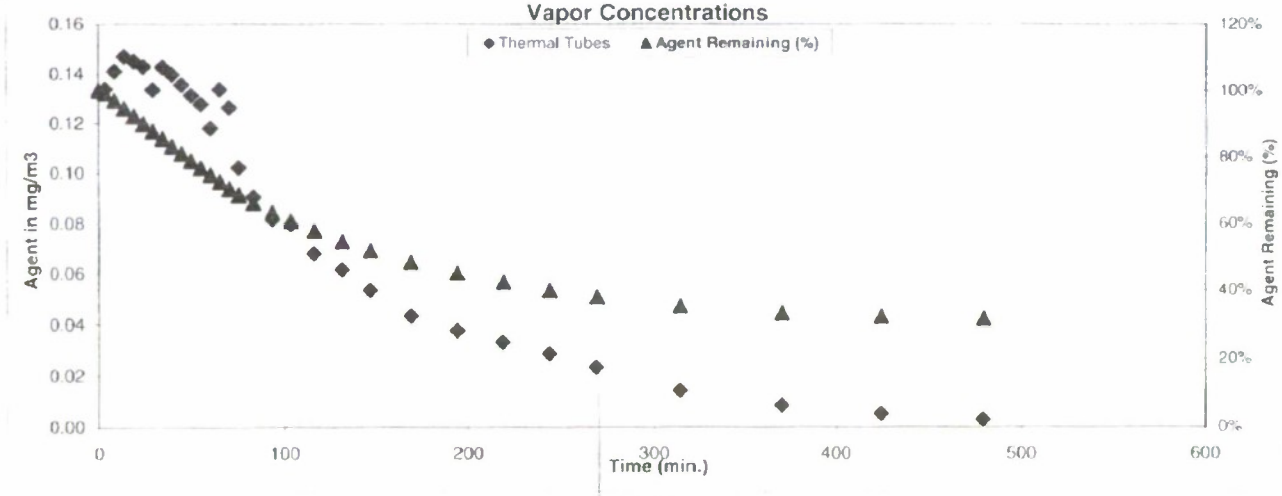


Time (min)	Conc. mg/m³	HD rem. (%)
3.47	5.22E-02	99.72%
9.56	6.12E-02	98.64%
15.65	5.72E-02	97.51%
21.74	5.26E-02	96.47%
27.82	5.59E-02	95.44%
33.90	5.33E-02	94.40%
39.99	5.00E-02	93.41%
46.07	5.31E-02	92.43%
52.15	4.75E-02	91.48%
58.24	4.66E-02	90.58%
66.32	4.46E-02	89.43%
74.43	3.88E-02	88.37%
82.51	3.85E-02	87.40%
92.60	3.84E-02	86.18%
102.69	3.04E-02	85.10%
115.30	2.79E-02	83.95%
135.41	2.50E-02	82.29%
155.55	2.21E-02	80.81%
178.17	1.82E-02	79.38%
208.30	1.62E-02	77.76%
240.96	1.22E-02	76.31%
276.12	9.86E-03	75.10%
321.30	6.87E-03	73.92%
381.52	4.08E-03	72.89%
441.73	2.01E-03	72.31%
511.99	1.15E-03	71.96%
612.31	8.12E-04	71.66%
712.50	5.77E-04	71.44%
812.57	5.19E-04	71.27%
932.65	4.45E-04	71.09%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 2 (2006-05-01)\(000a)HS\20060201_3c_80(000a1)HS\20060201_3c_80.xls

Data Evaluation Grade: **Modeling Grade**

Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Experiment #:	02/01/06	80			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		75.1%		
Number of drops:	1				
Nominal drop volume:	6 µL				
Mass of agent disseminated:	7.62	mg	Data Evaluation		
Corrected mass on 100% agent purity:	5.72	mg	SD	%SD	Status
Average substrate temperature:	34.64	°C	0.1	0.37%	Go
Average air temperature above drop:	34.92	°C	0.2	0.48%	Go
Average air flow rate:	181.33	SLPM	1.5	0.85%	Go
Test section air flow speed:	1.56	m/s	-	-	Go
Crude Evap Rate:	23.3	ug/min			
Mass % recovery in vapor:	68.5	%			
Mass % recovery by extraction:	4.4	%			
Total agent % mass recovery:	72.9	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				



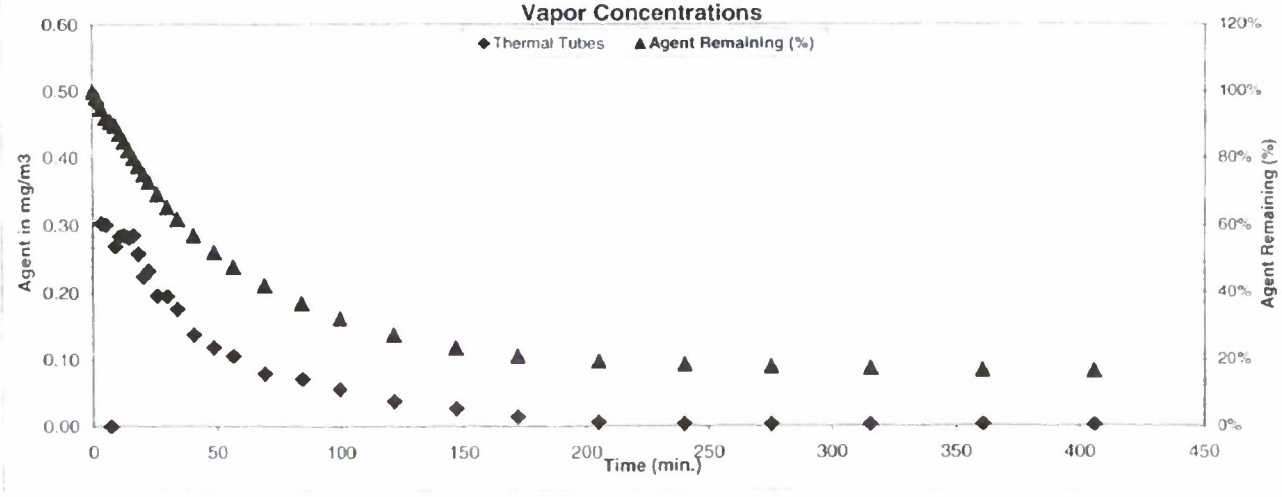
Time (min)	Conc. mg/m³	HD rem. (%)
3.58	1.34E-01	99.24%
8.73	1.41E-01	96.99%
13.88	1.47E-01	94.64%
19.05	1.45E-01	92.25%
24.20	1.43E-01	89.90%
29.29	1.34E-01	87.67%
34.37	1.43E-01	85.45%
39.52	1.40E-01	83.14%
44.67	1.36E-01	80.89%
49.82	1.31E-01	78.71%
54.97	1.28E-01	76.60%
60.12	1.18E-01	74.59%
65.27	1.34E-01	72.54%
70.42	1.26E-01	70.41%
75.57	1.02E-01	68.55%
83.22	9.06E-02	66.21%
93.37	8.19E-02	63.43%
103.52	7.98E-02	60.83%
116.18	8.80E-02	57.87%
131.33	6.16E-02	54.76%
146.48	5.34E-02	52.00%
169.05	4.33E-02	48.54%
194.12	3.76E-02	45.33%
219.18	3.29E-02	42.53%
244.25	2.86E-02	40.08%
269.32	2.32E-02	38.02%
314.40	1.43E-02	35.34%
369.47	8.45E-03	33.35%
424.53	4.95E-03	32.18%
479.60	2.81E-03	31.50%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 1 (2006-04-24)\(+++a)HS\20060215_3c_88(+++a1)HS\20060215_3c_88v.xls

Data Evaluation Grade: **Test Grade (requires further evaluation)**

Tunnel:	3c		
Instruments:	VTS#1/GCMSD		
Date/Experiment #:	02/15/06	88	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	75.1%	
Number of drops:	1		
Nominal drop volume:	9 µL		
Mass of agent disseminated:	11.43 mg		
Corrected mass on 100% agent purity:	8.58 mg		
Average substrate temperature:	50.13 °C		
Average air temperature above drop:	50.81 °C		
Average air flow rate:	405.51 SLPM		
Test section air flow speed:	3.42 m/s		
Crude Evap Rate:	99.9 ug/min		
Mass % recovery in vapor:	83.5 %		
Mass % recovery by extraction:	5.3 %		
Total agent % mass recovery:	88.8 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.2	0.46%	Go
0.5	0.95%	Go
8.3	2.05%	Flag
-	-	Go

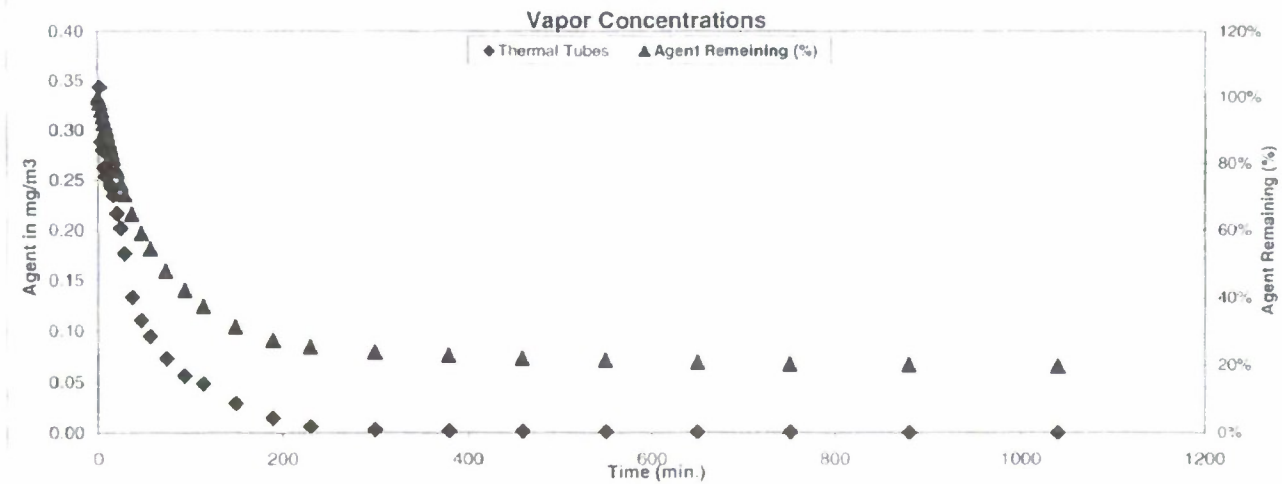


Time (min)	Conc. mg/m^3	HD rem. (%)
1.48	4.83E-01	98.32%
3.31	3.04E-01	94.91%
5.13	3.01E-01	92.30%
6.96	0.00E+00	91.00%
8.78	2.70E-01	89.84%
10.59	2.84E-01	87.47%
12.42	2.86E-01	85.00%
14.25	2.82E-01	82.55%
16.08	2.86E-01	80.10%
18.02	2.59E-01	77.60%
20.11	2.25E-01	75.22%
22.17	2.33E-01	72.98%
25.76	1.96E-01	69.34%
29.84	1.95E-01	65.56%
33.92	1.77E-01	61.97%
40.50	1.38E-01	57.07%
48.59	1.19E-01	52.16%
56.68	1.06E-01	47.86%
69.28	7.94E-02	42.33%
84.40	7.11E-02	36.96%
99.50	5.55E-02	32.44%
122.12	3.75E-02	27.47%
147.25	2.69E-02	23.64%
172.39	1.44E-02	21.19%
205.04	6.76E-03	19.56%
240.19	4.53E-03	18.62%
275.36	3.36E-03	17.96%
315.52	2.51E-03	17.41%
360.71	2.05E-03	16.92%
405.89	1.77E-03	16.51%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 1 (2006-04-24)\(+++a)HS\20060227_3c_94(+++a3)HS\20060227_3c_94v.xls

Tunnel:	3c		
Instruments:	VTS#1/GCMSD		
Date/Experiment #:	02/27/06	94	
Type of substrate :	Sand		Purity
Test agent/purity:	H		78.2%
Number of drops:	1		
Nominal drop volume:	9	µL	
Mass of agent disseminated:	11.62	mg	
Corrected mass on 100% agent purity:	9.09	mg	
Average substrate temperature:	49.83	°C	
Average air temperature above drop:	50.26	°C	
Average air flow rate:	404.44	SLPM	
Test section air flow speed:	3.39	m/s	
Crude Evap Rate:	95.1	ug/min	
Mass % recovery in vapor:	80.2	%	
Mass % recovery by extraction:	2.7	%	
Total egent % mass recovery:	82.9	%	
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.1	0.21%	Go
0.3	0.61%	Go
4.6	1.13%	Flag
-	-	Go



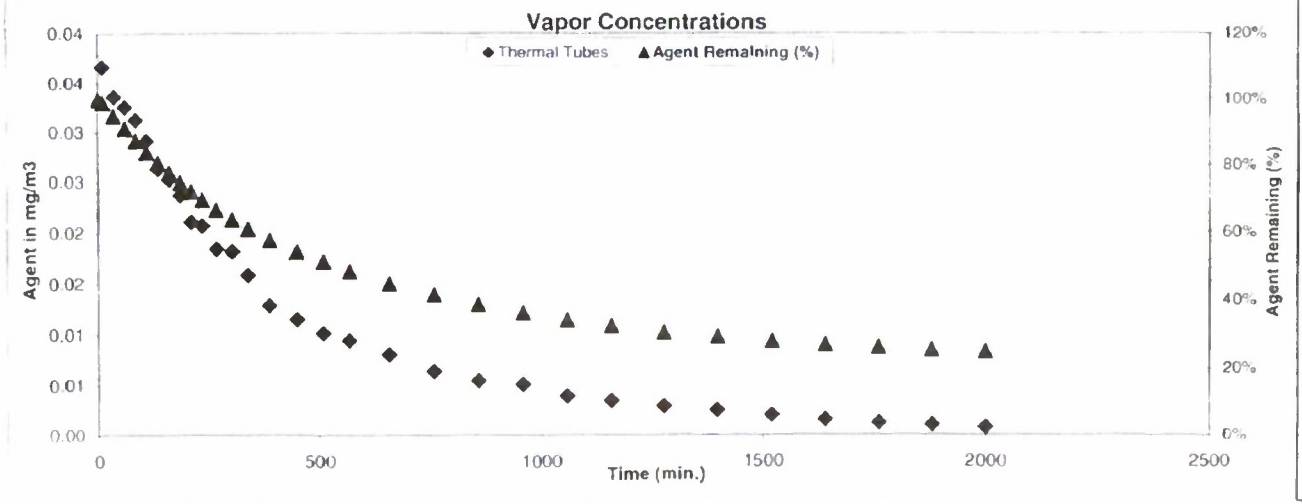
Time (min)	Conc. mg/m³	HD rem. (%)
1.95	3.44E-01	98.51%
3.53	2.88E-01	96.28%
5.12	2.80E-01	94.28%
6.70	2.82E-01	92.37%
8.28	2.54E-01	90.55%
9.87	2.60E-01	88.74%
11.45	2.58E-01	86.92%
13.05	2.45E-01	85.13%
14.63	2.42E-01	83.41%
16.22	2.34E-01	81.73%
20.03	2.16E-01	77.90%
24.10	2.02E-01	74.11%
28.17	1.77E-01	70.67%
36.75	1.34E-01	64.73%
46.82	1.11E-01	59.24%
56.88	9.51E-02	54.62%
74.47	7.34E-02	48.03%
94.53	5.65E-02	42.23%
114.60	4.87E-02	37.53%
149.67	2.93E-02	31.45%
189.73	1.52E-02	27.48%
229.82	6.54E-03	25.54%
299.88	3.54E-03	23.97%
379.95	2.42E-03	22.91%
460.02	1.86E-03	22.14%
550.08	1.42E-03	21.49%
650.17	1.08E-03	20.93%
750.23	8.14E-04	20.50%
880.30	5.53E-04	20.11%
1040.37	3.64E-04	19.78%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 2 (2006-05-01)\(-++a)HS\20060210_3d_40(-++a1)HS\20060210_3d_40v.xls

Data Evaluation Grade: **Modeling Grade**

Tunnel:	3d				
Instruments:	VTS#2/GCMSD				
Date/Expenment #:	02/10/06	40			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		75.1%		
Number of drops:	1				
Nominal drop volume:	9	µL			
Mass of agent disseminated:	11.62	mg			
Corrected mass on 100% agent purity:	8.72	mg			
Average substrate temperature:	15.20	°C			
Average air temperature above drop:	14.82	°C			
Average air flow rate:	405.63	SLPM			
Test section air flow speed:	3.15	m/s			
Crude Evap Rate:	11.3	ug/min			
Mass % recovery in vapor:	75.0	%			
Mass % recovery by extraction:	9.8	%			
Total agent % mass recovery:	84.7	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				

Data Evaluation			
	SD	%SD	Status
	0.2	1.63%	Go
	0.2	1.19%	Go
	0.5	0.12%	Go
	-	-	Go



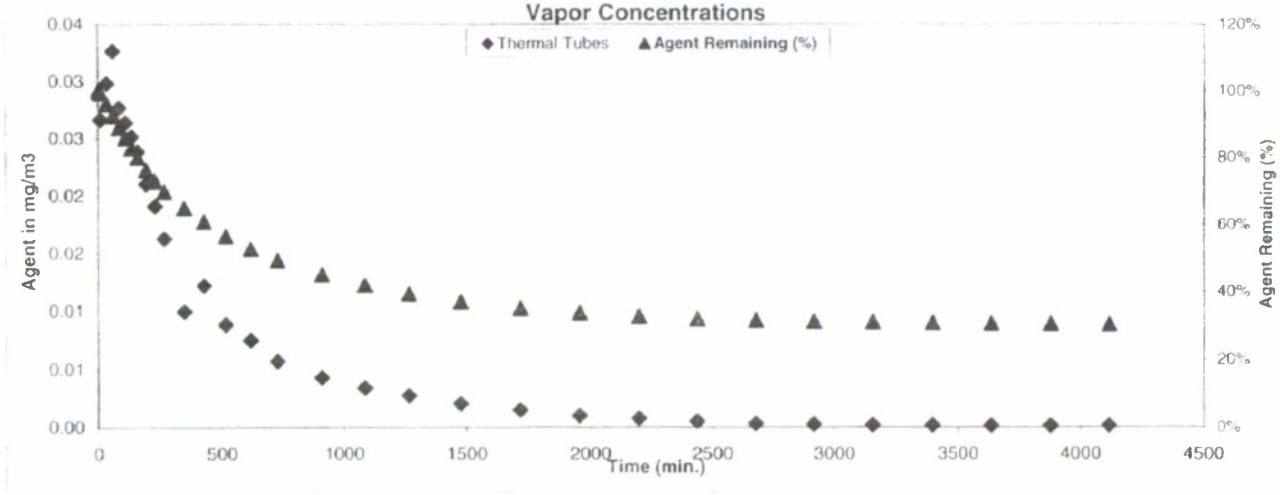
Time (min)	Conc. mg/m³	HD rem. (%)
9.86	3.66E-02	99.16%
34.90	3.37E-02	95.07%
59.93	3.26E-02	91.21%
84.98	3.13E-02	87.49%
110.01	2.91E-02	83.98%
135.06	2.63E-02	80.75%
160.09	2.53E-02	77.75%
185.14	2.37E-02	74.90%
210.18	2.11E-02	72.29%
235.21	2.07E-02	69.85%
267.76	1.84E-02	66.89%
302.79	1.82E-02	63.91%
337.83	1.58E-02	61.14%
387.84	1.29E-02	57.80%
447.85	1.15E-02	54.40%
507.92	1.01E-02	51.39%
567.97	9.42E-03	48.66%
658.03	8.05E-03	45.00%
758.10	6.40E-03	41.64%
858.15	5.47E-03	38.88%
958.22	5.12E-03	36.41%
1058.58	3.98E-03	34.29%
1158.99	3.49E-03	32.55%
1279.08	2.94E-03	30.75%
1399.18	2.46E-03	29.24%
1519.28	2.02E-03	27.99%
1639.38	1.62E-03	26.97%
1759.48	1.22E-03	26.18%
1879.58	1.03E-03	25.55%
1999.65	8.20E-04	25.03%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 1 (2006-04-24)\(-++a)HS\20060216_3d_43(-++a2)HS\20060216_3d_43v.xls

Data Evaluation Grade: Test Grade (requires further evaluation)

Tunnel:	3d		
Instruments:	VTS#3/GCMSD		
Date/Experiment #:	02/16/06	43	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	75.1%	
Number of drops:	1		
Nominal drop volume:	9 µL		
Mass of agent disseminated:	11.62	mg	
Corrected mass on 100% agent purity:	8.72	mg	
Average substrate temperature:	15.12	°C	
Average air temperature above drop:	15.23	°C	
Average air flow rate:	405.63	SLPM	
Test section air flow speed:	3.16	m/s	
Crude Evap Rate:	10.3	ug/min	
Mass % recovery in vapor:	69.7	%	
Mass % recovery by extraction:	8.9	%	
Total agent % mass recovery:	78.7	%	
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.3	1.86%	Go
0.2	1.13%	Go
3.5	0.86%	Flag
-	-	Go

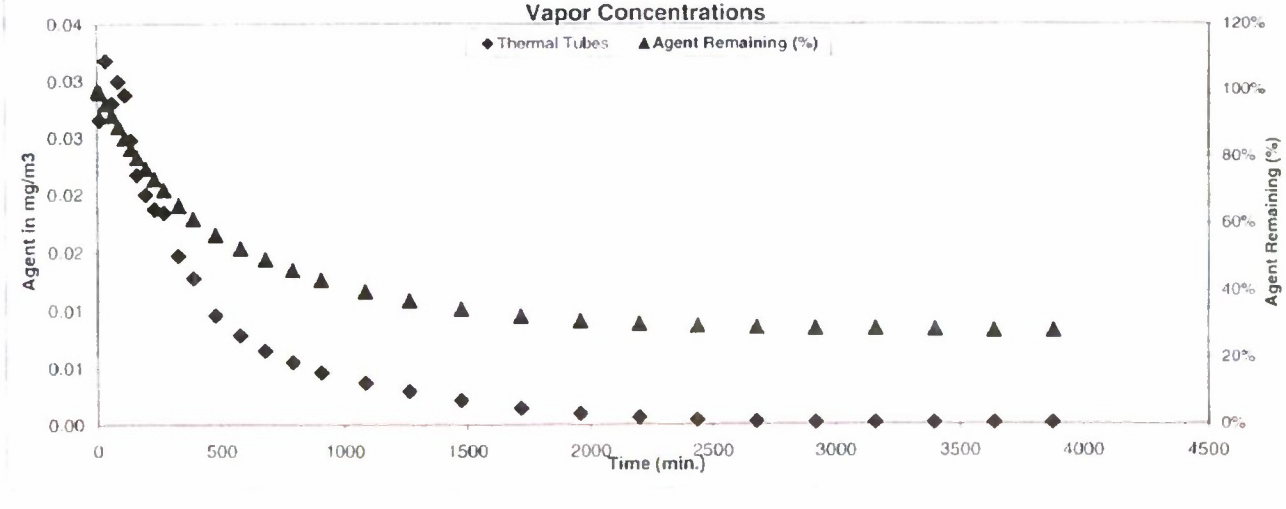


Time (min)	Conc. mg/m³	HD rem. (%)
8.59	2.66E-02	99.47%
33.68	2.98E-02	96.17%
58.78	3.27E-02	92.53%
83.86	2.77E-02	89.01%
108.96	2.64E-02	85.85%
134.06	2.51E-02	82.85%
159.14	2.38E-02	79.99%
194.26	2.11E-02	76.33%
229.36	1.91E-02	73.05%
266.96	1.63E-02	69.95%
347.13	9.97E-03	65.06%
427.23	1.22E-02	60.93%
517.28	8.84E-03	56.53%
617.35	7.48E-03	52.73%
727.42	5.70E-03	49.36%
907.48	4.28E-03	45.18%
1086.42	3.39E-03	41.99%
1266.40	2.74E-03	39.42%
1476.38	2.05E-03	37.09%
1716.33	1.50E-03	35.10%
1956.33	1.01E-03	33.70%
2196.38	7.67E-04	32.71%
2436.45	5.13E-04	32.00%
2676.52	3.25E-04	31.53%
2916.57	2.59E-04	31.21%
3156.63	1.97E-04	30.95%
3396.68	1.79E-04	30.74%
3636.75	1.43E-04	30.56%
3876.82	1.27E-04	30.41%
4116.87	1.22E-04	30.27%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 1 (2006-04-24)\(-++a)HS\20060224_3d_46(-++a3)HS\20060224_3d_46v.xls

Tunnel:	3d		
Instruments:	VTS#3/GCMSD		
Date/Experiment #:	02/24/06	46	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	75.1%	
Number of drops:	1		
Nominal drop volume:	9 µL		
Mass of agent disseminated:	11.62 mg		
Corrected mass on 100% agent purity:	8.72 mg		
Average substrate temperature:	14.70 °C		
Average air temperature above drop:	14.60 °C		
Average air flow rate:	405.63 SLPM		
Test section air flow speed:	3.16 m/s		
Crude Evap Rate:	10.2 ug/min		
Mass % recovery in vapor:	71.7 %		
Mass % recovery by extraction:	15.1 %		
Total agent % mass recovery:	86.8 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.2	1.31%	Go
0.2	1.42%	Go
0.7	0.18%	Go
-	-	Go

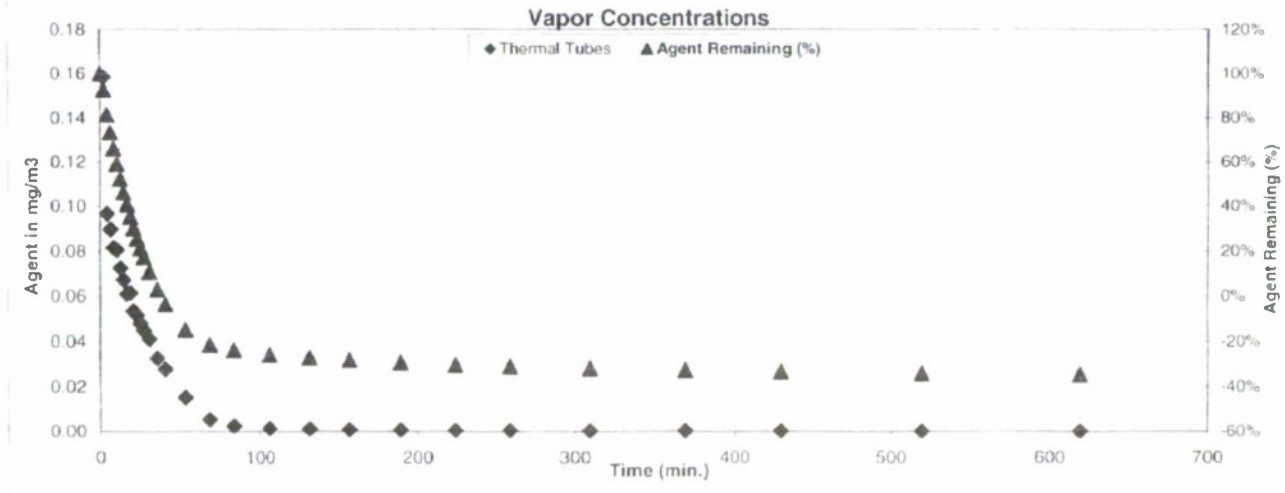


Time (min)	Conc. mg/m^3	HD rem. (%)
8.73	2.66E-02	99.46%
33.78	3.18E-02	96.06%
58.85	2.80E-02	92.57%
83.92	3.00E-02	89.19%
108.97	2.88E-02	85.77%
134.03	2.48E-02	82.64%
159.08	2.18E-02	79.93%
184.15	2.00E-02	76.52%
229.22	1.88E-02	73.36%
266.77	1.85E-02	70.11%
326.83	1.48E-02	65.47%
386.88	1.28E-02	61.61%
476.95	9.62E-03	56.91%
577.02	7.90E-03	52.84%
677.07	6.54E-03	49.48%
787.13	5.53E-03	46.39%
907.20	4.63E-03	43.55%
1087.25	3.74E-03	40.05%
1267.32	2.96E-03	37.24%
1477.37	2.17E-03	34.74%
1717.43	1.49E-03	32.69%
1957.50	1.02E-03	31.28%
2197.55	6.56E-04	30.35%
2437.62	4.20E-04	29.75%
2677.67	3.04E-04	29.34%
2917.73	2.41E-04	29.04%
3157.78	1.97E-04	28.79%
3397.85	1.68E-04	28.59%
3637.92	1.48E-04	28.41%
3877.97	1.24E-04	28.26%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 1 (2006-04-24)\(+-+a)HS\20060221_3c_90(+-+a1)HS\20060221_3c_90v.xls

Tunnel:	3c		
Instruments:	VTS#1/GCMSD		
Date/Experiment #:	02/21/06	90	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	75.1%	
Number of drops:	1		
Nominal drop volume:	1	µL	
Mass of agent disseminated:	1.29	mg	
Corrected mass on 100% agent purity:	0.97	mg	
Average substrate temperature:	50.44	°C	
Average air temperature above drop:	49.75	°C	
Average air flow rate:	404.51	SLPM	
Test section air flow speed:	3.39	m/s	
Crude Evap Rate:	30.7	ug/min	
Mass % recovery in vapor:	134.7	%	
Mass % recovery by extraction:	4.3	%	
Total agent % mass recovery:	139.0	%	
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.2	0.34%	Go
0.4	0.80%	Go
4.7	1.17%	Flag
-	-	Flag



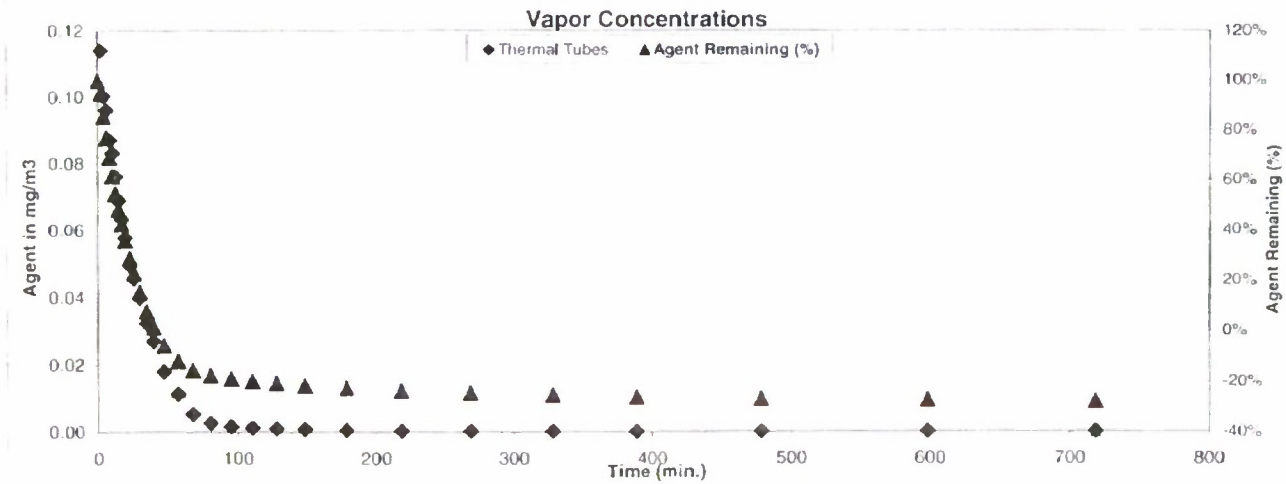
Time (min)	Conc. mg/m³	HD rem. (%)
2.17	1.59E-01	92.83%
4.25	9.66E-02	81.73%
6.33	8.99E-02	73.62%
8.42	8.18E-02	66.16%
10.50	8.08E-02	59.09%
12.60	7.26E-02	52.37%
14.68	6.73E-02	46.29%
16.77	6.11E-02	40.70%
18.85	6.15E-02	35.37%
20.93	5.36E-02	30.37%
23.02	5.17E-02	25.79%
25.12	4.81E-02	21.41%
27.20	4.50E-02	17.36%
30.78	4.12E-02	10.91%
35.87	3.26E-02	3.09%
40.97	2.78E-02	-3.35%
53.53	1.53E-02	-14.67%
68.60	5.45E-03	-21.20%
83.67	2.56E-03	-23.72%
106.23	1.45E-03	-25.61%
131.32	1.20E-03	-27.00%
156.38	9.12E-04	-28.10%
188.95	7.08E-04	-29.20%
224.02	5.83E-04	-30.15%
259.08	5.03E-04	-30.94%
309.15	3.54E-04	-31.84%
369.22	2.88E-04	-32.64%
429.30	2.66E-04	-33.34%
519.37	1.50E-04	-34.12%
619.43	1.11E-04	-34.67%

G:\AgentFateToch\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 2 (2006-05-01)\(+-+a)HS\20060223_3c_92(+-+a2)HS\20060223_3c_92v.xls

Data Evaluation Grade: **Test Grade (requires further evaluation)**

Tunnel:	3c		
Instruments:	VTS#1/GCMSD		
Date/Experiment #:	02/23/06	92	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	75.1%	
Number of drops:	1		
Nominal drop volume:	1 µL		
Mass of agent disseminated:	1.29 mg		
Corrected mass on 100% agent purity:	0.97 mg		
Average substrate temperature:	50.06 °C		
Average air temperature above drop:	49.84 °C		
Average air flow rate:	405.44 SLPM		
Test section air flow speed:	3.39 m/s		
Crude Evap Rate:	31.9 ug/min		
Mass % recovery in vapor:	127.9 %		
Mass % recovery by extraction:	3.6 %		
Total agent % mass recovery:	131.5 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.2	0.35%	Go
0.4	0.81%	Go
3.6	0.88%	Flag
-	-	Flag



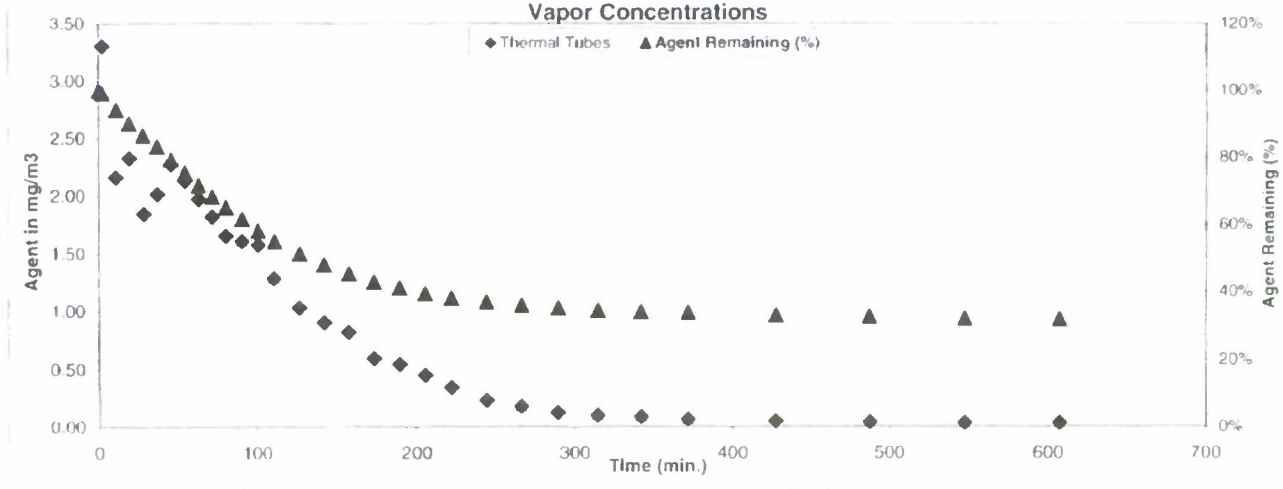
Time (min)	Conc. mg/m³	HD rem. (%)
2.08	1.14E-01	95.03%
4.17	1.00E-01	85.69%
6.25	9.62E-02	77.10%
8.33	8.71E-02	69.13%
10.42	8.32E-02	61.72%
12.50	7.61E-02	54.78%
14.58	6.91E-02	48.45%
16.67	6.34E-02	42.68%
19.27	5.79E-02	36.09%
22.36	4.97E-02	29.14%
25.43	4.58E-02	22.99%
29.52	4.00E-02	15.66%
34.60	3.24E-02	7.95%
39.68	2.72E-02	1.61%
47.28	1.80E-02	-5.57%
57.37	1.14E-02	-11.77%
67.45	5.38E-03	-15.30%
80.03	2.68E-03	-17.42%
95.13	1.58E-03	-18.77%
110.22	1.35E-03	-19.70%
127.80	1.09E-03	-20.60%
147.88	9.30E-04	-21.45%
177.97	6.89E-04	-22.46%
218.07	5.21E-04	-23.48%
268.15	4.00E-04	-24.44%
328.23	2.88E-04	-25.31%
388.32	2.42E-04	-25.97%
478.40	1.59E-04	-26.73%
598.48	1.11E-04	-27.40%
718.57	8.08E-05	-27.88%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 2 (2006-05-01)\(++-a)HS\20060117_3c_72(++-a1)HS\20060117_3c_72v.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3c		
Instruments:	VTS#1/GCMSD		
Date/Experiment #:	01/17/06	72	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	75.1%	
Number of drops:	1		
Nominal drop volume:	9 µL		
Mass of agent disseminated:	11.62 mg		
Corrected mass on 100% agent purity:	8.72 mg		
Average substrate temperature:	50.21 °C		
Average air temperature above drop:	50.30 °C		
Average air flow rate:	18.08 SLPM		
Test section air flow speed:	0.12 m/s		
Crude Evap Rate:	33.1 ug/min		
Mass % recovery in vapor:	68.3 %		
Mass % recovery by extraction:	4.9 %		
Total agent % mass recovery:	73.3 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.3	0.66%	Go
0.2	0.40%	Go
0.0	0.19%	Go
-	-	Go



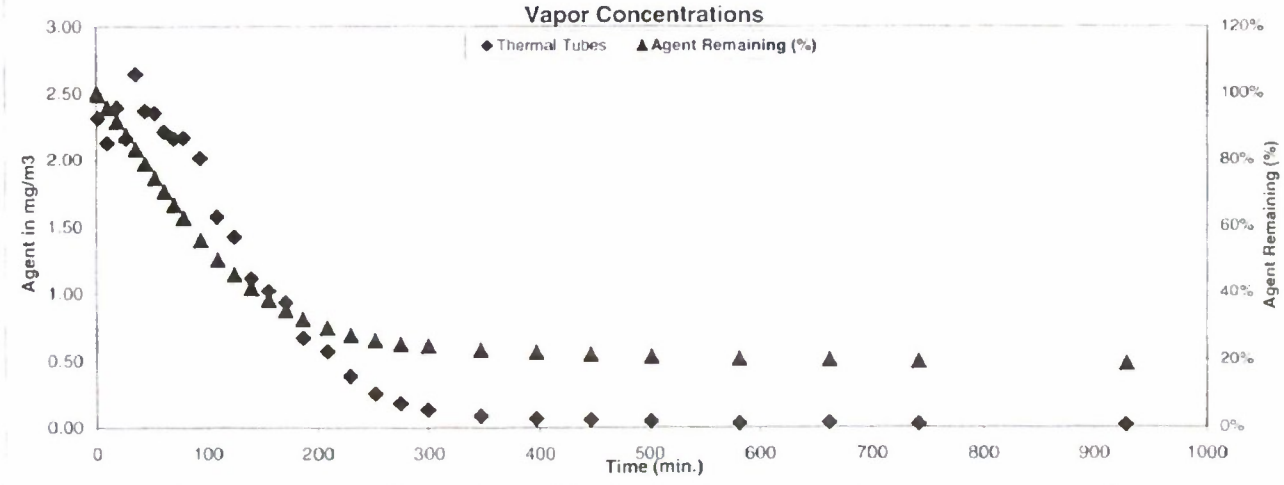
Time (min)	Conc. mg/m³	HD rem. (%)
2.08	3.31E+00	99.29%
10.74	2.16E+00	94.38%
19.39	2.32E+00	90.36%
28.04	1.85E+00	86.63%
36.69	2.01E+00	83.17%
45.34	2.27E+00	79.34%
53.99	2.13E+00	75.39%
62.64	1.97E+00	71.72%
71.29	1.82E+00	68.32%
79.94	1.65E+00	65.21%
90.28	1.61E+00	61.72%
100.59	1.58E+00	58.32%
110.91	1.28E+00	55.26%
126.35	1.03E+00	51.55%
141.92	9.03E-01	48.43%
157.48	8.20E-01	45.65%
173.32	5.98E-01	43.33%
189.38	5.45E-01	41.43%
205.45	4.51E-01	39.77%
222.02	3.41E-01	38.41%
244.08	2.34E-01	37.09%
266.17	1.78E-01	36.15%
289.73	1.25E-01	35.41%
314.80	1.06E-01	34.82%
342.37	8.71E-02	34.27%
372.43	6.64E-02	33.79%
427.50	4.96E-02	33.13%
487.57	4.14E-02	32.56%
547.65	3.42E-02	32.09%
607.72	3.14E-02	31.68%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 1 (2006-04-24)\(++-a)HS\20060119_3c_74(++-a2)HS\20060119_3c_74v.xls

Data Evaluation Grade: **Modeling Grade**

Tunnel:	3c		
Instruments:	VTS#1/GCMSD		
Date/Experiment #:	01/19/06	74	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	75.1%	
Number of drops:	1		
Nominal drop volume:	9 µL		
Mass of agent disseminated:	11.62 mg		
Corrected mass on 100% agent purity:	8.72 mg		
Average substrate temperature:	50.02 °C		
Average air temperature above drop:	50.18 °C		
Average air flow rate:	18.07 SLPM		
Test section air flow speed:	0.12 m/s		
Crude Evap Rate:	40.4 ug/min		
Mass % recovery in vapor:	81.1 %		
Mass % recovery by extraction:	1.9 %		
Total agent % mass recovery:	83.1 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.3	0.52%	Go
0.2	0.38%	Go
0.0	0.20%	Go
-	-	Go

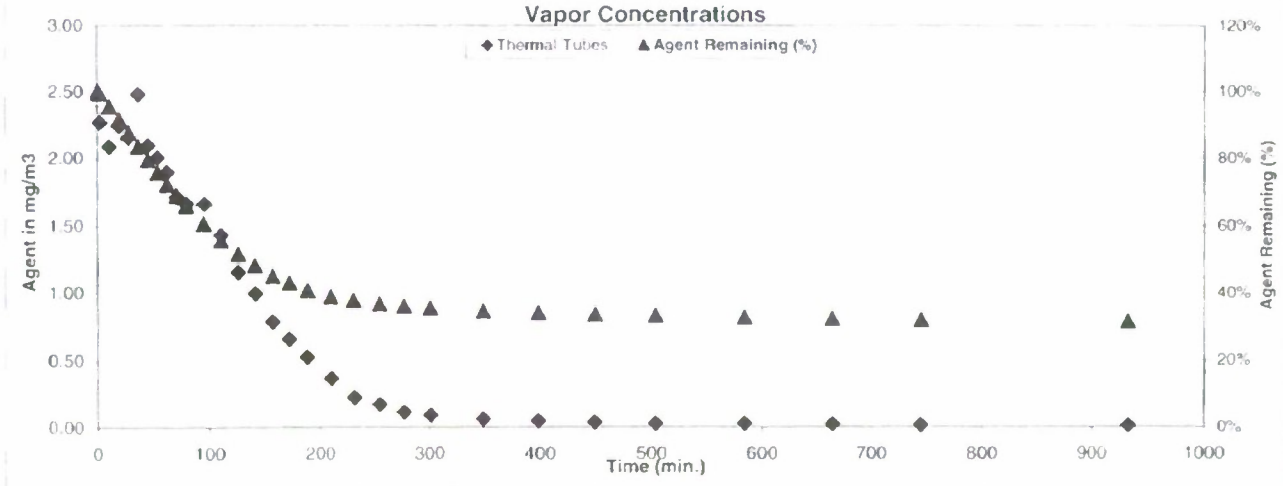


Time (min)	Conc. mg/m^3	HD rem. (%)
1.43	2.31E+00	99.66%
10.06	2.12E+00	95.69%
18.69	2.39E+00	91.65%
27.31	2.16E+00	87.59%
35.94	2.64E+00	83.29%
44.57	2.37E+00	78.80%
53.21	2.35E+00	74.58%
61.82	2.21E+00	70.51%
70.46	2.16E+00	66.60%
79.09	2.17E+00	62.73%
94.37	2.01E+00	56.12%
109.64	1.58E+00	50.45%
124.93	1.42E+00	45.70%
140.33	1.11E+00	41.65%
155.87	1.02E+00	38.22%
171.40	9.33E-01	35.08%
187.18	6.69E-01	32.46%
208.20	5.70E-01	29.76%
229.72	3.87E-01	27.63%
252.22	2.51E-01	26.14%
275.23	1.81E-01	25.11%
299.24	1.32E-01	24.33%
346.69	8.67E-02	23.26%
396.64	6.53E-02	22.47%
446.59	5.87E-02	21.83%
501.60	4.61E-02	21.23%
581.67	3.31E-02	20.58%
661.73	2.86E-02	20.07%
741.80	2.46E-02	19.62%
928.55	1.54E-02	18.85%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 1 (2006-04-24)\(++-a)HS\20060127_3c_77(++-a3)HS\20060127_3c_77v.xls

Data Evaluation Grade: **Modeling Grade**

Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Experiment #:	01/27/06	77			
Type of substrate:	Sand		Purity:		
Test agent/purity:	H		75.1%		
Number of drops:	1				
Nominal drop volume:	9	µL			
Mass of agent disseminated:	11.62	mg	Data Evaluation		
Corrected mass on 100% agent purity:	8.72	mg	SD	%SD	Status
Average substrate temperature:	50.26	°C	0.1	0.24%	Go
Average air temperature above drop:	50.28	°C	0.2	0.47%	Go
Average air flow rate:	18.09	SLPM	0.0	0.25%	Go
Test section air flow speed:	0.17	m/s	-	-	Go
Crude Evap Rate:	35.1	ug/min			
Mass % recovery in vapor:	68.6	%			
Mass % recovery by extraction:	0.7	%			
Total agent % mass recovery:	69.3	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				

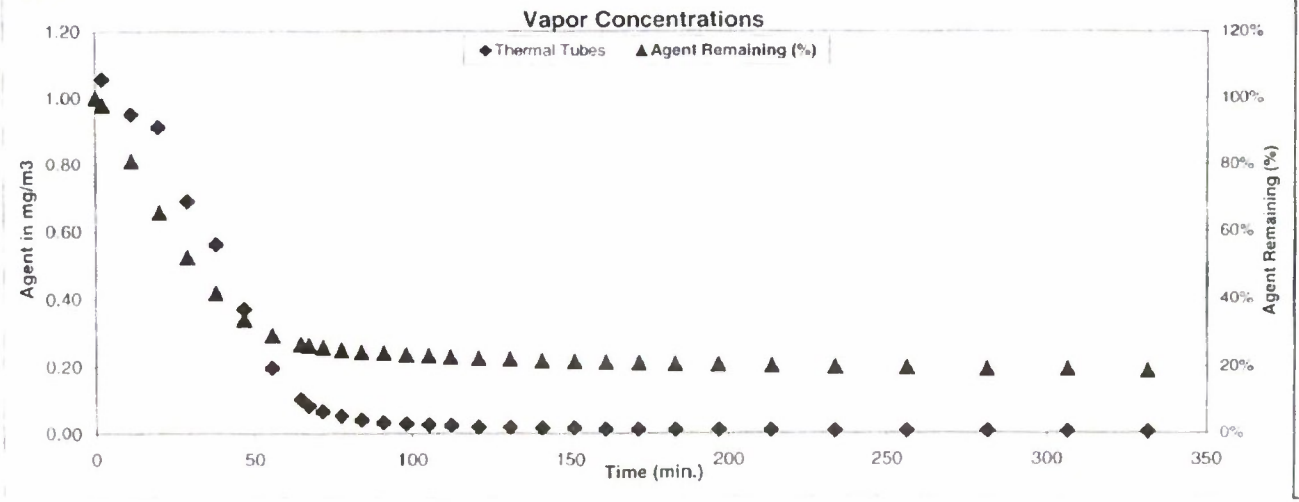


Time (min)	Conc. mg/m³	HD rem. (%)
1.94	2.27E+00	99.54%
10.59	2.09E+00	95.63%
19.24	2.24E+00	91.74%
27.89	2.16E+00	87.80%
36.54	2.48E+00	83.64%
45.19	2.10E+00	79.53%
53.84	2.01E+00	75.85%
62.51	1.90E+00	72.34%
71.19	1.72E+00	69.09%
79.86	1.66E+00	66.05%
95.22	1.66E+00	60.75%
110.58	1.43E+00	55.82%
125.94	1.16E+00	51.68%
141.43	1.00E+00	48.21%
157.03	7.88E-01	45.31%
172.65	6.64E-01	42.96%
188.50	5.27E-01	41.01%
209.63	3.64E-01	39.05%
231.26	2.31E-01	37.72%
253.89	1.73E-01	36.77%
277.00	1.16E-01	36.08%
301.14	9.33E-02	35.56%
348.83	6.35E-02	34.79%
399.03	5.13E-02	34.19%
449.21	4.26E-02	33.70%
504.42	3.34E-02	33.27%
584.69	2.74E-02	32.76%
664.96	2.32E-02	32.34%
745.24	1.85E-02	31.99%
932.30	1.19E-02	31.40%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 2 (2006-05-01)\(+--a)HS\20060118_3c_73(+--a1)HS\20060118_3c_73v.xls

Data Evaluation Grade: Modeling Grade

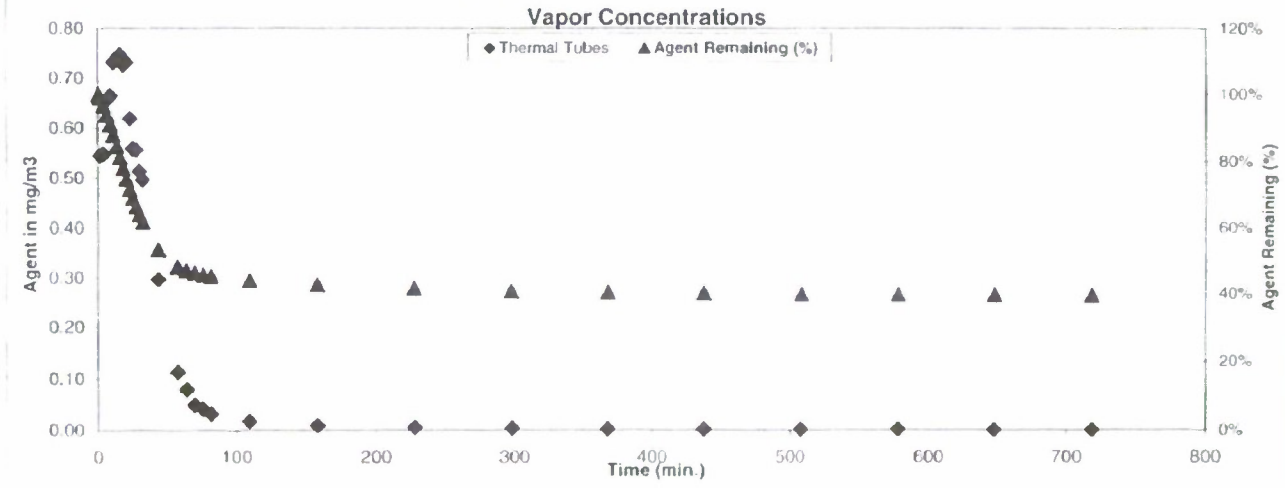
Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Experiment #:	01/18/06	73			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		75.1%		
Number of drops:	1				
Nominal drop volume:	1	µL			
Mass of agent disseminated:	1.29	mg	Data Evaluation		
Corrected mass on 100% agent purity:	0.97	mg	SD	%SD	Status
Average substrate temperature:	50.25	°C	0.5	0.99%	Go
Average air temperature above drop:	50.29	°C	0.3	0.52%	Go
Average air flow rate:	18.08	SLPM	0.0	0.24%	Go
Test section air flow speed:	0.12	m/s	-	-	Go
Crude Evap Rate:	14.2	ug/min			
Mass % recovery in vapor:	81.0	%			
Mass % recovery by extraction:	4.1	%			
Total agent % mass recovery:	85.1	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				



Time (min)	Conc. mg/m³	HD rem. (%)
2.10	1.06E+00	97.93%
11.02	9.51E-01	81.23%
19.95	9.13E-01	65.71%
28.88	6.89E-01	52.36%
37.80	5.64E-01	41.94%
46.72	3.71E-01	34.17%
55.65	1.98E-01	29.43%
64.57	1.03E-01	26.93%
67.05	8.31E-02	26.50%
71.47	6.82E-02	25.88%
77.55	5.36E-02	25.19%
84.14	4.05E-02	24.61%
91.24	3.31E-02	24.12%
98.32	2.89E-02	23.71%
105.41	2.64E-02	23.34%
112.49	2.37E-02	23.01%
121.07	1.93E-02	22.67%
131.17	1.86E-02	22.31%
141.28	1.59E-02	21.99%
151.37	1.51E-02	21.70%
161.46	1.32E-02	21.43%
171.56	1.17E-02	21.19%
183.33	1.06E-02	20.95%
196.76	1.03E-02	20.69%
213.54	8.82E-03	20.39%
233.65	7.98E-03	20.07%
256.29	6.49E-03	19.77%
281.41	5.98E-03	19.48%
306.54	5.17E-03	19.21%
331.68	4.54E-03	18.99%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 2 (2006-05-01)\(+--a)HS\20060124_3c_76(+--a3)HS(R)\20060124_3c_76v.xls

Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Experiment #:	01/24/06	76			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		75.1%		
Number of drops:	1				
Nominal drop volume:	1	µL			
Mass of agent disseminated:	1.29	mg	Data Evaluation		
Corrected mass on 100% agent purity:	0.97	mg	SD	%SD	Status
Average substrate temperature:	49.94	°C	0.3	0.70%	Go
Average air temperature above drop:	50.24	°C	0.3	0.56%	Go
Average air flow rate:	18.08	SLPM	0.2	0.98%	Go
Test section air flow speed:	0.12	m/s	-	-	Go
Crude Evap Rate:	12.1	ug/min			
Mass % recovery in vapor:	60.4	%			
Mass % recovery by extraction:	0.0	%			
Total agent % mass recovery:	60.4	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				



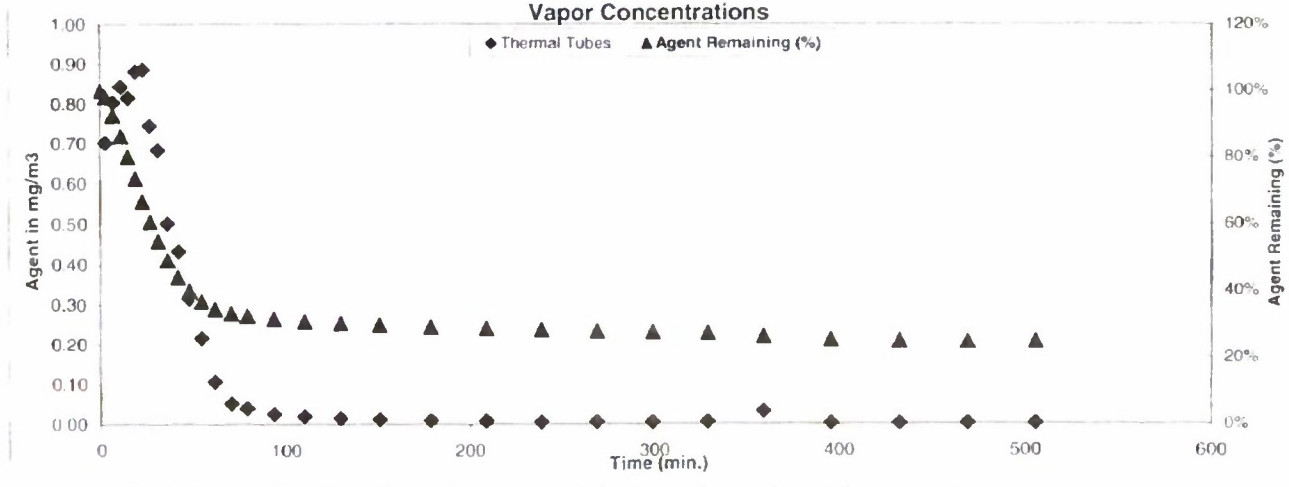
Time (min)	Conc. mg/m^3	HD rem. (%)
1.45	5.45E-01	99.26%
3.85	5.48E-01	96.82%
6.25	6.57E-01	94.12%
8.65	6.65E-01	91.16%
11.05	7.32E-01	88.04%
13.45	7.40E-01	84.74%
15.85	7.48E-01	81.41%
18.25	7.27E-01	78.11%
20.65	7.32E-01	74.84%
23.05	6.20E-01	71.81%
25.45	5.59E-01	69.17%
27.85	5.57E-01	66.68%
30.25	5.14E-01	64.28%
32.65	4.97E-01	62.01%
43.97	2.97E-01	53.63%
57.53	1.15E-01	48.42%
63.62	8.00E-02	47.31%
69.68	5.04E-02	46.57%
75.75	4.29E-02	46.05%
81.82	3.26E-02	45.62%
109.38	1.84E-02	44.31%
157.80	1.05E-02	43.00%
227.87	6.36E-03	41.90%
297.93	4.43E-03	41.20%
368.00	3.11E-03	40.71%
438.07	2.28E-03	40.35%
508.15	1.84E-03	40.09%
578.22	1.37E-03	39.88%
648.28	1.10E-03	39.71%
718.35	9.04E-04	39.58%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 1 (2006-04-24)\(+--a)HS\20060120_3c_75(+--a2)HS\20060120_3c_75v.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3c		
Instruments:	VTS#1/GCMSD		
Date/Experiment #:	01/20/06	75	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	75.1%	
Number of drops:	1		
Nominal drop volume:	1 µL		
Mass of agent disseminated:	1.29 mg		
Corrected mass on 100% agent purity:	0.97 mg		
Average substrate temperature:	50.02 °C		
Average air temperature above drop:	50.11 °C		
Average air flow rate:	18.07 SLPM		
Test section air flow speed:	0.12 m/s		
Crude Evap Rate:	14.4 ug/min		
Mass % recovery in vapor:	75.3 %		
Mass % recovery by extraction:	0.0 %		
Total agent % mass recovery:	75.3 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.7	1.39%	Go
0.3	0.58%	Go
0.2	1.28%	Go
-	-	Go

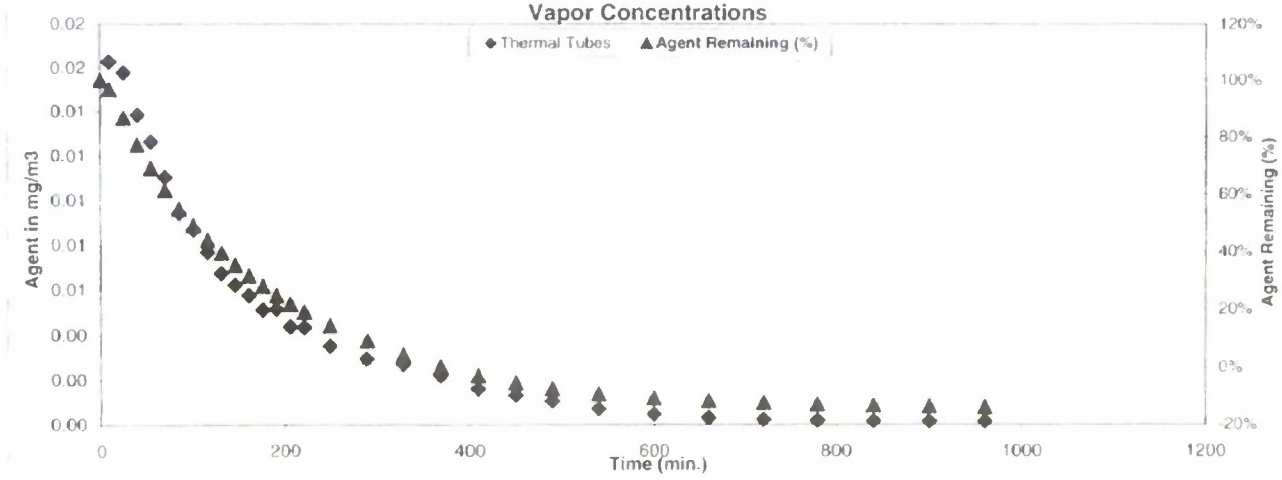


Time (min)	Conc. mg/m³	HD rem. (%)
2.62	7.02E-01	98.29%
6.68	8.04E-01	92.58%
10.75	8.44E-01	86.33%
14.82	8.16E-01	80.03%
18.88	8.81E-01	73.60%
22.95	8.87E-01	66.89%
27.02	7.45E-01	60.71%
31.33	6.83E-01	54.96%
36.40	5.03E-01	49.36%
41.97	4.34E-01	44.50%
48.03	3.16E-01	40.26%
54.60	2.17E-01	36.99%
62.17	1.06E-01	34.71%
70.73	5.28E-02	33.44%
79.30	4.04E-02	32.69%
93.52	2.49E-02	31.83%
110.25	2.00E-02	31.13%
129.46	1.56E-02	30.49%
151.20	1.27E-02	29.92%
178.75	1.03E-02	29.32%
208.80	8.46E-03	28.80%
238.84	6.90E-03	28.37%
268.90	5.71E-03	28.01%
298.95	4.96E-03	27.71%
329.00	4.19E-03	27.46%
359.05	3.23E-02	26.44%
395.75	3.23E-03	25.22%
432.46	2.68E-03	25.02%
469.16	2.28E-03	24.85%
505.88	2.11E-03	24.70%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 2 (2006-05-01)\(--+a)HS\20060209_3d_39(--+a1)HS\20060209_3d_39v.xls

Data Evaluation Grade: Test Grade (requires further evaluation)

Tunnel:	3d				
Instruments:	VTS#2/GCMSD				
Date/Experiment #:	02/09/06	39			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		75.1%		
Number of drops:	1				
Nominal drop volume:	1	µL			
Mass of agent disseminated:	1.29	mg	Data Evaluation		
Corrected mass on 100% agent purity:	0.97	mg	SD	%SD	Status
Average substrate temperature:	15.62	°C	0.1	0.94%	Go
Average air temperature above drop:	15.74	°C	0.2	1.46%	Go
Average air flow rate:	405.46	SLPM	7.8	1.93%	Flag
Test section air flow speed:	3.15	m/s	-	-	Flag
Crude Evap Rate:	6.0	ug/min			
Mass % recovery in vapor:	114.0	%			
Mass % recovery by extraction:	16.5	%			
Total agent % mass recovery:	130.5	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				



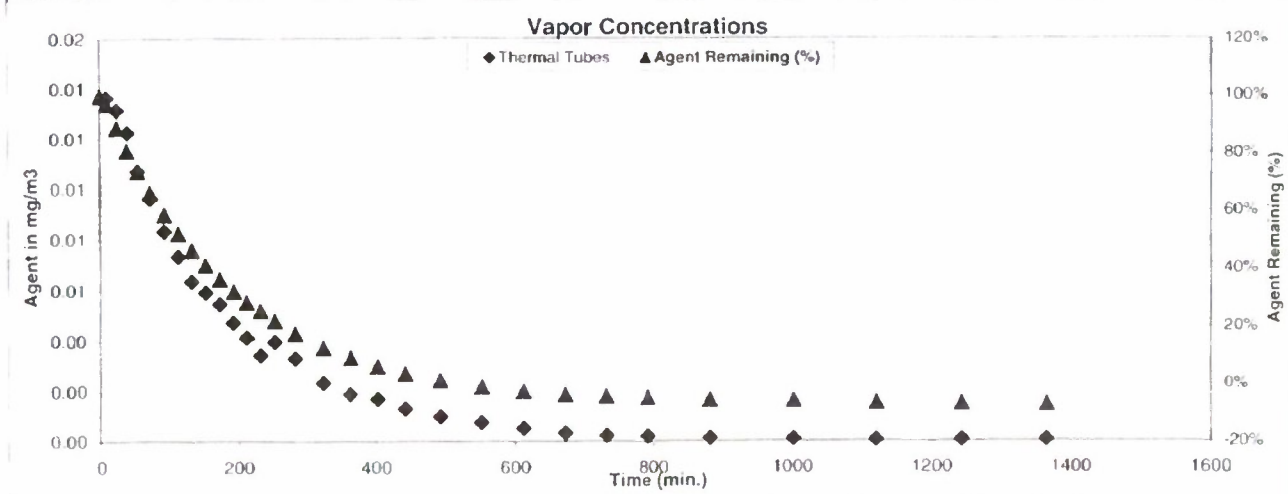
Time (min)	Conc. mg/m³	HD rem. (%)
9.43	1.63E-02	96.79%
24.53	1.58E-02	86.66%
39.63	1.38E-02	77.30%
54.73	1.26E-02	68.93%
69.85	1.10E-02	61.45%
84.95	9.45E-03	54.98%
100.05	8.70E-03	49.25%
115.15	7.69E-03	44.07%
130.25	6.75E-03	39.51%
145.37	6.23E-03	35.41%
160.47	5.76E-03	31.62%
175.57	5.13E-03	28.18%
190.67	5.17E-03	24.93%
205.77	4.38E-03	21.91%
220.87	4.35E-03	19.16%
248.50	3.53E-03	14.60%
288.65	2.94E-03	9.17%
328.80	2.71E-03	4.43%
368.95	2.19E-03	0.32%
409.09	1.62E-03	-2.88%
449.24	1.34E-03	-5.36%
489.39	1.05E-03	-7.37%
539.56	6.99E-04	-9.20%
599.74	4.59E-04	-10.66%
659.91	3.10E-04	-11.63%
720.02	2.26E-04	-12.30%
780.10	1.85E-04	-12.82%
840.18	1.49E-04	-13.24%
900.25	1.41E-04	-13.61%
960.33	1.47E-04	-13.97%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 2 (2006-05-01)\(--+a)HS\20060215_3d_42(--+a2)HS\20060215_3d_42v.xls

Data Evaluation Grade: Test Grade (requires further evaluation)

Tunnel:	3d		
Instruments:	VTS#3/GCMSD		
Date/Expenment #:	02/15/06	42	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	75.1%	
Number of drops:	1		
Nominal drop volume:	1 µL		
Mass of agent disseminated:	1.29 mg		
Corrected mass on 100% agent purity:	0.97 mg		
Average substrate temperature:	14.85 °C		
Average air temperature above drop:	14.84 °C		
Average air flow rate:	405.54 SLPM		
Test section air flow speed:	3.16 m/s		
Crude Evap Rate:	4.3 ug/min		
Mass % recovery in vapor:	106.9 %		
Mass % recovery by extraction:	26.1 %		
Total agent % mass recovery:	133.1 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

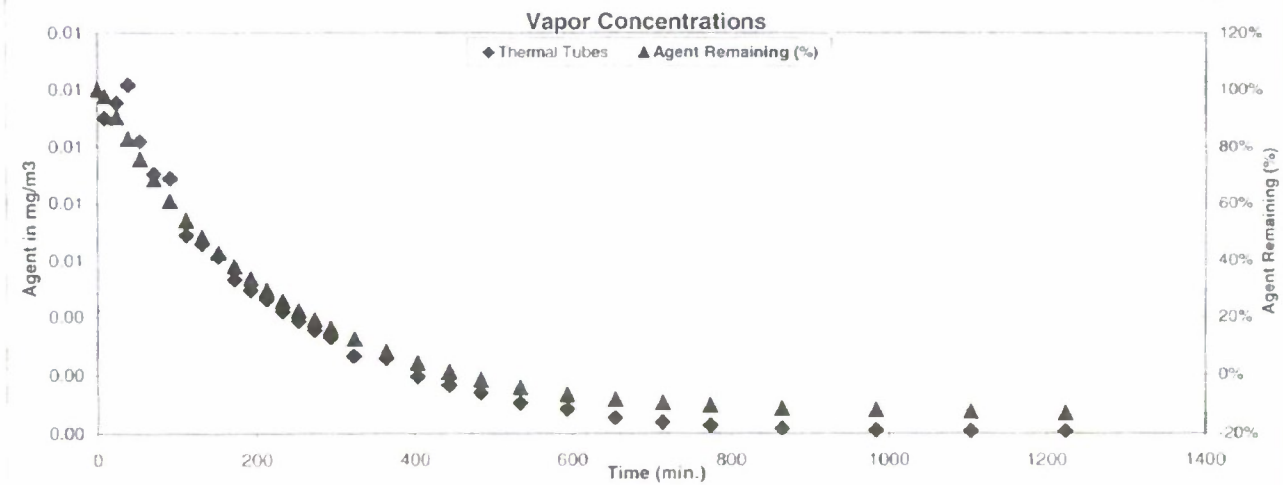
Data Evaluation		
SD	%SD	Status
0.3	1.71%	Go
0.2	1.37%	Go
7.5	1.85%	Flag
-	-	Go



Time (min)	Conc. mg/m³	HD rem. (%)
9.26	1.37E-02	97.35%
24.30	1.32E-02	88.92%
39.35	1.23E-02	80.92%
54.38	1.07E-02	73.69%
71.91	9.64E-03	66.22%
91.94	8.34E-03	58.69%
111.96	7.35E-03	52.12%
131.99	6.36E-03	46.38%
152.01	5.92E-03	41.24%
172.04	5.47E-03	36.47%
192.07	4.74E-03	32.19%
212.09	4.15E-03	28.47%
232.13	3.45E-03	25.29%
252.14	3.97E-03	22.18%
282.15	3.33E-03	17.60%
322.13	2.37E-03	12.83%
362.10	1.90E-03	9.26%
402.08	1.70E-03	6.25%
442.07	1.32E-03	3.72%
492.01	9.94E-04	1.31%
551.94	7.52E-04	-0.88%
611.88	5.07E-04	-2.46%
671.92	3.31E-04	-3.51%
731.98	2.31E-04	-4.22%
792.07	1.98E-04	-4.76%
882.15	1.28E-04	-5.38%
1002.22	8.62E-05	-5.92%
1122.30	7.09E-05	-6.31%
1243.44	5.95E-05	-6.64%
1364.66	5.75E-05	-6.94%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 2 (2006-05-01)\(--+a)HS\20060222_3d_45(--+a3)HS\20060223_3d_45.xls

Tunnel:	3d				
Instruments:	VTS#3/GCMSD				
Date/Experiment #:	02/23/06	45			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		75.1%		
Number of drops:	1				
Nominal drop volume:	1	µL			
Mass of agent disseminated:	1.27	mg	Data Evaluation		
Corrected mass on 100% agent purity:	0.95	mg	S0	%SD	Status
Average substrate temperature:	15.21	°C	0.2	1.21%	Go
Average air temperature above drop:	15.07	°C	0.2	1.26%	Go
Average air flow rate:	405.83	SLPM	0.7	0.18%	Go
Test section air flow speed:	3.16	m/s	-	-	Flag
Crude Evap Rate:	3.4	ug/min			
Mass % recovery in vapor:	112.8	%			
Mass % recovery by extraction:	21.1	%			
Total agent % mass recovery:	133.9	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				

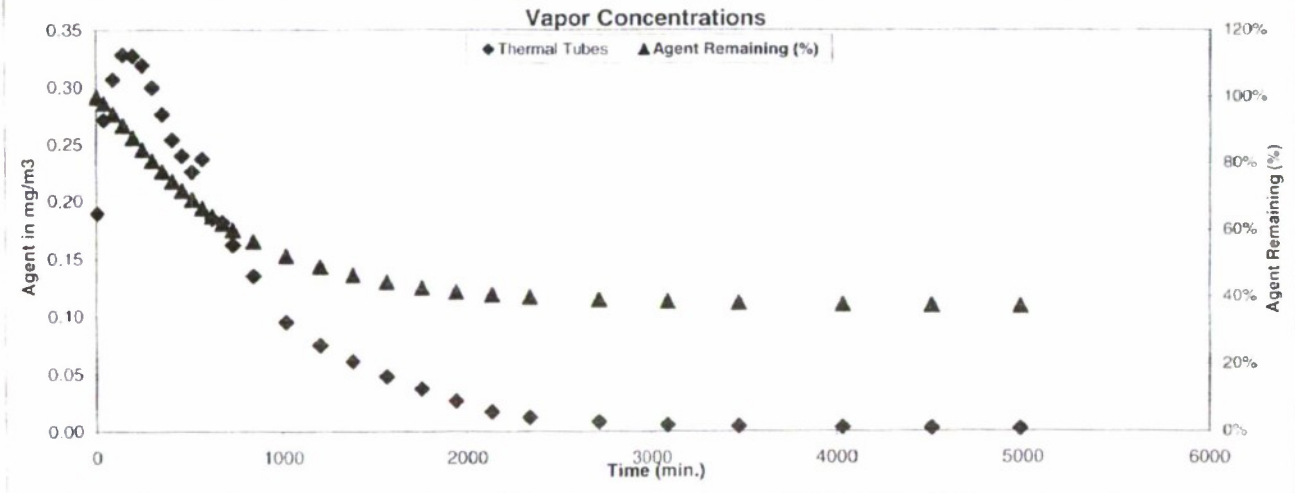


Time (min)	Conc. mg/m^3	HD rem. (%)
9.40	1.10E-02	97.80%
24.48	1.15E-02	90.56%
39.55	1.22E-02	82.95%
54.63	1.02E-02	75.77%
72.20	9.04E-03	68.57%
92.28	8.90E-03	60.91%
112.37	6.90E-03	54.15%
132.43	6.58E-03	48.39%
152.52	6.15E-03	42.96%
172.58	5.34E-03	38.05%
192.67	4.95E-03	33.65%
212.75	4.62E-03	29.56%
232.82	4.20E-03	25.80%
252.90	3.86E-03	22.35%
272.97	3.54E-03	19.19%
293.05	3.30E-03	16.27%
323.13	2.65E-03	12.46%
363.20	2.57E-03	8.01%
403.28	1.95E-03	4.15%
443.37	1.65E-03	1.08%
483.43	1.40E-03	-1.52%
533.52	1.05E-03	-4.13%
593.58	8.48E-04	-6.56%
653.67	5.34E-04	-8.32%
713.75	3.80E-04	-9.49%
773.82	2.71E-04	-10.33%
863.90	1.70E-04	-11.17%
983.97	1.12E-04	-11.89%
1104.05	8.70E-05	-12.40%
1224.12	7.67E-05	-12.82%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 2 (2006-05-01)\(-+-a)HS\20060120_3d_29(-+-a1)HS\20060120_3d_29.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3d				
Instruments:	VTS#2/GCMSD				
Date/Experiment #:	01/20/06	29			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		75.1%		
Number of drops:	1				
Nominal drop volume:	9	µL			
Mass of agent disseminated:	11.43	mg	Data Evaluation		
Corrected mass on 100% agent purity:	8.58	mg	SD	%SD	Status
Average substrate temperature:	15.24	°C	0.3	2.07%	Go
Average air temperature above drop:	15.70	°C	0.1	0.88%	Go
Average air flow rate:	18.09	SLPM	0.0	0.14%	Go
Test section air flow speed:	0.16	m/s	-	-	Go
Crude Evap Rate:	5.2	ug/min			
Mass % recovery in vapor:	62.8	%			
Mass % recovery by extraction:	7.6	%			
Total agent % mass recovery:	70.3	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				

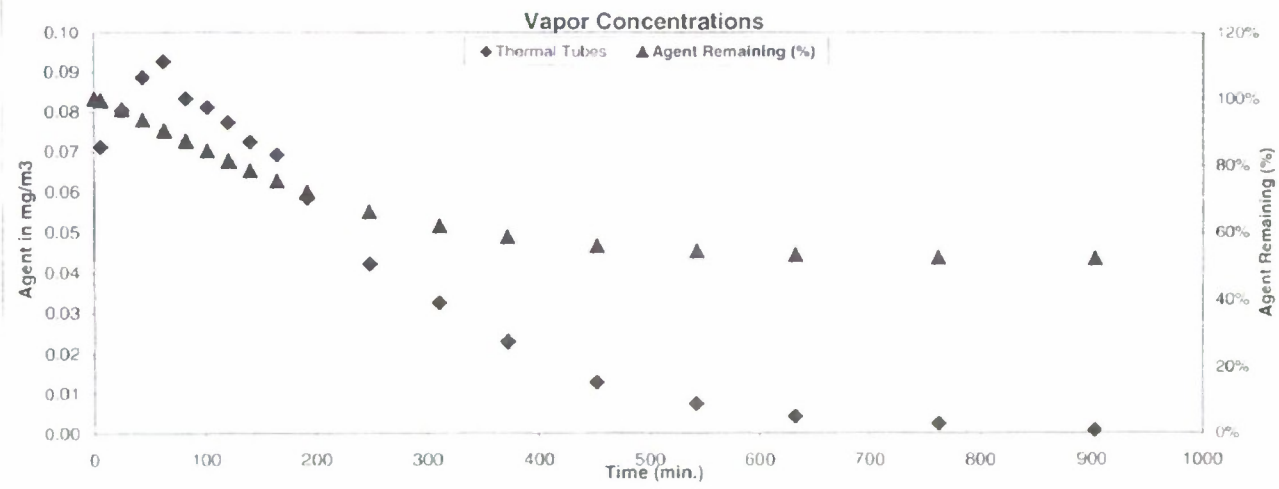


Time (min)	Conc. mg/m³	HD rem. (%)
4.35	1.90E-01	99.91%
40.72	2.71E-01	98.15%
93.75	3.07E-01	94.91%
146.77	3.28E-01	91.36%
199.78	3.27E-01	87.70%
252.80	3.19E-01	84.08%
305.83	3.00E-01	80.62%
358.85	2.76E-01	77.40%
411.87	2.54E-01	74.44%
464.90	2.40E-01	71.68%
517.92	2.25E-01	69.08%
570.93	2.37E-01	66.50%
625.00	1.85E-01	64.10%
680.07	1.82E-01	61.97%
735.12	1.62E-01	59.98%
842.68	1.35E-01	56.61%
1019.42	9.49E-02	52.33%
1199.22	7.51E-02	49.11%
1380.90	6.09E-02	46.50%
1565.10	4.76E-02	44.39%
1751.78	3.68E-02	42.73%
1938.48	2.64E-02	41.49%
2135.20	1.69E-02	40.59%
2341.92	1.21E-02	39.96%
2715.45	8.38E-03	39.15%
3088.82	5.59E-03	38.60%
3472.20	4.34E-03	38.20%
4032.27	3.12E-03	37.76%
4509.02	2.58E-03	37.47%
4985.73	2.18E-03	37.23%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 2 (2006-05-01)\(---a)HS\20060124_3d_30(---a1)HS(R)\20060124_3d_30.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3d				
Instruments:	VTS#2/GCMSD				
Date/Experiment #:	01/24/06	30			
Type of substrate:	Sand		Purity		
Test agent/purity:	HD		75.1%		
Number of drops:	1				
Nominal drop volume:	1 µL				
Mass of agent disseminated:	1.27	mg	Data Evaluation		
Corrected mass on 100% agent purity:	0.95	mg	SD	%SD	Status
Average substrate temperature:	15.12	°C	0.5	3.05%	Go
Average air temperature above drop:	15.40	°C	0.1	0.92%	Go
Average air flow rate:	18.09	SLPM	0.0	0.14%	Go
Test section air flow speed:	0.16	m/s	-	-	Go
Crude Evap Rate:	1.5	ug/min			
Mass % recovery in vapor:	47.8	%			
Mass % recovery by extraction:	0.0	%			
Total agent % mass recovery:	47.8	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				

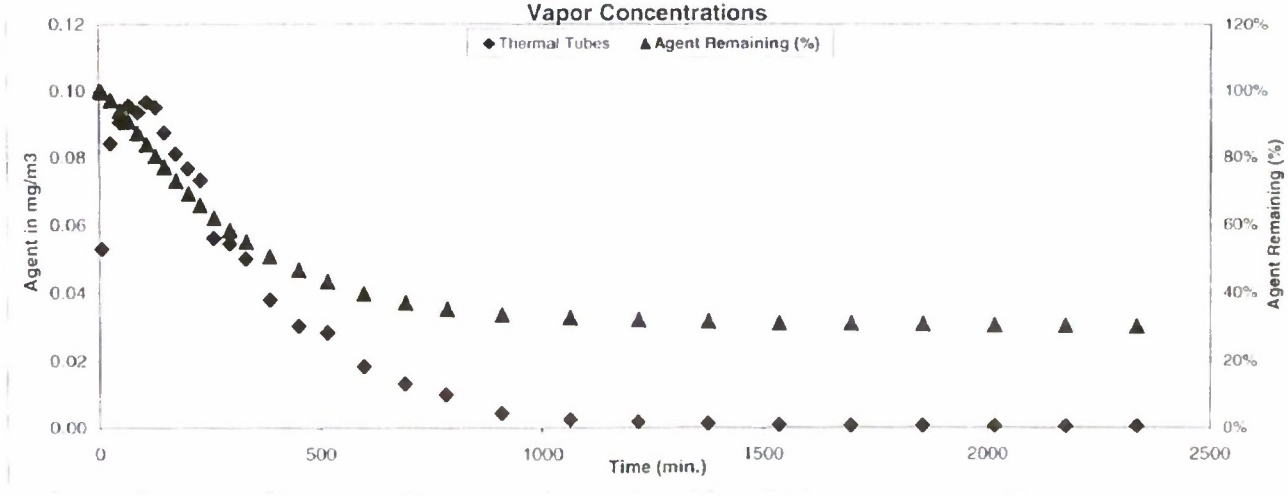


Time (min)	Conc. mg/m³	HD rem. (%)
5.75	7.13E-02	99.61%
24.97	8.05E-02	96.84%
44.20	8.87E-02	93.76%
63.42	9.26E-02	90.45%
82.65	8.34E-02	87.24%
101.87	8.11E-02	84.24%
121.10	7.72E-02	81.35%
140.34	7.25E-02	78.62%
159.38	6.92E-02	75.25%
192.12	5.87E-02	72.01%
248.83	4.23E-02	66.58%
310.57	3.27E-02	62.19%
372.28	2.30E-02	58.93%
452.35	1.28E-02	56.21%
542.42	7.43E-03	54.48%
632.48	4.27E-03	53.48%
762.53	2.38E-03	52.66%
902.61	7.90E-04	52.24%
0.00	0.00E+00	0.00%
0.00	0.00E+00	0.00%
0.00	0.00E+00	0.00%
0.00	0.00E+00	0.00%
0.00	0.00E+00	0.00%
0.00	0.00E+00	0.00%
0.00	0.00E+00	0.00%
0.00	0.00E+00	0.00%
0.00	0.00E+00	0.00%
0.00	0.00E+00	0.00%
0.00	0.00E+00	0.00%
0.00	0.00E+00	0.00%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 2 (2006-05-01)\(---a)HS\20060227_3d_47(---a2)HS\20060227_3d_47v.xls

Data Evaluation Grade: Modeling Grade

Tonnel:	3d				
Instruments:	VTS#3/GCMSD				
Date/Experiment #:	02/27/06	47			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		78.2%		
Number of drops:	1				
Nominal drop volume:	1	µL			
Mass of agent disseminated:	1.29	mg	Data Evaluation		
Corrected mass on 100% agent purity:	1.01	mg	SO	%SD	Status
Average substrate temperature:	15.11	°C	0.2	1.64%	Go
Average air temperature above drop:	15.05	°C	0.5	3.55%	Go
Average air flow rate:	18.10	SLPM	0.0	0.13%	Go
Test section air flow speed:	0.15	m/s	-	-	Go
Crude Evap Rate:	1.6	ug/min			
Mass % recovery in vapor:	69.8	%			
Mass % recovery by extraction:	30.3	%			
Total agent % mass recovery:	100.1	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				

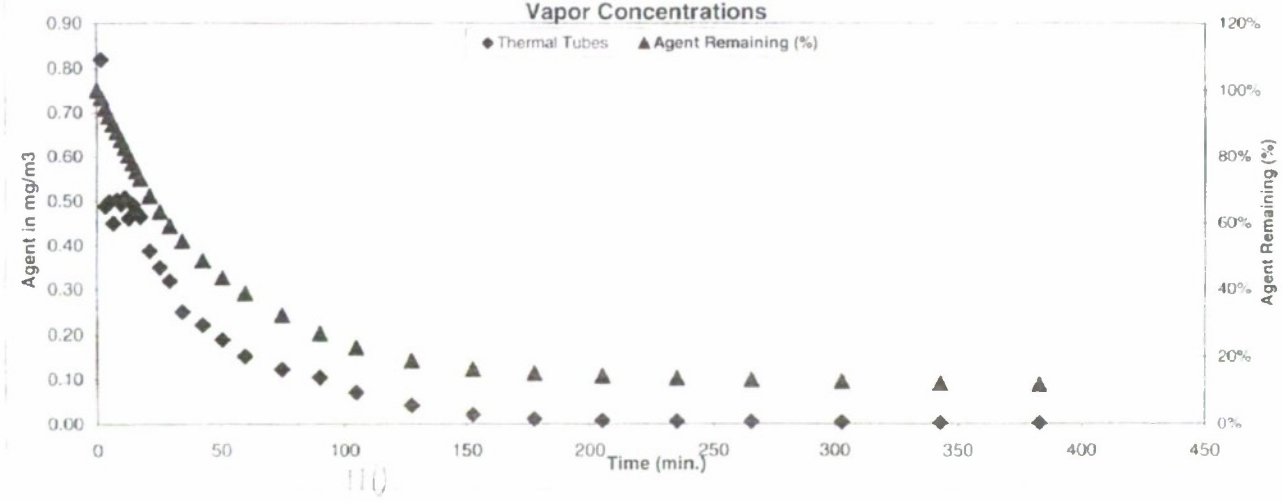


Time (min)	Conc. mg/m³	HO rem. (%)
5.40	5.30E-02	99.74%
25.47	8.41E-02	97.28%
45.52	9.06E-02	94.14%
65.59	9.55E-02	90.79%
85.65	9.36E-02	87.39%
105.70	9.66E-02	83.97%
125.77	9.51E-02	80.52%
145.82	8.75E-02	77.24%
171.72	8.11E-02	73.33%
198.45	7.68E-02	69.55%
225.17	7.34E-02	65.95%
256.90	5.62E-02	62.26%
293.62	5.46E-02	58.62%
330.35	5.01E-02	55.17%
385.40	3.81E-02	50.82%
450.47	3.03E-02	46.84%
515.53	2.85E-02	43.41%
598.93	1.84E-02	39.90%
692.32	1.33E-02	37.25%
785.72	9.93E-03	35.31%
909.10	4.47E-03	33.72%
1062.50	2.62E-03	32.74%
1215.88	1.90E-03	32.12%
1375.95	1.37E-03	31.65%
1536.02	1.07E-03	31.30%
1696.07	8.94E-04	31.02%
1856.13	7.59E-04	30.78%
2016.20	6.37E-04	30.58%
2176.25	5.95E-04	30.41%
2336.32	5.53E-04	30.24%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 2 (2006-05-01)\(+00a)HS\20060214_3c_87(+00a1)HS\20060214_3c_87v.xls

Data Evaluation Grade: **Test Grade (requires further evaluation)**

Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Experiment #:	02/14/06	87			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		75.1%		
Number of drops:	1				
Nominal drop volume:	6	µL			
Mass of agent disseminated:	7.75	mg	Data Evaluation		
Corrected mass on 100% agent purity:	5.82	mg	SD	%SD	Status
Average substrate temperature:	50.59	°C	0.8	1.55%	Go
Average air temperature above drop:	50.27	°C	0.2	0.42%	Go
Average air flow rate:	181.99	SLPM	2.5	1.39%	Flag
Test section air flow speed:	1.63	m/s	-	-	Go
Crude Evap Rate:	80.8	ug/min			
Mass % recovery in vapor:	88.1	%			
Mass % recovery by extraction:	6.0	%			
Total agent % mass recovery:	94.1	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				



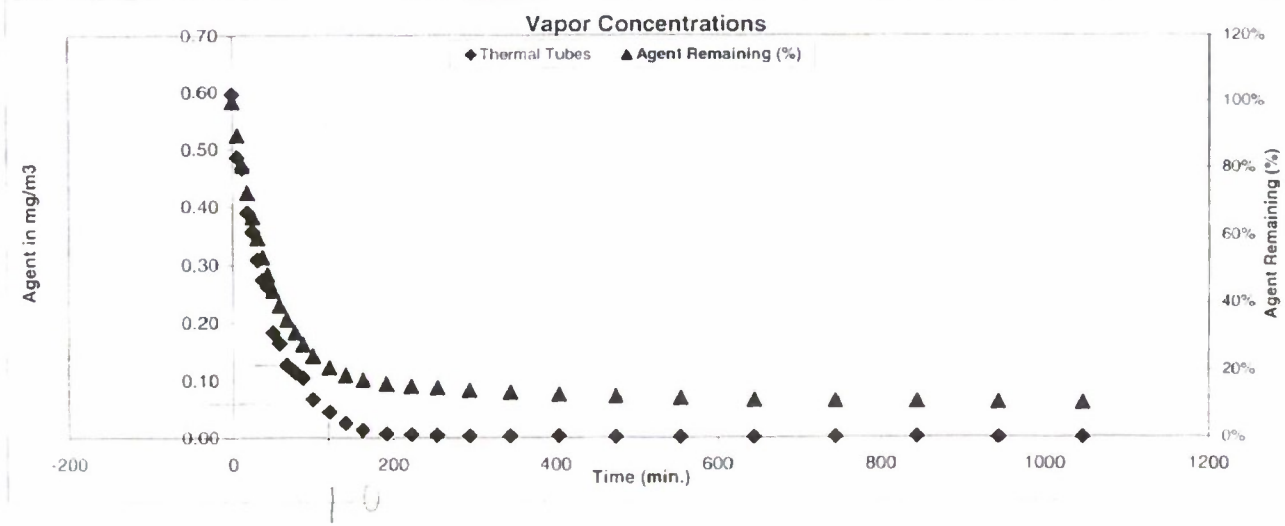
Time (min)	Conc. mg/m^3	HD rem. (%)
1.72	8.19E-01	97.80%
3.28	4.88E-01	94.60%
4.85	4.98E-01	92.18%
6.42	4.50E-01	89.86%
8.00	5.02E-01	87.50%
9.57	4.94E-01	85.06%
11.13	5.07E-01	82.60%
12.70	4.61E-01	80.23%
14.27	4.92E-01	77.90%
15.83	4.76E-01	75.52%
17.40	4.64E-01	73.22%
21.22	3.87E-01	68.13%
25.30	3.49E-01	63.42%
29.37	3.19E-01	59.17%
34.43	2.50E-01	54.66%
42.50	2.21E-01	48.72%
50.57	1.88E-01	43.56%
59.65	1.51E-01	38.74%
74.72	1.22E-01	32.31%
89.78	1.04E-01	26.98%
104.87	7.08E-02	22.85%
127.43	4.19E-02	18.87%
152.50	2.07E-02	16.41%
177.57	1.10E-02	15.17%
205.13	7.62E-03	14.36%
235.22	6.13E-03	13.71%
265.28	4.75E-03	13.20%
302.85	3.94E-03	12.69%
342.92	3.25E-03	12.24%
383.00	2.77E-03	11.86%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 1 (2006-04-24)\(+00a)HS\20060216_3c_89(+00a2)HS\20060216_3c_89v.xls

Data Evaluation Grade: **Modeling Grade**

Tunnel:	3c		
Instruments:	VTS#1/GCMSD		
Date/Experiment #	02/16/06	89	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	75.1%	
Number of drops:	1		
Nominal drop volume:	6 µL		
Mass of agent disseminated:	7.75 mg		
Corrected mass on 100% agent purity:	5.82 mg		
Average substrate temperature:	50.32 °C		
Average air temperature above drop:	50.08 °C		
Average air flow rate:	181.62 SLPM		
Test section air flow speed:	1.63 m/s		
Crude Evap Rate:	50.3 ug/min		
Mass % recovery in vapor:	89.4 %		
Mass % recovery by extraction:	3.6 %		
Total agent % mass recovery:	93.1 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation			
SD	%SD	Status	
0.1	0.23%	Go	
0.1	0.30%	Go	
1.6	0.87%	Go	
-	-	Go	

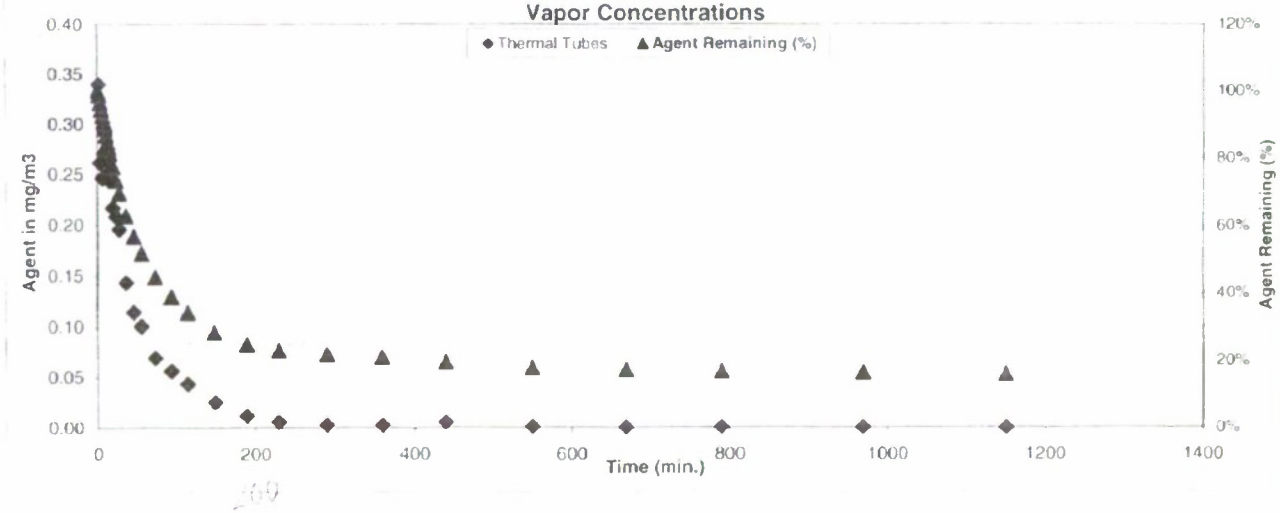


Time (min)	Conc. mg/m³	HD rem. (%)
-0.12	5.96E-01	100.11%
5.95	4.86E-01	89.86%
12.00	4.66E-01	80.86%
18.05	3.90E-01	72.77%
24.10	3.58E-01	65.71%
30.17	3.09E-01	59.39%
36.22	2.74E-01	53.88%
42.27	2.63E-01	48.80%
49.33	1.84E-01	43.88%
57.37	1.65E-01	39.50%
66.41	1.28E-01	35.36%
76.46	1.15E-01	31.55%
86.51	1.05E-01	28.09%
99.04	6.82E-02	24.69%
119.06	4.61E-02	21.12%
139.09	2.64E-02	18.85%
161.60	1.44E-02	17.42%
191.60	8.74E-03	16.34%
221.58	6.75E-03	15.61%
254.08	5.50E-03	14.99%
294.04	4.46E-03	14.37%
343.99	3.63E-03	13.74%
403.98	2.89E-03	13.12%
474.07	2.25E-03	12.56%
554.13	1.88E-03	12.05%
644.20	1.35E-03	11.59%
744.27	9.96E-04	11.22%
844.33	7.95E-04	10.94%
944.40	5.78E-04	10.73%
1046.63	4.81E-04	10.56%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk - Set 1 (2006-04-24)\(+++a)HS\20060222_3c_91(+++a2)HS\20060222_3c_91v.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Experiment #:	04/13/06	117			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		78.2%		
Number of drops:	1				
Nominal drop volume:	6 µL				
Mass of agent disseminated:	7.62 mg		Data Evaluation		
Corrected mass on 100% agent purity:	5.96 mg		SD	%SD	Status
Average substrate temperature:	50.36 °C		0.3	0.64%	Go
Average air temperature above drop:	50.42 °C		0.3	0.55%	Go
Average air flow rate:	181.84 SLPM		1.3	0.71%	Go
Test section air flow speed:	1.53 m/s		-	-	Go
Crude Evap Rate:	44.8 ug/min				
Mass % recovery in vapor:	70.8 %				
Mass % recovery by extraction:	n/a %				
Total agent % mass recovery:	70.8 %				
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				



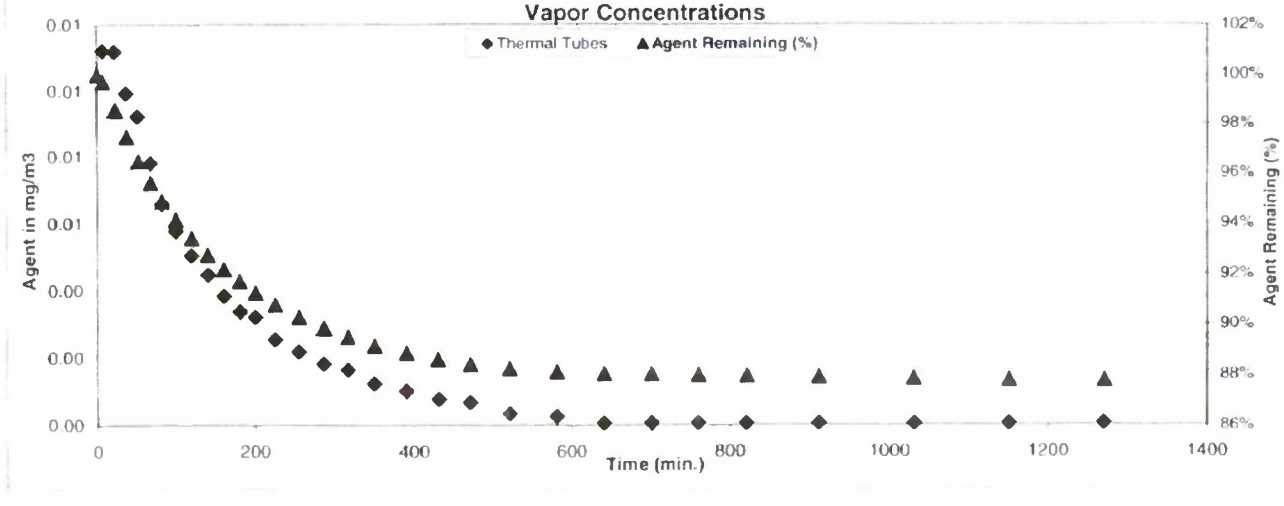
Time (min)	Conc. mg/m³	HD rem. (%)
2.53	4.16E-01	98.39%
6.58	2.98E-01	93.97%
10.63	2.84E-01	90.38%
14.68	2.73E-01	86.94%
18.72	2.68E-01	83.61%
22.77	2.58E-01	80.36%
26.82	2.45E-01	77.26%
30.87	2.27E-01	74.35%
36.42	2.09E-01	70.66%
42.47	1.62E-01	67.24%
48.52	1.63E-01	64.24%
55.07	1.49E-01	61.12%
63.12	1.32E-01	57.66%
71.17	1.16E-01	54.62%
79.38	1.07E-01	51.83%
88.62	9.37E-02	49.00%
98.67	8.47E-02	46.26%
113.72	7.00E-02	42.71%
131.27	4.91E-02	39.52%
151.30	3.42E-02	36.97%
173.85	1.93E-02	35.13%
201.40	9.69E-03	33.91%
241.45	6.69E-03	32.91%
301.50	3.85E-03	31.94%
371.55	2.97E-03	31.21%
431.62	2.21E-03	30.74%
521.68	1.53E-03	30.23%
641.75	9.99E-04	29.76%
761.82	6.91E-04	29.45%
881.88	5.01E-04	29.23%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060419_3d_56.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3d		
Instruments:	VTS#3/GCMSD		
Date/Experiment #:	04/19/06	56	
Type of substrate:	Glass	Purity	
Test agent/purity:	H	78.2%	
Number of drops:	1		
Nominal drop volume:	6 µL		
Mass of agent disseminated:	7.62 mg		
Corrected mass on 100% agent purity:	5.96 mg		
Average substrate temperature:	15.44 °C		
Average air temperature above drop:	15.22 °C		
Average air flow rate:	405.01 SLPM		
Test section air flow speed:	3.14 m/s		
Crude Evap Rate:	3.6 ug/min		
Mass % recovery in vapor:	12.2 %		
Mass % recovery by extraction:	n/a %		
Total agent % mass recovery:	12.2 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.5	3.49%	Go
0.6	4.10%	Go
1.0	0.24%	Go
-	-	Go

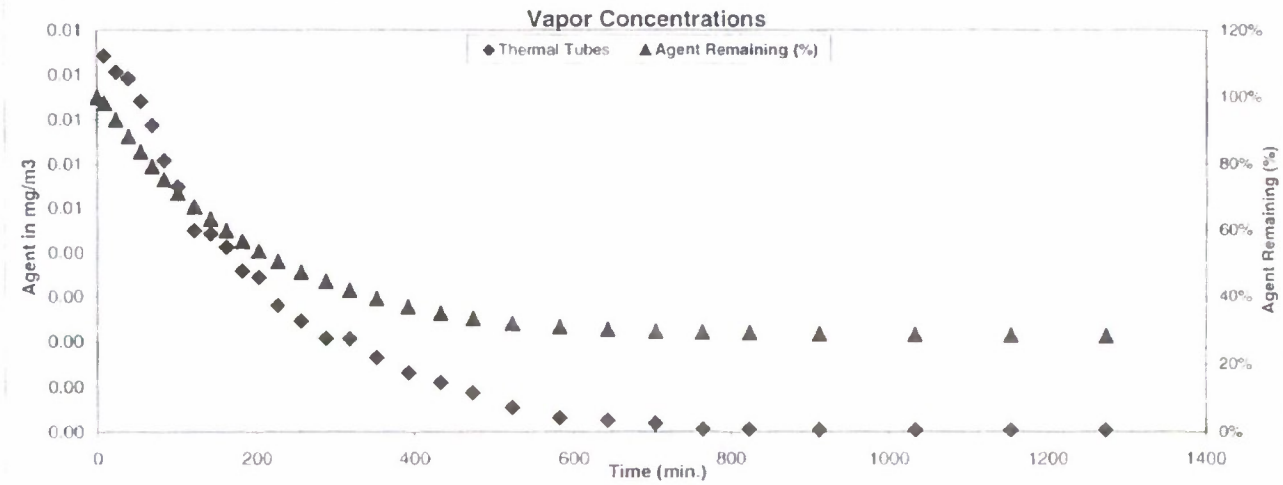


Time (min)	Conc. mg/m³	HD rem. (%)
7.50	1.12E-02	99.71%
22.57	1.12E-02	98.57%
37.63	9.94E-03	97.48%
52.68	9.23E-03	96.50%
67.75	7.80E-03	95.63%
82.82	6.59E-03	94.89%
100.38	5.79E-03	94.16%
120.45	5.06E-03	93.42%
140.52	4.48E-03	92.76%
160.57	3.84E-03	92.20%
180.63	3.37E-03	91.71%
200.70	3.21E-03	91.26%
225.77	2.55E-03	90.77%
255.83	2.20E-03	90.28%
285.90	1.83E-03	89.87%
315.97	1.65E-03	89.51%
351.03	1.23E-03	89.17%
391.10	1.02E-03	88.86%
431.17	7.85E-04	88.61%
471.23	6.86E-04	88.41%
521.28	3.42E-04	88.24%
581.35	2.64E-04	88.12%
641.42	7.55E-05	88.05%
701.48	7.24E-05	88.02%
761.55	7.26E-05	87.99%
821.62	6.99E-05	87.96%
911.68	5.72E-05	87.92%
1031.73	5.38E-05	87.87%
1151.80	5.65E-05	87.83%
1271.87	6.37E-05	87.78%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060413_3d_55.xls

Tunnel:	3d		
Instruments:	VTS#3/GCMSD		
Date/Experiment #:	04/13/06	55	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	78.2%	
Number of drops:	1		
Nominal drop volume:	1 µL		
Mass of agent disseminated:	1.27 mg		
Corrected mass on 100% agent purity:	0.99 mg		
Average substrate temperature:	15.64 °C		
Average air temperature above drop:	14.82 °C		
Average air flow rate:	405.02 SLPM		
Test section air flow speed:	3.15 m/s		
Crude Evap Rate:	2.8 ug/min		
Mass % recovery in vapor:	71.8 %		
Mass % recovery by extraction:	n/a %		
Total agent % mass recovery:	71.8 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.7	4.66%	Go
0.6	3.82%	Go
0.8	0.21%	Go
-	-	Go



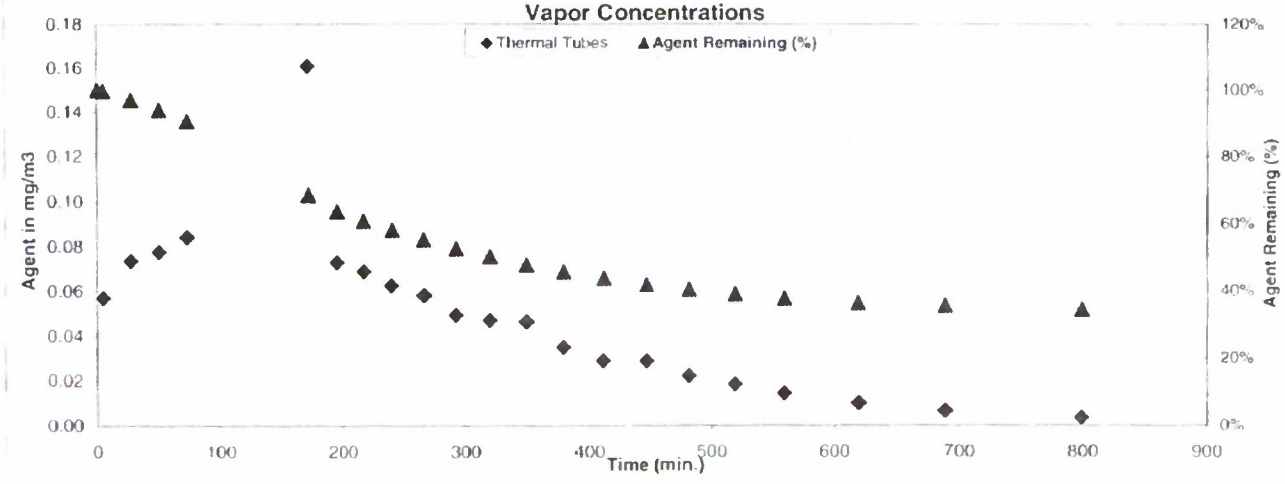
Time (min)	Conc. mg/m^3	HD rem. (%)
9.07	8.43E-03	98.44%
24.12	8.07E-03	93.38%
39.18	7.93E-03	88.47%
54.25	7.43E-03	83.75%
69.32	6.88E-03	79.35%
84.38	6.08E-03	75.37%
101.95	5.49E-03	71.23%
122.00	4.50E-03	67.14%
142.07	4.43E-03	63.49%
162.13	4.13E-03	59.98%
182.20	3.59E-03	56.82%
202.27	3.44E-03	53.94%
227.33	2.81E-03	50.75%
257.40	2.46E-03	47.52%
287.45	2.07E-03	44.74%
317.53	2.06E-03	42.21%
352.58	1.66E-03	39.55%
392.65	1.32E-03	37.12%
432.72	1.11E-03	35.14%
472.78	8.79E-04	33.52%
522.85	5.52E-04	32.06%
582.92	3.18E-04	30.99%
642.98	2.57E-04	30.29%
703.05	1.96E-04	29.74%
763.10	7.10E-05	29.41%
823.17	7.18E-05	29.23%
913.23	5.40E-05	29.00%
1033.30	5.19E-05	28.74%
1153.37	5.21E-05	28.49%
1273.43	4.87E-05	28.24%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060330_3d_53.xls

Data Evaluation Grade: **Modeling Grade**

Tunnel:	3d		
Instruments:	VTS#3/GCMSD		
Date/Expenment #:	03/30/06	53	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	78.2%	
Number of drops:	1		
Nominal drop volume:	1 µL		
Mass of agent disseminated:	1.27 mg		
Corrected mass on 100% agent purity:	0.99 mg		
Average substrate temperature:	15.29 °C		
Average air temperature above drop:	14.88 °C		
Average air flow rate:	18.03 SLPM		
Test section air flow speed:	0.18 m/s		
Crude Evap Rate:	2.0 ug/min		
Mass % recovery in vapor:	65.5 %		
Mass % recovery by extraction:	n/a %		
Total agent % mass recovery:	65.5 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.5	3.25%	Go
0.3	2.03%	Go
0.4	2.32%	Go
-	-	Go

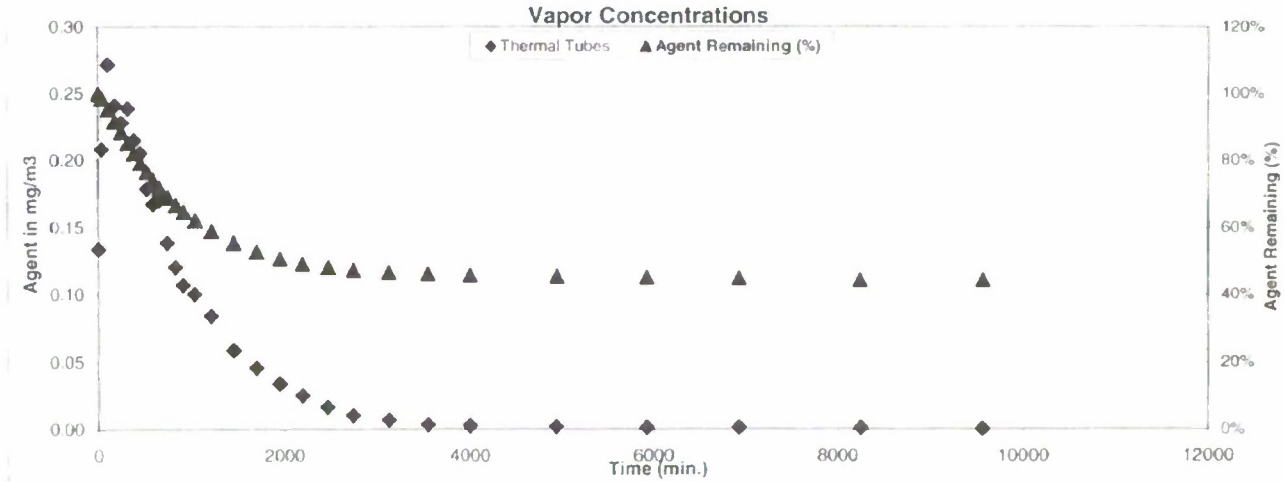


Time (min)	Conc. mg/m³	HD rem. (%)
4.77	5.68E-02	99.75%
27.48	7.38E-02	97.06%
50.20	7.77E-02	93.94%
72.92	8.42E-02	90.60%
172.20	1.61E-01	68.53%
194.92	7.28E-02	63.72%
217.63	6.86E-02	60.80%
240.35	6.25E-02	58.10%
266.40	5.79E-02	55.25%
292.45	4.92E-02	52.72%
319.67	4.67E-02	50.35%
348.90	4.62E-02	47.89%
378.95	3.47E-02	45.68%
411.50	2.90E-02	43.79%
446.55	2.87E-02	41.96%
481.62	2.22E-02	40.33%
519.17	1.85E-02	38.95%
559.22	1.41E-02	37.76%
619.27	9.86E-03	36.45%
689.32	6.24E-03	35.43%
799.37	3.44E-03	34.46%
0.00	0.00E+00	0.00%
0.00	0.00E+00	0.00%
0.00	0.00E+00	0.00%
0.00	0.00E+00	0.00%
0.00	0.00E+00	0.00%
0.00	0.00E+00	0.00%
0.00	0.00E+00	0.00%
0.00	0.00E+00	0.00%
0.00	0.00E+00	0.00%
0.00	0.00E+00	0.00%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060323_3d_52v.xls

Data Evaluation Grade: Test Grade (requires further evaluation)

Tunnel:	3d				
Instruments:	VTS#3/GCMSD				
Date/Expenment #:	03/23/06	52			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		78.2%		
Number of drops:	1				
Nominal drop volume:	9 µL				
Mass of agent disseminated:	11.43 mg		Data Evaluation		
Corrected mass on 100% agent purity:	8.94 mg		SD	%SD	Status
Average substrate temperature:	14.79 °C		0.5	3.55%	Go
Average air temperature above drop:	14.92 °C		1.8	12.40%	Flag
Average air flow rate:	18.04 SLPM		0.0	0.10%	Go
Test section air flow speed:	0.20 m/s		-	-	Go
Crude Evap Rate:	3.9 ug/min				
Mass % recovery in vapor:	55.7 %				
Mass % recovery by extraction:	n/a %				
Total agent % mass recovery:	55.7 %				
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				

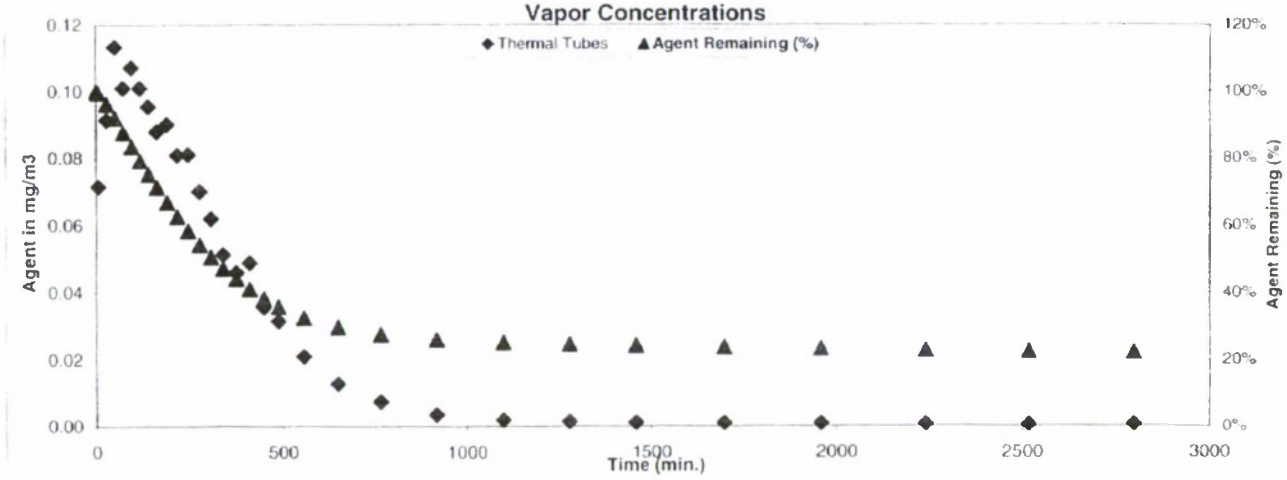


Time (min)	Conc. mg/m³	HD rem. (%)
2.97	1.34E-01	99.96%
38.85	2.08E-01	98.72%
107.57	2.72E-01	95.39%
176.28	2.41E-01	91.83%
245.00	2.28E-01	88.58%
313.72	2.39E-01	85.34%
382.42	2.15E-01	82.19%
451.13	2.05E-01	79.27%
520.35	1.79E-01	76.59%
590.07	1.68E-01	74.15%
659.78	1.71E-01	71.77%
746.17	1.39E-01	69.08%
833.05	1.21E-01	66.80%
920.93	1.08E-01	64.77%
1042.63	1.00E-01	62.22%
1215.62	8.42E-02	58.99%
1457.75	5.90E-02	55.49%
1701.12	4.60E-02	52.92%
1949.50	3.44E-02	50.90%
2202.88	2.53E-02	49.38%
2466.27	1.66E-02	48.26%
2739.65	1.06E-02	47.51%
3123.03	7.07E-03	46.83%
3546.42	3.80E-03	46.36%
3999.78	3.00E-03	46.05%
4953.17	2.17E-03	45.55%
5926.55	1.53E-03	45.19%
6919.93	1.45E-03	44.89%
8246.65	1.07E-03	44.55%
9573.37	7.81E-04	44.31%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060321_3d_51.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3d				
Instruments:	VTS#3/GCMSD				
Date/Experiment #:	03/21/06	51			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		78.2%		
Number of drops:	1				
Nominal drop volume:	1	µL			
Mass of agent disseminated:	1.27	mg	Data Evaluation		
Corrected mass on 100% agent purity:	0.99	mg	SD	%SD	Status
Average substrate temperature:	14.77	°C	0.2	1.68%	Go
Average air temperature above drop:	14.97	°C	0.1	0.96%	Go
Average air flow rate:	18.04	SLPM	0.0	0.18%	Go
Test section air flow speed:	0.22	m/s	-	-	Go
Crude Evap Rate:	1.6	ug/min			
Mass % recovery in vapor:	77.7	%			
Mass % recovery by extraction:	n/a	%			
Total agent % mass recovery:	77.7	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				

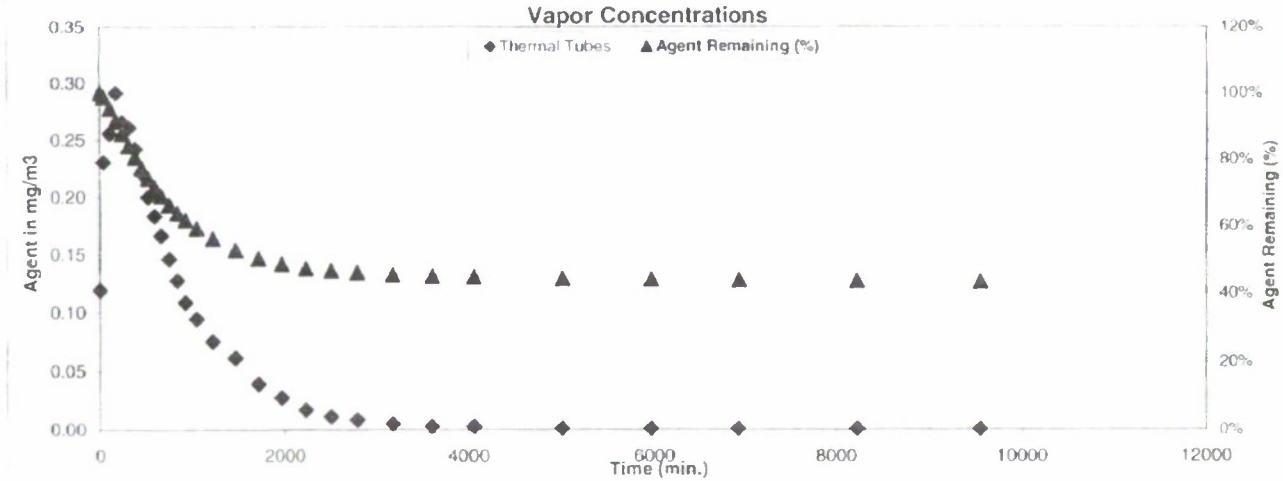


Time (min)	Conc. mg/m³	HD rem. (%)
5.28	7.15E-02	99.66%
27.83	9.15E-02	96.32%
50.38	1.13E-01	92.12%
72.93	1.01E-01	87.73%
95.48	1.07E-01	83.47%
118.02	1.01E-01	79.20%
140.57	9.56E-02	75.18%
163.12	8.80E-02	71.42%
190.67	9.02E-02	66.96%
218.22	8.09E-02	62.68%
247.02	8.11E-02	58.44%
277.07	7.01E-02	54.31%
307.12	6.21E-02	50.70%
339.65	5.13E-02	47.35%
374.70	4.61E-02	44.25%
409.77	4.90E-02	41.22%
447.30	3.57E-02	38.33%
487.35	3.15E-02	35.89%
557.40	2.10E-02	32.55%
647.45	1.28E-02	29.78%
767.50	7.44E-03	27.57%
917.55	3.53E-03	26.08%
1097.58	1.92E-03	25.18%
1277.63	1.45E-03	24.63%
1457.68	1.07E-03	24.22%
1697.73	9.70E-04	23.78%
1957.78	8.14E-04	23.36%
2237.83	7.02E-04	22.97%
2517.88	5.91E-04	22.64%
2797.93	6.90E-04	22.32%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060308_3d_50v.xls

Data Evaluation Grade: **Test Grade (requires further evaluation)**

Tunnel:	3d				
Instruments:	VTS#3/GCMSD				
Date/Experiment #:	03/08/06	50			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		78.2%		
Number of drops:	1				
Nominal drop volume:	9	µL			
Mass of agent disseminated:	11.43	mg			
Corrected mass on 100% agent purity:	8.94	mg	Data Evaluation		
Average substrate temperature:	14.39	°C	SD	%SD	Status
Average air temperature above drop:	15.23	°C	1.0	7.00%	Flag
Average air flow rate:	18.04	SLPM	0.6	3.95%	Go
Test section air flow speed:	0.15	m/s	0.0	0.12%	Go
Crude Evap Rate:	4.3	ug/min	-	-	Go
Mass % recovery in vapor:	56.5	%			
Mass % recovery by extraction:	n/a	%			
Total agent % mass recovery:	56.5	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				



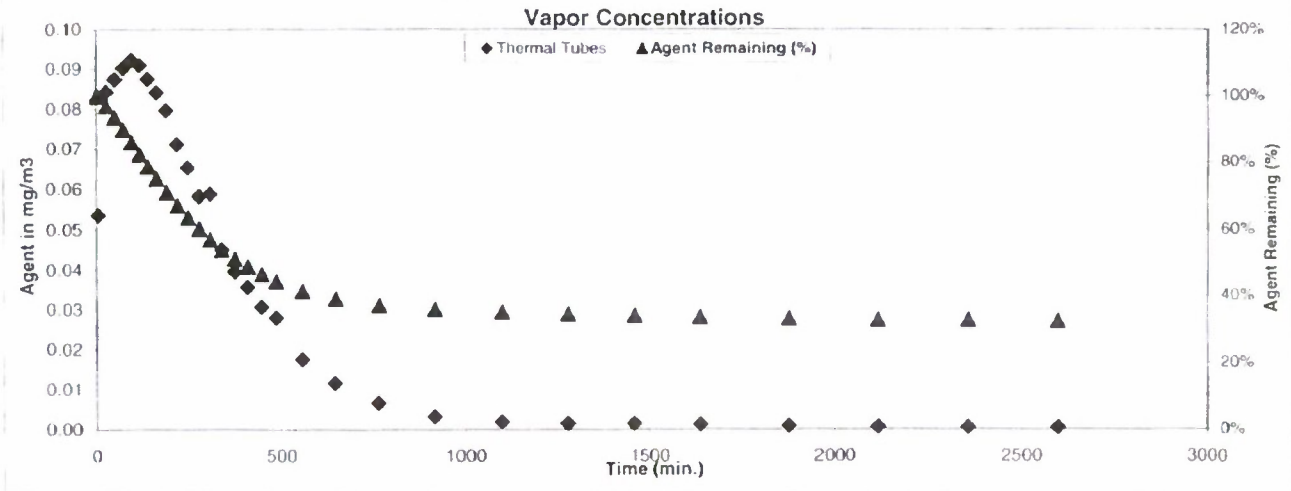
Time (min)	Conc. mg/m^3	HD rem. (%)
2.87	1.19E-01	99.97%
39.25	2.31E-01	98.68%
108.47	2.56E-01	95.28%
177.17	2.92E-01	91.49%
245.88	2.65E-01	87.63%
314.60	2.61E-01	83.98%
383.82	2.42E-01	80.47%
453.53	2.21E-01	77.21%
523.25	2.00E-01	74.25%
592.97	1.84E-01	71.55%
662.67	1.66E-01	69.09%
750.05	1.46E-01	66.33%
838.43	1.28E-01	63.89%
926.82	1.09E-01	61.78%
1049.78	9.48E-02	59.25%
1225.25	7.59E-02	56.23%
1468.63	6.14E-02	52.86%
1717.02	3.93E-02	50.33%
1970.40	2.76E-02	48.62%
2233.78	1.70E-02	47.44%
2507.15	1.11E-02	46.66%
2790.53	8.29E-03	46.11%
3183.92	5.27E-03	45.57%
3607.30	3.11E-03	45.21%
4060.68	2.98E-03	44.94%
5014.07	1.52E-03	44.50%
5967.43	1.28E-03	44.23%
6920.82	9.27E-04	44.02%
8227.53	1.08E-03	43.76%
9554.25	6.78E-04	43.52%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060306_3d_49v.xls

Data Evaluation Grade: **Test Grade (requires further evaluation)**

Tunnel:	3d		
Instruments:	VTS#3/GCMSD		
Date/Experiment #:	03/06/06	49	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	78.2%	
Number of drops:	1		
Nominal drop volume:	1 µL		
Mass of agent disseminated:	1.27 mg		
Corrected mass on 100% agent purity:	0.99 mg		
Average substrate temperature:	18.48 °C		
Average air temperature above drop:	14.51 °C		
Average air flow rate:	18.04 SLPM		
Test section air flow speed:	0.15 m/s		
Crude Evap Rate:	1.5 ug/min		
Mass % recovery in vapor:	67.6 %		
Mass % recovery by extraction:	n/a %		
Total agent % mass recovery:	67.6 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
6.3	34.32%	Flag
0.7	4.50%	Go
0.0	0.13%	Go
-	-	Go

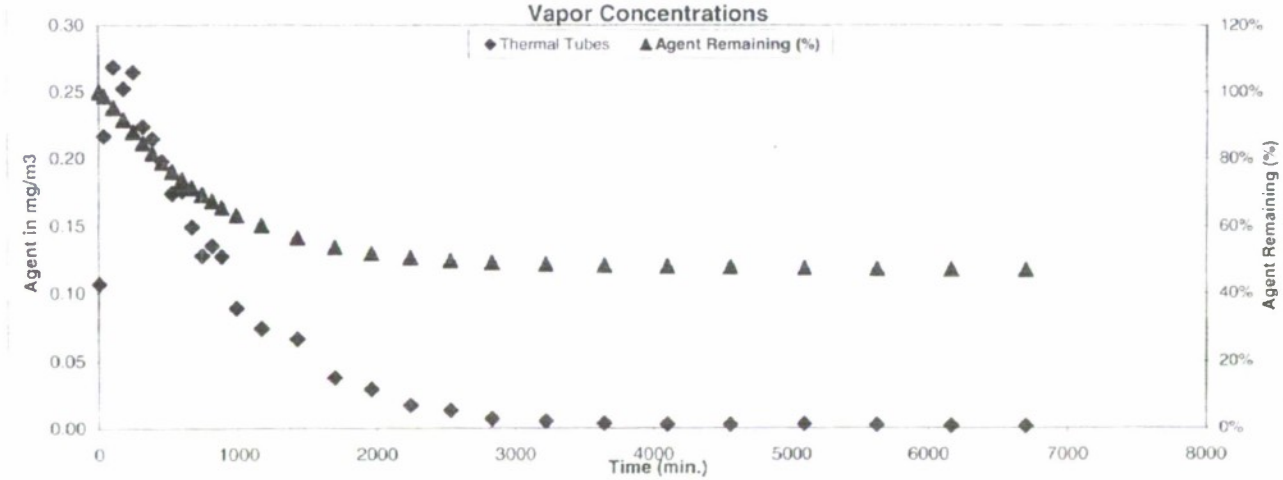


Time (min)	Conc. mg/m^3	HD rem. (%)
4.97	5.36E-02	99.76%
27.52	8.43E-02	96.93%
50.07	8.74E-02	93.42%
72.62	9.03E-02	89.78%
95.17	9.23E-02	86.04%
117.70	9.10E-02	82.29%
140.25	8.75E-02	78.63%
162.80	8.41E-02	75.12%
190.35	7.97E-02	71.02%
217.90	7.11E-02	67.25%
246.70	6.53E-02	63.68%
276.75	5.83E-02	60.31%
306.78	5.88E-02	57.11%
339.33	4.51E-02	54.04%
374.38	3.95E-02	51.35%
409.43	3.56E-02	48.95%
446.98	3.07E-02	46.69%
487.03	2.79E-02	44.56%
557.08	1.76E-02	41.67%
647.13	1.17E-02	39.28%
767.18	6.64E-03	37.28%
917.23	3.16E-03	35.95%
1097.27	1.88E-03	35.12%
1277.32	1.53E-03	34.56%
1457.37	1.44E-03	34.08%
1637.42	1.26E-03	33.64%
1877.47	8.18E-04	33.19%
2117.52	6.14E-04	32.87%
2357.55	5.02E-04	32.63%
2597.60	4.32E-04	32.43%

G:\Agent\FateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060301_3d_48v.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3d				
Instruments:	VTS#3/GCMSD				
Date/Experiment #:	03/01/06	48			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		78.2%		
Number of drops:	1				
Nominal drop volume:	9	µL			
Mass of agent disseminated:	11.43	mg	Data Evaluation		
Corrected mass on 100% agent purity:	8.94	mg	SD	%SD	Status
Average substrate temperature:	15.12	°C	0.2	1.00%	Go
Average air temperature above drop:	14.67	°C	0.3	1.93%	Go
Average air flow rate:	18.04	SLPM	0.0	0.12%	Go
Test section air flow speed:	0.15	m/s	-	-	Go
Crude Evap Rate:	4.2	ug/min			
Mass % recovery in vapor:	53.1	%			
Mass % recovery by extraction:	n/a	%			
Total agent % mass recovery:	53.1	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				

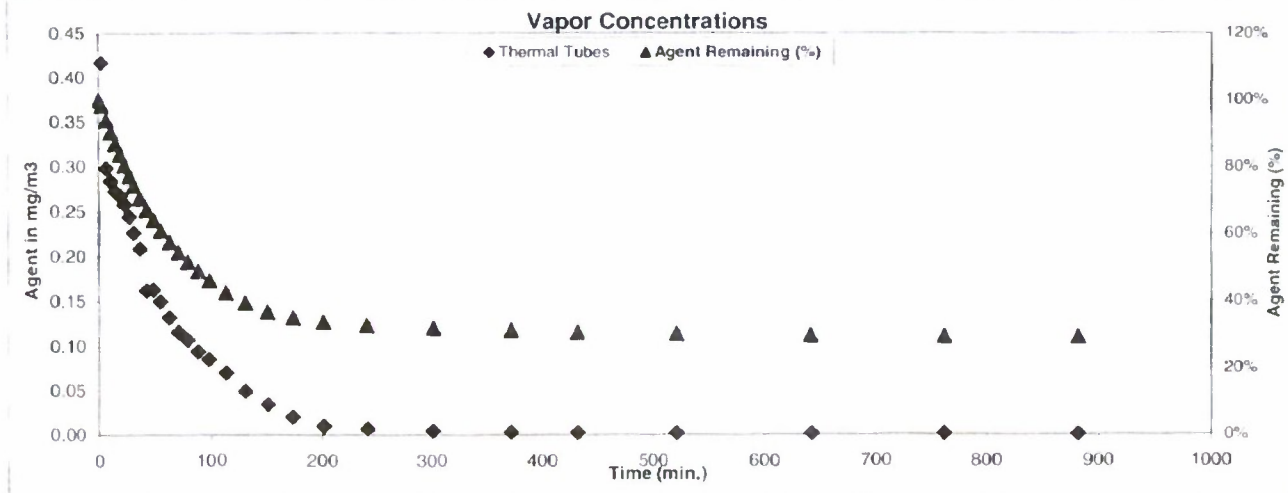


Time (min)	Conc. mg/m^3	HD rem. (%)
3.10	1.07E-01	99.97%
39.48	2.17E-01	98.78%
109.20	2.69E-01	95.36%
178.92	2.52E-01	91.70%
248.63	2.65E-01	88.06%
318.35	2.24E-01	84.62%
388.07	2.15E-01	81.53%
457.77	1.98E-01	78.64%
527.48	1.74E-01	76.02%
597.20	1.76E-01	73.56%
666.92	1.49E-01	71.27%
737.63	1.28E-01	69.29%
809.35	1.35E-01	67.39%
881.05	1.27E-01	65.49%
988.60	8.88E-02	63.14%
1165.33	7.42E-02	60.23%
1425.38	6.64E-02	56.54%
1690.42	3.76E-02	53.76%
1960.47	2.91E-02	51.94%
2240.52	1.70E-02	50.64%
2530.57	1.31E-02	49.76%
2830.62	6.98E-03	49.15%
3224.00	5.12E-03	48.67%
3647.38	3.54E-03	48.30%
4100.75	2.77E-03	48.01%
4554.13	2.42E-03	47.78%
5090.85	2.86E-03	47.49%
5627.57	2.12E-03	47.22%
6164.28	1.47E-03	47.02%
6701.00	1.28E-03	46.88%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060413_3c_117.xls

Data Evaluation Grade: **Modeling Grade**

Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Experiment #:	04/13/06	117			
Type of substrate :	Sand		Purity		
Test agent/purity:	H		78.2%		
Number of drops:	1				
Nominal drop volume:	6	µL			
Mass of agent disseminated:	7.62	mg	Data Evaluation		
Corrected mass on 100% agent purity:	5.96	mg	SD	%SD	Status
Average substrate temperature:	50.36	°C	0.3	0.64%	Go
Average air temperature above drop:	50.42	°C	0.3	0.55%	Go
Average air flow rate:	181.84	SLPM	1.3	0.71%	Go
Test section air flow speed:	1.53	m/s	-	-	Go
Crude Evap Rate:	44.8	ug/min			
Mass % recovery in vapor:	70.8	%			
Mass % recovery by extraction:	n/a	%			
Total agent % mass recovery:	70.8	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				



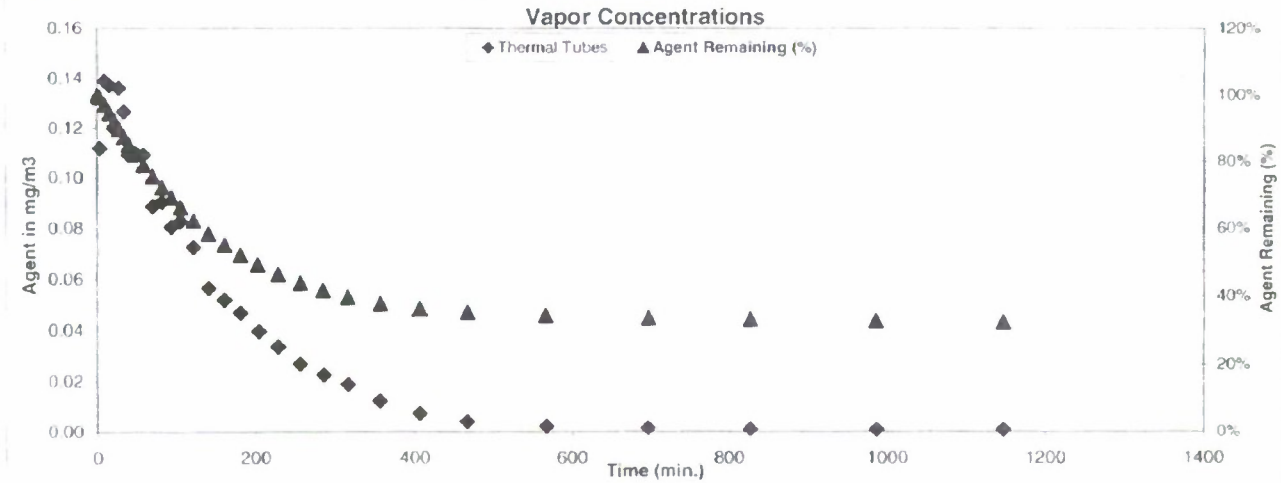
Time (min)	Conc. mg/m^3	HD rem. (%)
2.53	4.16E-01	98.39%
6.58	2.98E-01	93.97%
10.63	2.84E-01	90.38%
14.68	2.73E-01	86.94%
18.72	2.68E-01	83.61%
22.77	2.58E-01	80.36%
26.82	2.45E-01	77.26%
30.87	2.27E-01	74.35%
36.42	2.09E-01	70.66%
42.47	1.62E-01	67.24%
48.52	1.63E-01	64.24%
55.07	1.49E-01	61.12%
63.12	1.32E-01	57.66%
71.17	1.16E-01	54.62%
79.38	1.07E-01	51.83%
88.62	9.37E-02	49.00%
98.67	8.47E-02	46.26%
113.72	7.00E-02	42.71%
131.27	4.91E-02	39.52%
151.30	3.42E-02	36.97%
173.85	1.93E-02	35.13%
201.40	9.69E-03	33.91%
241.45	6.69E-03	32.91%
301.50	3.85E-03	31.94%
371.55	2.97E-03	31.21%
431.62	2.21E-03	30.74%
521.68	1.53E-03	30.23%
641.75	9.99E-04	29.76%
761.82	6.91E-04	29.45%
881.88	5.01E-04	29.23%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060404_3c_111v.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3c		
Instruments:	VTS#1/GCMSD		
Date/Experiment #:	04/04/06	111	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	78.2%	
Number of drops:	1		
Nominal drop volume:	6 µL		
Mass of agent disseminated:	7.62 mg		
Corrected mass on 100% agent purity:	5.96 mg		
Average substrate temperature:	34.87 °C		
Average air temperature above drop:	34.77 °C		
Average air flow rate:	181.79 SLPM		
Test section air flow speed:	1.51 m/s		
Crude Evap Rate:	20.6 ug/min		
Mass % recovery in vapor:	67.7 %		
Mass % recovery by extraction:	n/a %		
Total agent % mass recovery:	67.7 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.2	0.44%	Go
0.1	0.31%	Go
1.4	0.76%	Go
-	-	Go

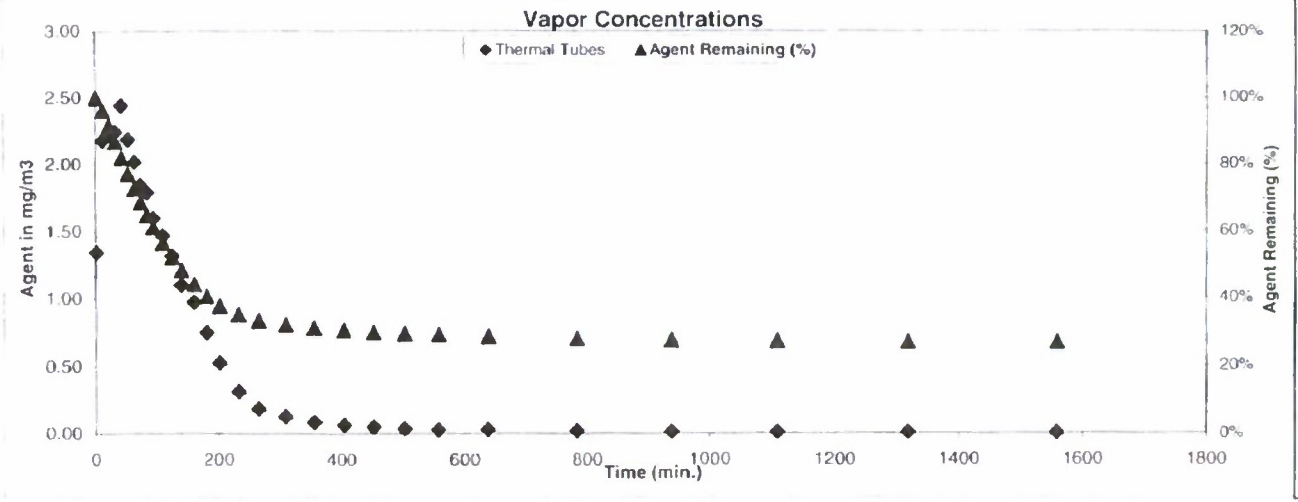


Time (min)	Conc. mg/m³	HD rem. (%)
3.55	1.12E-01	99.39%
9.60	1.39E-01	97.08%
15.65	1.37E-01	94.53%
21.68	1.20E-01	92.16%
27.73	1.36E-01	89.80%
33.78	1.27E-01	87.38%
39.83	1.09E-01	85.20%
49.13	1.10E-01	82.09%
58.68	1.09E-01	78.90%
70.15	8.87E-02	75.43%
81.87	9.05E-02	72.23%
93.58	8.04E-02	69.18%
105.30	8.28E-02	66.26%
122.02	7.25E-02	62.30%
141.23	5.64E-02	58.52%
161.28	5.19E-02	55.20%
181.33	4.68E-02	52.18%
203.88	3.95E-02	49.22%
228.93	3.38E-02	46.41%
256.48	2.67E-02	43.87%
286.53	2.25E-02	41.62%
316.58	1.89E-02	39.73%
356.63	1.22E-02	37.83%
406.68	7.21E-03	36.35%
466.73	3.97E-03	35.32%
566.78	2.03E-03	34.41%
696.83	1.46E-03	33.72%
826.88	1.11E-03	33.21%
986.93	9.12E-04	32.71%
1146.98	7.00E-04	32.32%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060328_3c_108v.xls

Data Evaluation Grade: **Modeling Grade**

Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Expenment #:	03/28/06	108			
Type of substrate :	Sand		Purity		
Test agent/purity:	H		78.2%		
Number of drops:	1				
Nominal drop volume:	9	µL			
Mass of agent disseminated:	11.43	mg	Data Evaluation		
Corrected mass on 100% agent purity:	8.94	mg	SD	%SD	Status
Average substrate temperature:	50.59	°C	0.2	0.35%	Go
Average air temperature above drop:	50.22	°C	0.2	0.39%	Go
Average air flow rate:	18.14	SLPM	0.1	0.60%	Go
Test section air flow speed:	0.10	m/s	-	-	Go
Crude Evap Rate:	38.2	ug/min			
Mass % recovery in vapor:	73.2	%			
Mass % recovery by extraction:	n/a	%			
Total agent % mass recovery:	73.2	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				

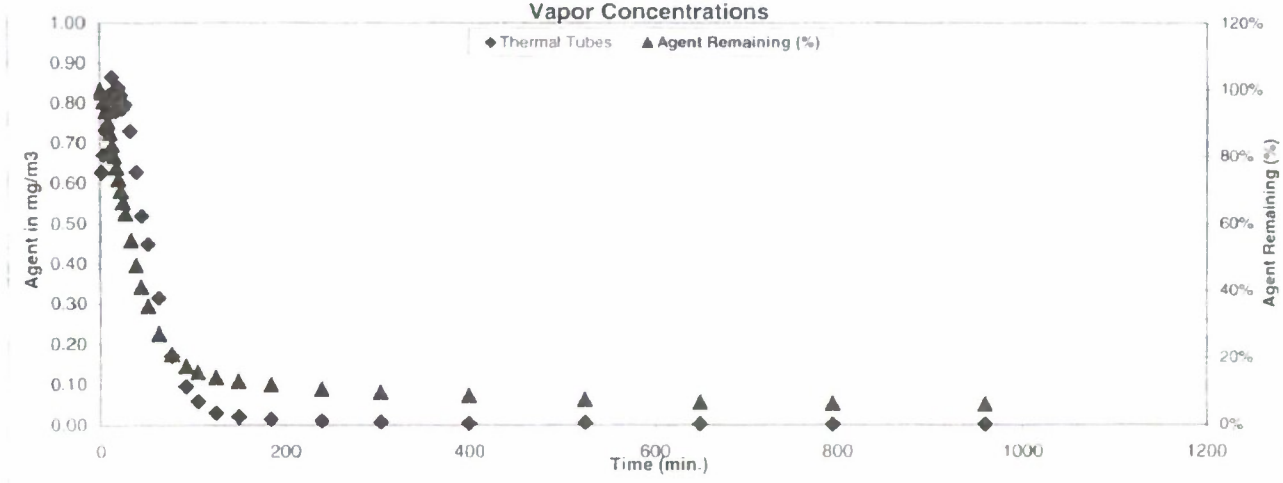


Time (min)	Conc. mg/m^3	HD rem. (%)
1.26	1.34E+00	99.83%
11.56	2.18E+00	96.15%
21.86	2.23E+00	91.54%
32.16	2.24E+00	86.87%
42.46	2.44E+00	81.98%
52.76	2.19E+00	77.14%
63.06	2.02E+00	72.75%
73.36	1.84E+00	68.72%
83.66	1.79E+00	64.93%
93.94	1.60E+00	61.39%
109.24	1.47E+00	56.63%
124.54	1.32E+00	52.30%
139.84	1.10E+00	48.54%
160.27	9.73E-01	44.24%
180.82	7.48E-01	40.66%
201.62	5.29E-01	37.96%
233.17	3.15E-01	35.26%
265.72	1.82E-01	33.62%
309.77	1.24E-01	32.25%
356.07	8.38E-02	31.28%
404.03	6.48E-02	30.55%
453.25	4.86E-02	29.99%
503.30	3.56E-02	29.56%
558.35	2.76E-02	29.21%
638.40	2.89E-02	28.75%
783.45	1.79E-02	28.06%
938.50	1.16E-02	27.60%
1108.55	7.64E-03	27.26%
1318.60	5.17E-03	26.99%
1558.65	3.19E-03	26.79%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060327_3c_107v.xls

Data Evaluation Grade: Modeling Grade

			Data Evaluation		
Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Experiment #:	03/27/06	107			
Type of substrate:	Sand	Purity			
Test agent/purity:	H	78.2%			
Number of drops:	1				
Nominal drop volume:	1 µL				
Mass of agent disseminated:	1.27 mg		SD	%SD	Status
Corrected mass on 100% agent purity:	0.99 mg		0.2	0.50%	Go
Average substrate temperature:	49.47 °C		0.2	0.42%	Go
Average air temperature above drop:	49.82 °C		0.1	0.67%	Go
Average air flow rate:	18.14 SLPM		-	-	Go
Test section air flow speed:	0.10 m/s				
Crude Evap Rate:	13.8 ug/min				
Mass % recovery in vapor:	94.0 %				
Mass % recovery by extraction:	n/a %				
Total agent % mass recovery:	94.0 %				
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				

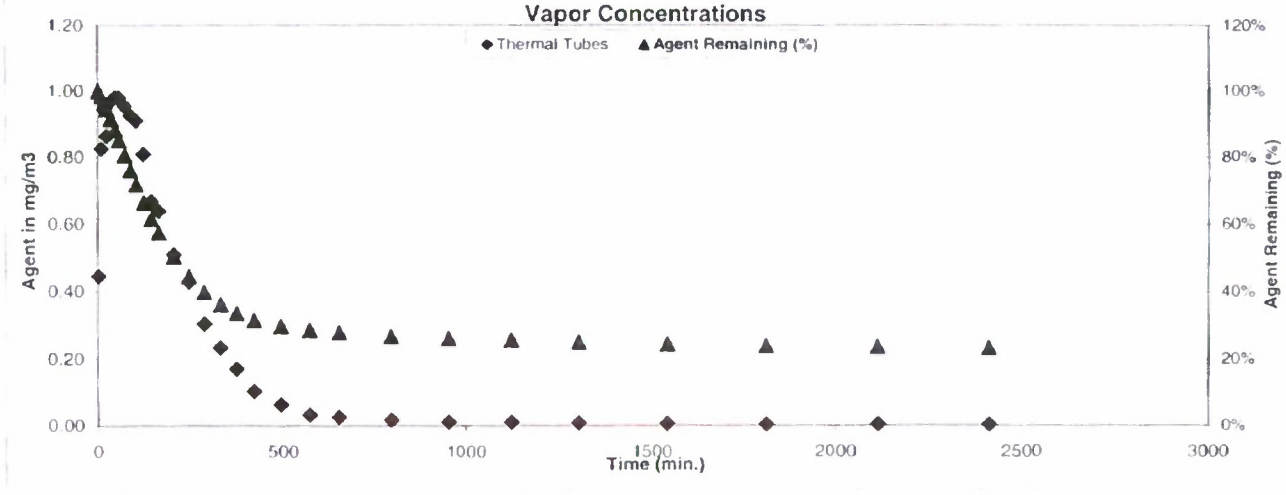


Time (min)	Conc. mg/m³	HD rem. (%)
1.36	6.26E-01	99.22%
3.66	6.69E-01	96.50%
5.96	7.32E-01	93.56%
8.26	7.73E-01	90.40%
10.56	8.21E-01	87.05%
12.86	8.64E-01	83.51%
15.16	8.08E-01	80.00%
17.46	7.79E-01	76.67%
19.76	8.38E-01	73.27%
22.06	8.19E-01	69.79%
24.36	7.86E-01	66.42%
26.66	7.95E-01	63.10%
32.46	7.30E-01	55.02%
38.37	6.27E-01	47.70%
44.67	5.19E-01	41.12%
51.23	4.49E-01	35.31%
63.03	3.14E-01	27.09%
76.58	1.70E-01	21.09%
91.63	9.43E-02	17.45%
104.18	5.65E-02	15.73%
124.23	2.96E-02	14.15%
149.27	2.08E-02	13.00%
184.32	1.37E-02	11.89%
239.37	9.94E-03	10.70%
304.42	7.26E-03	9.68%
399.47	4.36E-03	8.67%
524.52	5.54E-03	7.54%
649.57	1.97E-03	6.68%
794.62	1.19E-03	6.27%
959.67	7.90E-04	5.97%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060322_3c_106v.xls

Tunnel:	3c		
Instruments:	VTS#1/GCMS0		
Date/Experiment #:	03/22/06	106	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	78.2%	
Number of drops:	1		
Nominal drop volume:	6	µL	
Mass of agent disseminated:	7.62	mg	
Corrected mass on 100% agent purity:	5.96	mg	
Average substrate temperature:	35.69	°C	
Average air temperature above drop:	34.95	°C	
Average air flow rate:	18.12	SLPM	
Test section air flow speed:	0.22	m/s	
Crude Evap Rate:	16.1	ug/min	
Mass % recovery in vapor:	76.7	%	
Mass % recovery by extraction:	n/a	%	
Total agent % mass recovery:	76.7	%	
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.3	0.94%	Go
0.2	0.47%	Go
0.1	0.52%	Go
-	-	Go

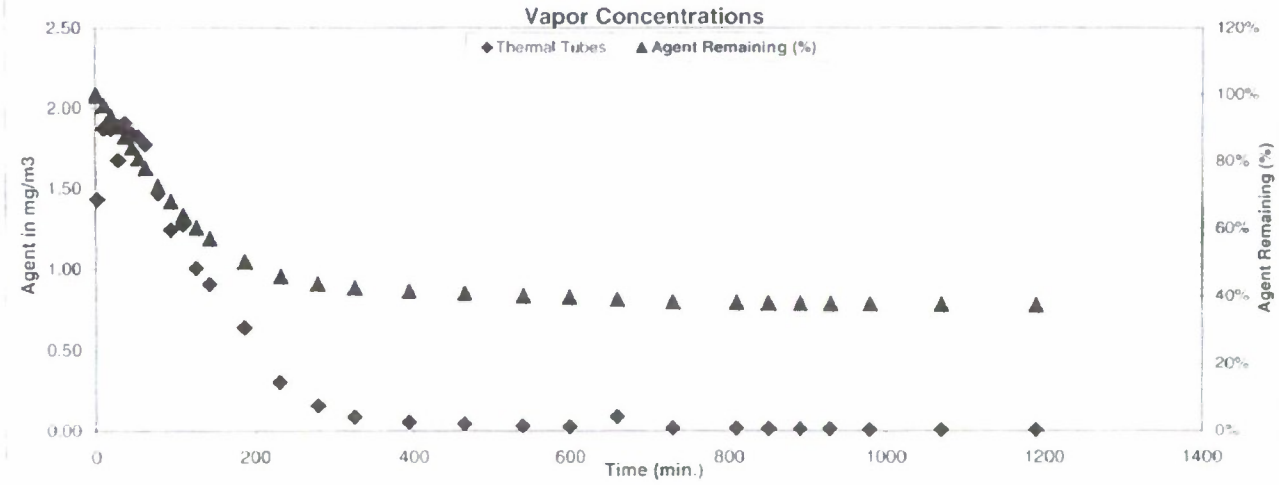


Time (min)	Conc. mg/m³	HD rem. (%)
1.89	4.46E-01	99.87%
9.19	8.25E-01	98.46%
16.49	9.44E-01	96.50%
23.79	8.64E-01	94.49%
34.42	9.69E-01	91.52%
45.06	9.81E-01	88.37%
55.69	9.81E-01	85.20%
71.32	9.55E-01	80.59%
86.96	9.27E-01	76.12%
102.59	9.11E-01	71.75%
123.23	8.11E-01	66.34%
143.94	6.67E-01	61.69%
164.74	6.39E-01	57.56%
205.67	5.10E-01	50.41%
246.72	4.31E-01	44.54%
288.27	3.05E-01	39.89%
330.82	2.34E-01	36.40%
374.87	1.72E-01	33.68%
422.42	1.05E-01	31.69%
494.97	6.36E-02	29.83%
572.52	3.49E-02	28.67%
652.57	2.67E-02	27.92%
797.62	1.77E-02	26.94%
952.67	1.35E-02	26.21%
1122.72	1.08E-02	25.58%
1302.77	9.10E-03	25.03%
1542.82	6.75E-03	24.45%
1812.87	4.66E-03	23.98%
2112.92	3.70E-03	23.60%
2412.97	2.69E-03	23.31%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060314_3c_105v.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Experiment #:	03/14/06	105			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		78.2%		
Number of drops:	1				
Nominal drop volume:	9	µL			
Mass of agent disseminated:	11.43	mg	Data Evaluation		
Corrected mass on 100% agent purity:	8.94	mg	SD	%SD	Status
Average substrate temperature:	49.38	°C	0.3	0.66%	Go
Average air temperature above drop:	49.59	°C	0.3	0.65%	Go
Average air flow rate:	18.14	SLPM	0.2	0.89%	Go
Test section air flow speed:	0.10	m/s	-	-	Go
Crude Evap Rate:	29.9	ug/min			
Mass % recovery in vapor:	62.6	%			
Mass % recovery by extraction:	n/a	%			
Total agent % mass recovery:	62.6	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				

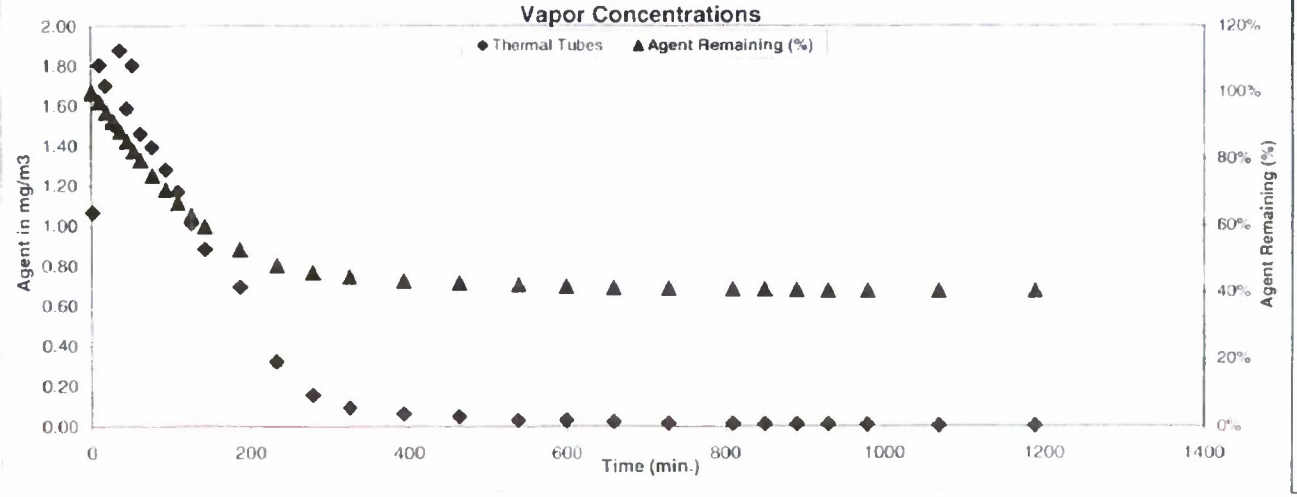


Time (min)	Conc. mg/m³	HD rem. (%)
1.73	1.43E+00	99.75%
10.28	1.87E+00	96.88%
18.83	1.87E+00	93.63%
27.38	1.67E+00	90.56%
35.93	1.91E+00	87.45%
44.48	1.84E+00	84.20%
53.03	1.82E+00	81.03%
61.58	1.77E+00	77.91%
77.63	1.47E+00	72.63%
93.68	1.24E+00	68.22%
109.73	1.27E+00	64.12%
126.28	1.00E+00	60.30%
143.33	9.05E-01	57.00%
186.38	6.40E-01	50.25%
232.35	3.04E-01	45.85%
278.57	1.59E-01	43.68%
325.03	8.69E-02	42.53%
394.25	5.71E-02	41.52%
464.30	4.47E-02	40.79%
539.35	3.25E-02	40.20%
599.40	2.76E-02	39.84%
659.45	8.96E-02	39.12%
729.50	1.77E-02	38.36%
809.55	1.47E-02	38.10%
849.62	1.40E-02	37.98%
889.68	1.28E-02	37.87%
929.73	1.17E-02	37.77%
979.78	9.51E-03	37.66%
1069.85	6.83E-03	37.51%
1189.92	5.53E-03	37.36%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060313_3c_104v.xls

Tunnel:	3c		
Instruments:	VTS#1/GCMSD		
Date/Experiment #:	03/13/06	104	
Type of substrate:	Sand		Purity
Test agent/purity:	H		78.2%
Number of drops:	1		
Nominal drop volume:	9	µL	
Mass of agent disseminated:	11.43	mg	
Corrected mass on 100% agent purity:	8.94	mg	
Average substrate temperature:	50.25	°C	
Average air temperature above drop:	50.08	°C	
Average air flow rate:	18.14	SLPM	
Test section air flow speed:	0.10	m/s	
Crude Evap Rate:	27.8	ug/min	
Mass % recovery in vapor:	59.8	%	
Mass % recovery by extraction:	n/a	%	
Total agent % mass recovery:	59.8	%	
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.3	0.61%	Go
0.3	0.64%	Go
0.1	0.82%	Go
-	-	Go

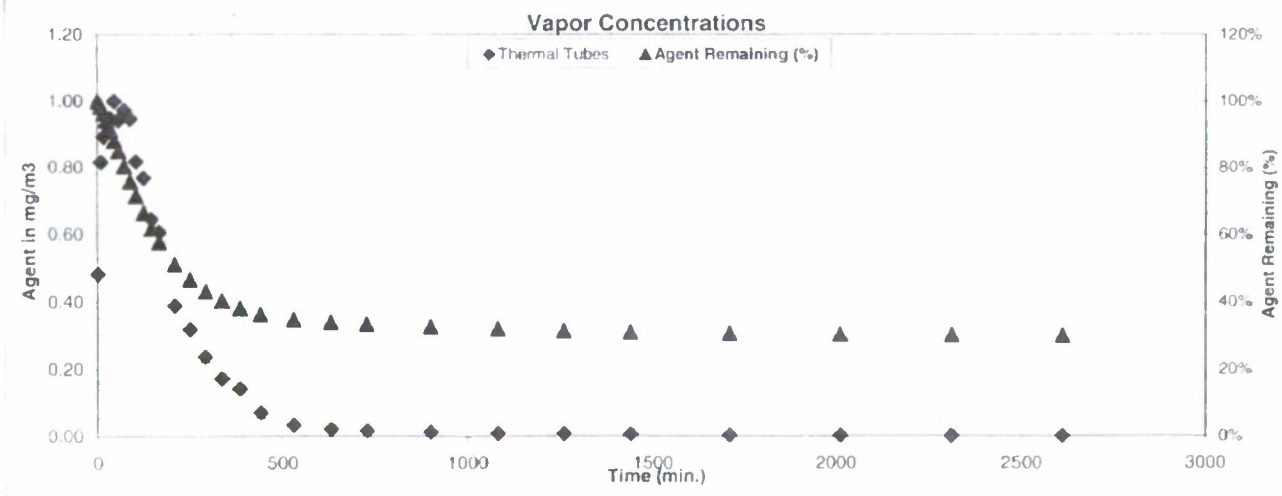


Time (min)	Conc. mg/m^3	HD rem. (%)
1.70	1.07E+00	99.82%
10.25	1.81E+00	97.32%
18.80	1.70E+00	94.28%
27.35	1.51E+00	91.49%
35.90	1.88E+00	88.55%
44.45	1.59E+00	85.55%
53.00	1.80E+00	82.60%
61.55	1.46E+00	79.77%
77.60	1.39E+00	75.12%
93.65	1.28E+00	70.76%
109.70	1.17E+00	66.77%
126.25	1.01E+00	63.11%
143.30	8.84E-01	59.82%
186.35	6.95E-01	52.92%
232.40	3.21E-01	48.18%
278.45	1.58E-01	45.94%
324.66	9.38E-02	44.76%
393.88	6.18E-02	43.67%
463.93	4.82E-02	42.88%
538.98	3.34E-02	42.26%
599.03	3.25E-02	41.86%
659.08	2.52E-02	41.51%
729.13	1.75E-02	41.21%
809.18	1.57E-02	40.94%
849.25	1.40E-02	40.82%
889.32	1.31E-02	40.71%
929.37	1.20E-02	40.60%
979.43	9.01E-03	40.50%
1069.50	5.89E-03	40.36%
1189.57	5.14E-03	40.23%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060310_3c_103v.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Experiment #:	03/10/06	103			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		78.2%		
Number of drops:	1				
Nominal drop volume:	6	µL			
Mass of agent disseminated:	7.62	mg	Data Evaluation		
Corrected mass on 100% agent purity:	5.96	mg	SD	%SD	Status
Average substrate temperature:	35.30	°C	0.4	1.08%	Go
Average air temperature above drop:	35.23	°C	0.2	0.57%	Go
Average air flow rate:	18.13	SLPM	0.1	0.42%	Go
Test section air flow speed:	0.22	m/s	-	-	Go
Crude Evap Rate:	15.8	ug/min			
Mass % recovery in vapor:	69.9	%			
Mass % recovery by extraction:	n/a	%			
Total agent % mass recovery:	69.9	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				



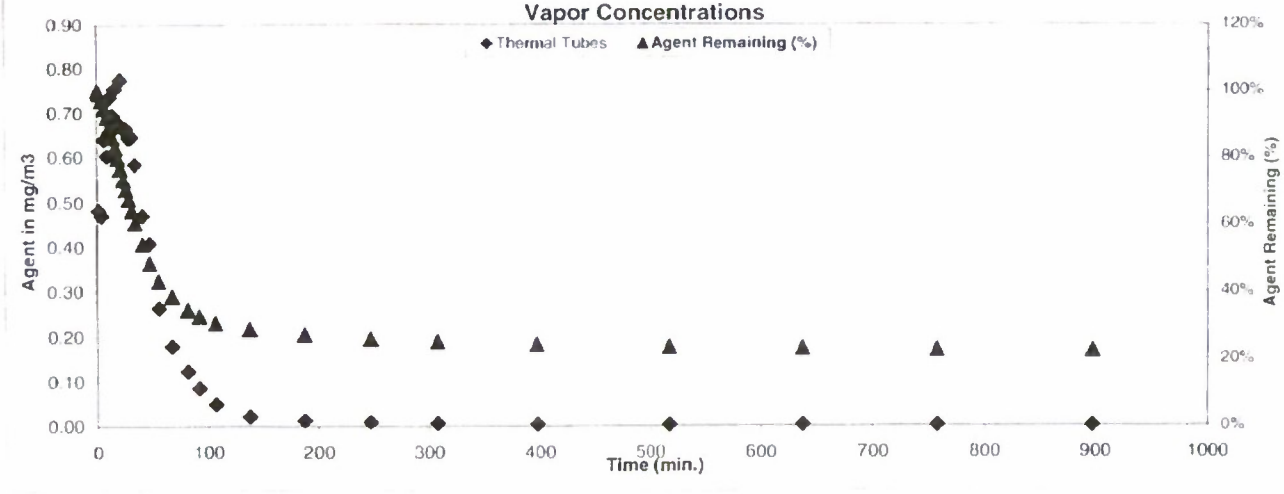
Time (min)	Conc. mg/m³	HD rem. (%)
1.64	4.84E-01	99.88%
9.11	8.16E-01	98.40%
16.58	8.93E-01	96.46%
24.04	9.29E-01	94.39%
34.84	9.47E-01	91.31%
45.64	1.00E+00	88.11%
56.44	9.43E-01	84.92%
72.24	9.73E-01	80.31%
88.04	9.47E-01	75.69%
103.84	8.18E-01	71.45%
124.77	7.67E-01	66.41%
146.05	6.45E-01	61.83%
167.60	6.07E-01	57.73%
209.40	3.89E-01	51.40%
251.45	3.20E-01	46.86%
294.02	2.38E-01	43.25%
338.07	1.74E-01	40.50%
385.62	1.43E-01	38.21%
440.67	7.15E-02	36.41%
530.72	3.49E-02	34.95%
630.77	2.17E-02	34.09%
730.82	1.70E-02	33.50%
900.87	1.32E-02	32.72%
1080.92	8.99E-03	32.11%
1260.95	9.11E-03	31.62%
1441.00	6.90E-03	31.18%
1711.05	3.86E-03	30.74%
2011.10	2.71E-03	30.44%
2311.15	1.71E-03	30.23%
2611.20	1.44E-03	30.09%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060309_3c_102v.xls

Data Evaluation Grade: **Modeling Grade**

Tunnel:	3c		
Instruments:	VTS#1/GCMSD		
Date/Experiment #:	03/09/06	102	
Type of substrate:	Sand		Purity
Test agent/purity:	H		78.2%
Number of drops:	1		
Nominal drop volume:	1	µL	
Mass of agent disseminated:	1.27	mg	
Corrected mass on 100% agent purity:	0.99	mg	
Average substrate temperature:	49.52	°C	
Average air temperature above drop:	50.44	°C	
Average air flow rate:	18.14	SLPM	
Test section air flow speed:	0.10	m/s	
Crude Evap Rate:	12.1	ug/min	
Mass % recovery in vapor:	77.5	%	
Mass % recovery by extraction:	n/a	%	
Total agent % mass recovery:	77.5	%	
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.2	0.37%	Go
0.3	0.52%	Go
0.2	0.89%	Go
-	-	Go

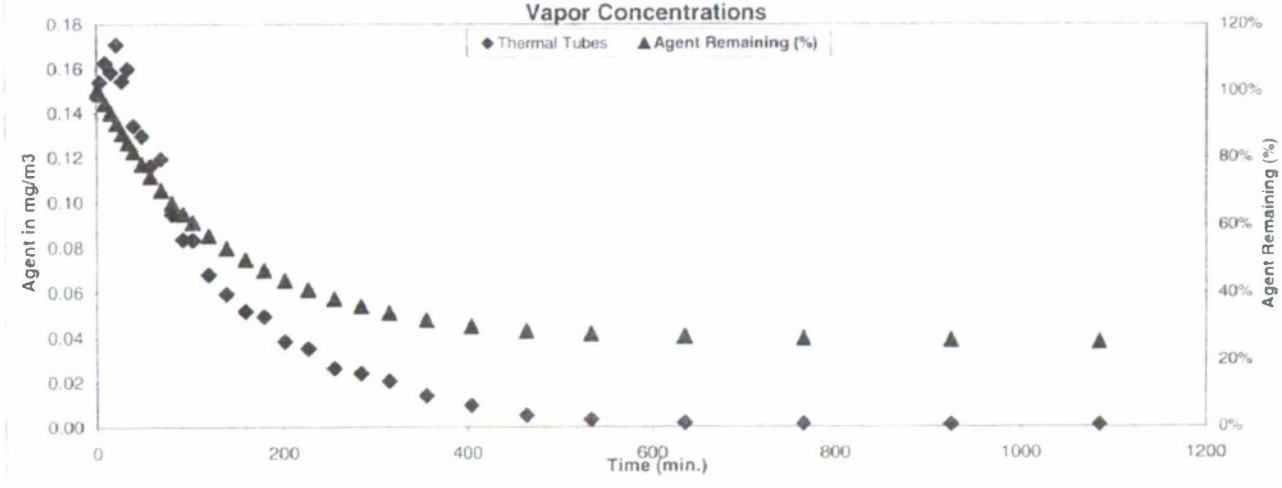


Time (min)	Conc. mg/m^3	HD rem. (%)
1.48	4.82E-01	99.35%
3.86	4.70E-01	97.28%
6.25	6.40E-01	94.86%
8.63	6.03E-01	92.15%
11.01	7.36E-01	89.24%
13.40	6.95E-01	86.12%
15.78	7.55E-01	82.97%
18.17	6.78E-01	79.85%
20.55	7.75E-01	76.69%
22.93	6.64E-01	73.56%
25.31	6.65E-01	70.67%
27.70	6.44E-01	67.82%
30.58	6.47E-01	64.42%
33.78	5.84E-01	60.83%
40.58	4.71E-01	54.27%
47.65	4.08E-01	48.60%
56.20	2.64E-01	43.35%
67.92	1.79E-01	38.61%
82.13	1.23E-01	34.69%
92.18	8.69E-02	32.76%
107.25	5.03E-02	30.87%
137.32	2.14E-02	28.90%
187.38	1.27E-02	27.34%
247.45	9.29E-03	26.14%
307.52	6.48E-03	25.27%
397.58	4.14E-03	24.40%
517.65	2.65E-03	23.65%
637.72	1.84E-03	23.16%
757.78	1.29E-03	22.82%
897.85	8.18E-04	22.55%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060308_3c_101.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Experiment #	03/08/06	101			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		78.2%		
Number of drops:	1				
Nominal drop volume:	6	µL			
Mass of agent disseminated:	7.62	mg	Data Evaluation		
Corrected mass on 100% agent purity:	5.96	mg	SD	%SD	Status
Average substrate temperature:	35.38	°C	0.2	0.49%	Go
Average air temperature above drop:	35.41	°C	0.1	0.40%	Go
Average air flow rate:	181.20	SLPM	1.7	0.92%	Go
Test section air flow speed:	1.56	m/s	-	-	Go
Crude Evap Rate:	26.8	ug/min			
Mass % recovery in vapor:	74.5	%			
Mass % recovery by extraction:	n/a	%			
Total agent % mass recovery:	74.5	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				



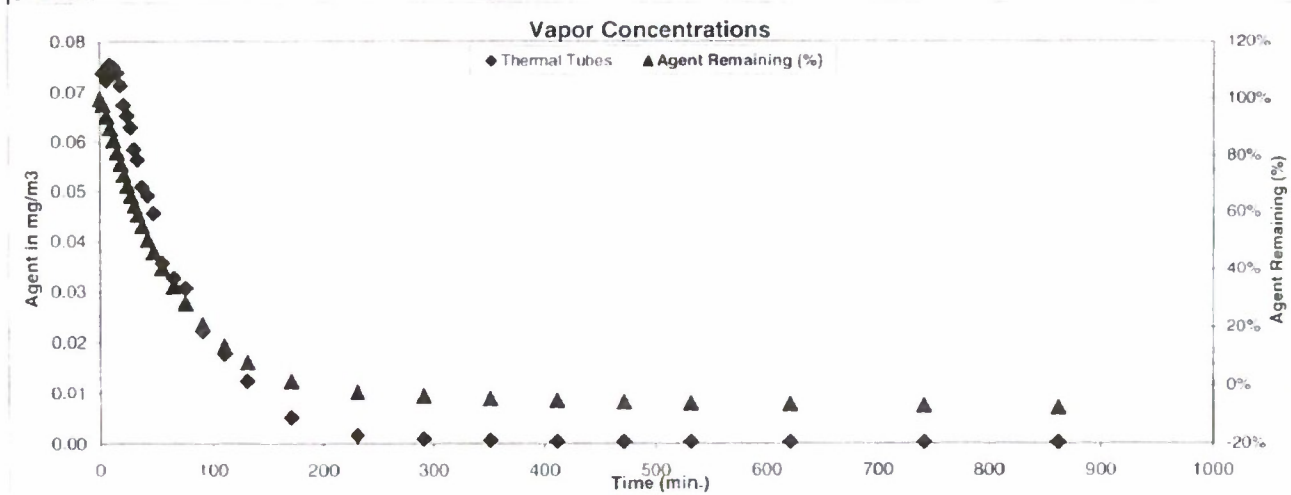
Time (min)	Conc. mg/m^3	HD rem. (%)
3.10	1.54E-01	99.27%
9.15	1.63E-01	96.36%
15.20	1.59E-01	93.41%
21.25	1.71E-01	90.38%
27.30	1.54E-01	87.39%
33.35	1.60E-01	84.50%
39.40	1.34E-01	81.79%
48.70	1.30E-01	78.06%
58.25	1.16E-01	74.49%
69.72	1.19E-01	70.39%
81.43	9.48E-02	66.57%
93.15	8.36E-02	63.40%
103.20	8.34E-02	60.84%
119.92	6.80E-02	57.00%
139.13	5.95E-02	53.27%
159.18	5.18E-02	49.88%
179.23	4.95E-02	46.79%
201.78	3.85E-02	43.77%
226.83	3.53E-02	40.96%
254.38	2.64E-02	38.37%
284.43	2.41E-02	36.06%
314.48	2.06E-02	34.02%
354.53	1.40E-02	31.91%
404.58	9.61E-03	30.11%
464.63	5.21E-03	28.76%
534.68	3.33E-03	27.85%
634.73	1.76E-03	27.07%
764.78	1.30E-03	26.47%
924.83	1.00E-03	25.91%
1084.88	8.51E-04	25.46%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060307_3c_100.xls

Data Evaluation Grade: **Modeling Grade**

Tunnel:	3c		
Instruments:	VTS#1/GCMSD		
Date/Experiment #:	03/07/06	100	
Type of substrate:	Sand		Purity
Test agent/purity:	H		78.2%
Number of drops:	1		
Nominal drop volume:	1	µL	
Mass of agent disseminated:	1.27	mg	
Corrected mass on 100% agent purity:	0.99	mg	
Average substrate temperature:	34.40	°C	
Average air temperature above drop:	34.69	°C	
Average air flow rate:	181.72	SLPM	
Test section air flow speed:	1.56	m/s	
Crude Evap Rate:	11.8	ug/min	
Mass % recovery in vapor:	107.7	%	
Mass % recovery by extraction:	n/a	%	
Total agent % mass recovery:	107.7	%	
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.7	1.92%	Go
0.2	0.58%	Go
1.8	0.99%	Go
-	-	Go

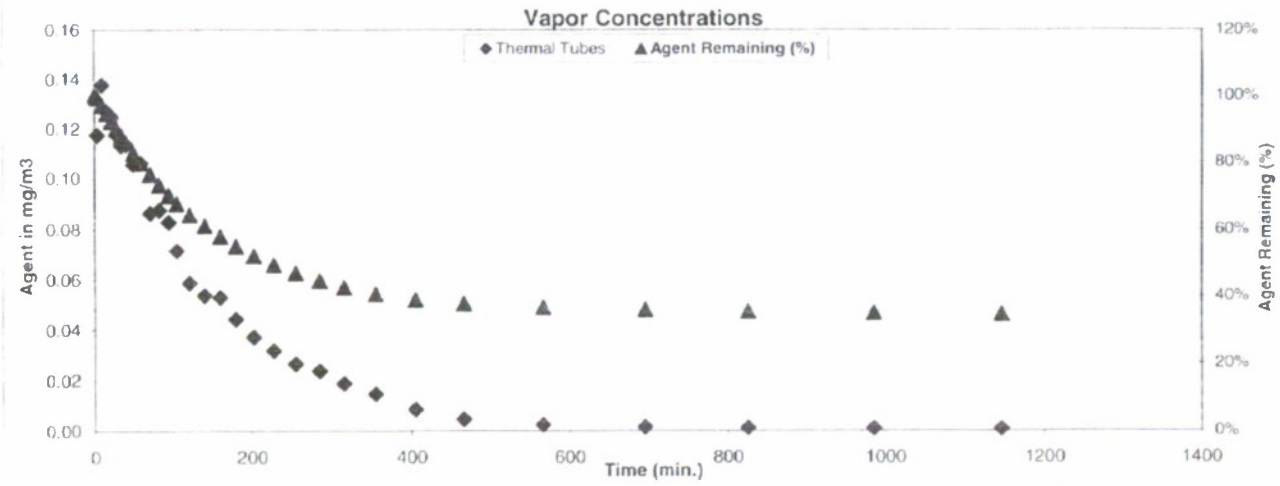


Time (min)	Conc. mg/m³	HD rem. (%)
2.73	7.37E-02	98.16%
5.82	7.24E-02	94.04%
8.90	7.54E-02	89.87%
11.98	7.49E-02	85.63%
15.07	7.38E-02	81.43%
18.15	7.14E-02	77.34%
21.23	6.74E-02	73.42%
24.33	6.53E-02	69.66%
27.42	6.29E-02	66.04%
30.50	5.85E-02	62.62%
33.58	5.64E-02	59.38%
37.67	5.08E-02	55.37%
42.77	4.91E-02	50.71%
47.85	4.56E-02	46.30%
55.43	3.57E-02	40.66%
65.53	3.27E-02	34.34%
75.62	3.07E-02	28.49%
90.70	2.22E-02	21.19%
110.78	1.78E-02	13.85%
130.87	1.25E-02	8.28%
170.95	5.23E-03	1.77%
231.05	1.69E-03	-2.03%
291.13	9.44E-04	-3.48%
351.22	6.77E-04	-4.37%
411.30	5.25E-04	-5.03%
471.38	4.33E-04	-5.56%
531.47	3.70E-04	-6.00%
621.57	2.97E-04	-6.55%
741.65	2.42E-04	-7.14%
861.73	2.31E-04	-7.66%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060306_3c_99.xls

Data Evaluation Grade: Modeling Grade

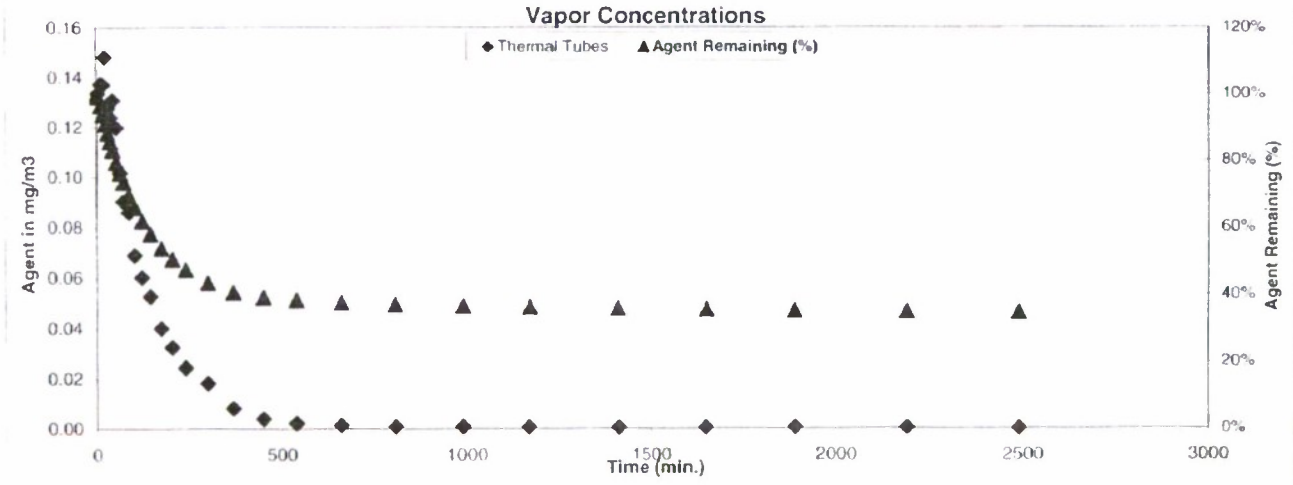
Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Experiment #:	03/06/06	99			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		78.2%		
Number of drops:	1				
Nominal drop volume:	6	µL			
Mass of agent disseminated:	7.62	mg	Data Evaluation		
Corrected mass on 100% agent purity:	5.96	mg	SD	%SD	Status
Average substrate temperature:	35.00	°C	0.1	0.38%	Go
Average air temperature above drop:	34.81	°C	0.1	0.37%	Go
Average air flow rate:	181.71	SLPM	1.6	0.90%	Go
Test section air flow speed:	1.57	m/s	-	-	Go
Crude Evap Rate:	21.1	ug/min			
Mass % recovery in vapor:	65.4	%			
Mass % recovery by extraction:	n/a	%			
Total agent % mass recovery:	65.4	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				



Time (min)	Conc. mg/m³	HD rem. (%)
3.18	1.17E-01	99.43%
9.25	1.38E-01	97.07%
15.32	1.27E-01	94.62%
21.38	1.25E-01	92.30%
27.47	1.18E-01	90.05%
33.53	1.13E-01	87.91%
39.60	1.14E-01	85.81%
48.93	1.06E-01	82.69%
58.50	1.06E-01	79.60%
69.98	8.65E-02	76.23%
81.72	8.76E-02	73.12%
93.45	8.29E-02	70.07%
103.52	7.14E-02	67.70%
120.25	5.86E-02	64.38%
139.50	5.35E-02	61.09%
159.57	5.28E-02	57.84%
179.63	4.41E-02	54.87%
202.20	3.72E-02	52.07%
227.27	3.18E-02	49.44%
254.85	2.65E-02	46.98%
284.92	2.37E-02	44.68%
314.98	1.87E-02	42.73%
355.05	1.45E-02	40.70%
405.12	8.48E-03	38.95%
465.18	4.61E-03	37.75%
565.27	2.30E-03	36.69%
695.33	1.42E-03	35.95%
825.40	1.11E-03	35.45%
985.47	8.81E-04	34.96%
1145.53	6.45E-04	34.59%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060303_3c_98.xls

Tunnel:	3c					
Instruments:	VTS#1/GCMSD					
Date/Experiment #:	03/03/06	98				
Type of substrate:	Sand		Purity			
Test agent/purity:	H		78.2%			
Number of drops:	1					
Nominal drop volume:	6	µL				
Mass of agent disseminated:	7.62	mg	Data Evaluation			
Corrected mass on 100% agent purity:	5.96	mg	SD	%SD	Status	
Average substrate temperature:	34.26	°C	0.4	1.22%	Go	
Average air temperature above drop:	34.80	°C	0.1	0.33%	Go	
Average air flow rate:	181.91	SLPM	1.1	0.59%	Go	
Test section air flow speed:	1.57	m/s	-	-	Go	
Crude Evap Rate:	23.5	ug/min				
Mass % recovery in vapor:	65.2	%				
Mass % recovery by extraction:	n/a	%				
Total agent % mass recovery:	65.2	%				
Tube #s consistant:	Yes					
Daily CCV < +/- 15%:	Yes					
Comments:	n/a					



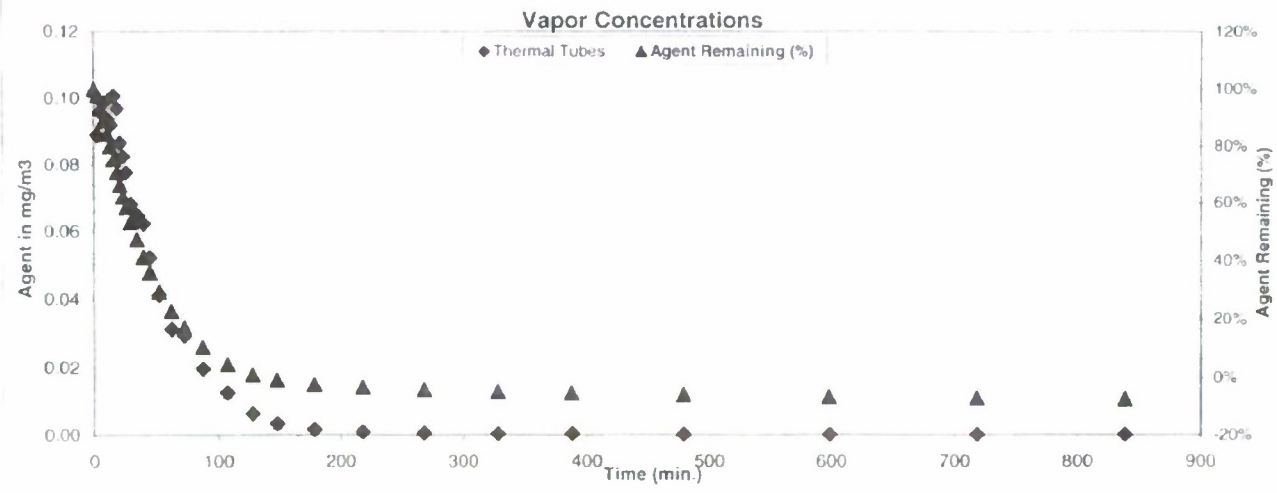
Time (min)	Conc. mg/m^3	HD rem. (%)
3.35	1.34E-01	99.32%
9.92	1.37E-01	96.60%
16.48	1.37E-01	93.85%
23.05	1.48E-01	90.99%
29.63	1.28E-01	88.22%
36.20	1.24E-01	85.70%
42.77	1.31E-01	83.14%
52.33	1.20E-01	79.48%
61.90	1.02E-01	76.25%
71.47	9.01E-02	73.44%
86.30	8.60E-02	69.46%
101.37	6.89E-02	65.89%
121.43	6.02E-02	61.94%
144.00	5.27E-02	58.05%
174.07	4.00E-02	53.80%
204.15	3.25E-02	50.47%
239.22	2.44E-02	47.43%
299.28	1.82E-02	43.52%
369.35	8.10E-03	40.71%
449.43	3.90E-03	39.24%
539.50	2.12E-03	38.41%
659.57	1.50E-03	37.75%
809.63	9.31E-04	37.19%
989.70	8.49E-04	36.70%
1169.77	6.07E-04	36.30%
1409.85	5.02E-04	35.89%
1649.92	3.95E-04	35.57%
1889.98	3.56E-04	35.29%
2190.05	2.70E-04	35.00%
2490.13	2.27E-04	34.78%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060302_3c_97.xls

Data Evaluation Grade: **Modeling Grade**

Tunnel:	3c		
Instruments:	VTS#1/GCMSD		
Date/Experiment #:	03/02/06 97		
Type of substrate:	Sand	Purity	
Test agent/purity:	H	78.2%	
Number of drops:	1		
Nominal drop volume:	1 µL		
Mass of agent disseminated:	1.27 mg		
Corrected mass on 100% agent purity:	0.99 mg		
Average substrate temperature:	35.03 °C		
Average air temperature above drop:	35.45 °C		
Average air flow rate:	181.73 SLPM		
Test section air flow speed:	1.57 m/s		
Crude Evap Rate:	15.8 ug/min		
Mass % recovery in vapor:	107.4 %		
Mass % recovery by extraction:	n/a %		
Total agent % mass recovery:	107.4 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.2	0.65%	Go
0.1	0.23%	Go
2.1	1.13%	Go
-	-	Go

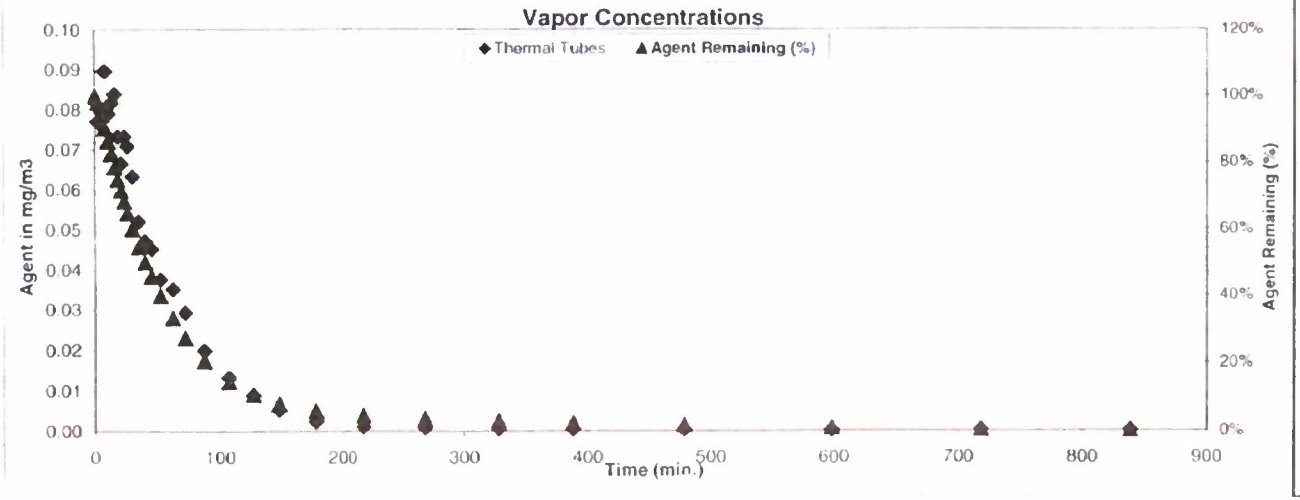


Time (min)	Conc. mg/m³	HD rem. (%)
2.62	8.90E-02	97.87%
5.20	9.59E-02	93.50%
7.78	9.87E-02	88.90%
10.37	9.39E-02	84.34%
12.95	9.21E-02	79.94%
15.53	1.01E-01	75.39%
18.13	9.70E-02	70.68%
20.72	8.66E-02	66.34%
23.30	8.25E-02	62.33%
25.88	7.76E-02	58.55%
29.72	6.82E-02	53.44%
34.80	6.49E-02	47.25%
39.88	6.23E-02	41.33%
44.98	5.23E-02	35.98%
52.57	4.14E-02	29.48%
62.65	3.14E-02	22.76%
72.75	2.96E-02	17.12%
87.83	1.98E-02	10.31%
107.92	1.26E-02	4.36%
128.00	6.41E-03	0.86%
148.08	3.47E-03	-0.95%
178.17	1.66E-03	-2.36%
218.25	1.02E-03	-3.35%
268.33	6.43E-04	-4.11%
328.43	4.80E-04	-4.72%
388.52	4.38E-04	-5.23%
478.60	3.19E-04	-5.85%
598.68	2.54E-04	-6.48%
718.77	2.12E-04	-6.99%
838.85	1.72E-04	-7.42%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060301_3c_96.xls

Tunnel:	3c		
Instruments:	VTS#1/GCMSD		
Date/Experiment #:	03/01/06	96	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	78.2%	
Number of drops:	1		
Nominal drop volume:	1 µL		
Mass of agent disseminated:	1.27 mg		
Corrected mass on 100% agent purity:	0.99 mg		
Average substrate temperature:	35.03 °C		
Average air temperature above drop:	35.48 °C		
Average air flow rate:	181.89 SLPM		
Test section air flow speed:	1.57 m/s		
Crude Evap Rate:	13.4 ug/min		
Mass % recovery in vapor:	100.0 %		
Mass % recovery by extraction:	n/a %		
Total agent % mass recovery:	100.0 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.2	0.47%	Go
0.1	0.28%	Go
1.6	0.90%	Go
-	-	Go

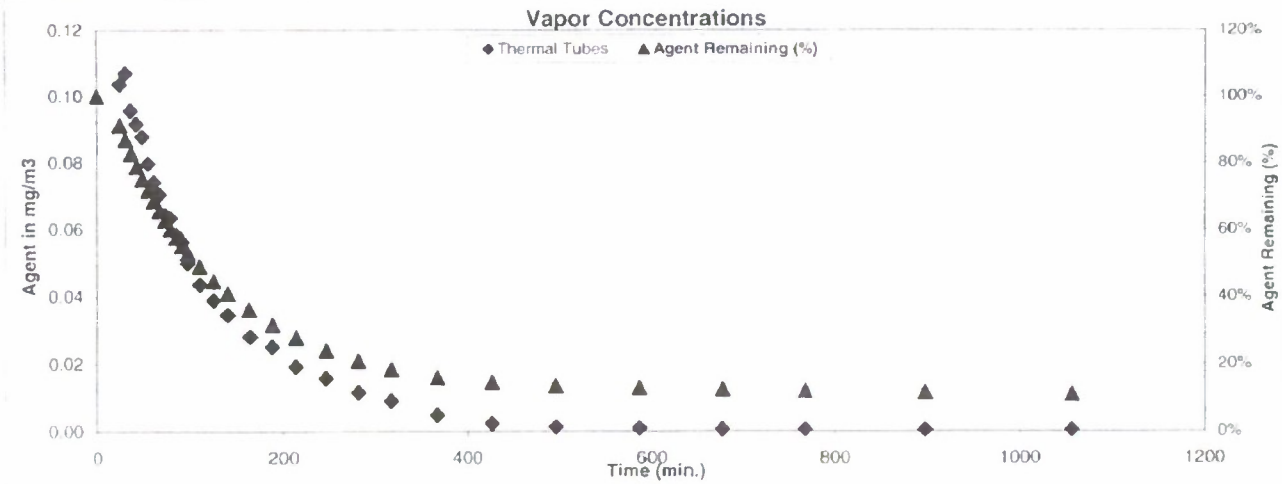


Time (min)	Conc. mg/m³	HD rem. (%)
2.38	7.71E-02	98.32%
4.97	7.95E-02	94.61%
7.57	8.96E-02	90.59%
10.15	7.90E-02	86.60%
12.73	8.17E-02	82.80%
15.32	8.39E-02	78.88%
17.90	7.34E-02	75.16%
20.48	6.66E-02	71.85%
23.07	7.33E-02	68.54%
25.67	7.09E-02	65.10%
29.50	6.33E-02	60.39%
34.58	5.21E-02	55.02%
39.67	4.73E-02	50.39%
44.75	4.53E-02	46.08%
52.33	3.76E-02	40.32%
62.43	3.52E-02	33.59%
72.52	2.92E-02	27.64%
87.60	1.98E-02	20.87%
107.70	1.32E-02	14.79%
127.78	8.87E-03	10.73%
147.87	5.20E-03	8.15%
177.95	2.42E-03	6.05%
218.03	1.16E-03	4.73%
268.12	7.95E-04	3.84%
328.22	6.00E-04	3.07%
388.30	4.86E-04	2.48%
478.38	3.90E-04	1.75%
598.47	2.76E-04	1.02%
718.55	2.30E-04	0.46%
838.63	1.79E-04	0.02%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060228_3c_95.xls

Data Evaluation Grade: **Test Grade (requires further evaluation)**

Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Experiment #:	02/28/06	95			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		78.2%		
Number of drops:	1				
Nominal drop volume:	6	µL			
Mass of agent disseminated:	7.62	mg	Data Evaluation		
Corrected mass on 100% agent purity:	5.96	mg	SD	%SD	Status
Average substrate temperature:	34.66	°C	0.3	0.80%	Go
Average air temperature above drop:	34.82	°C	0.1	0.34%	Go
Average air flow rate:	403.90	SLPM	6.6	1.63%	Flag
Test section air flow speed:	3.27	m/s	-	-	Go
Crude Evap Rate:	33.7	ug/min			
Mass % recovery in vapor:	89.0	%			
Mass % recovery by extraction:	n/a	%			
Total agent % mass recovery:	89.0	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				



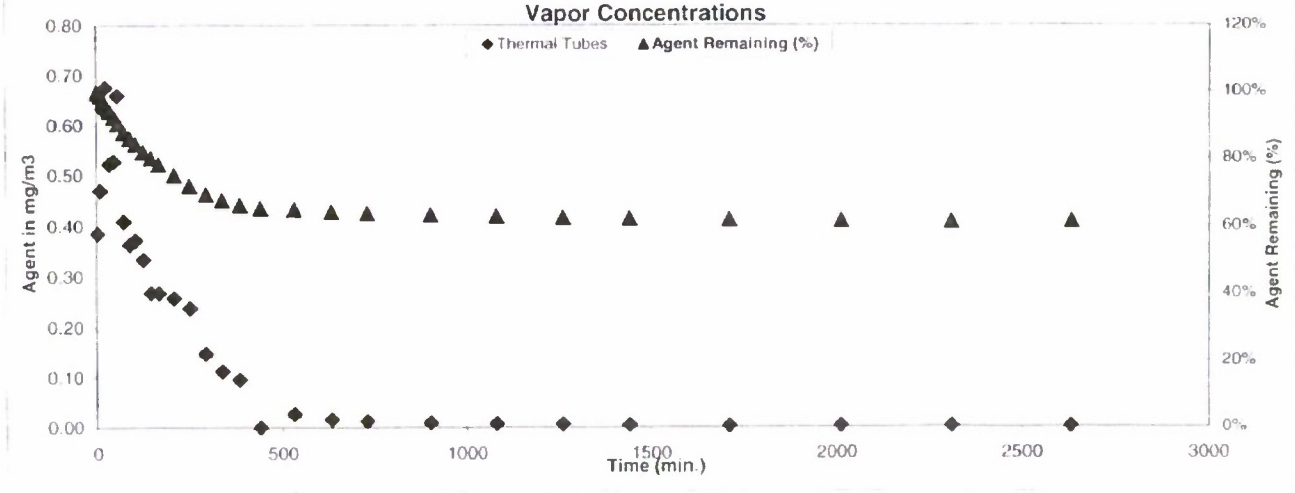
Time (min)	Conc. mg/m³	HD rem. (%)
24.85	1.04E-01	91.27%
30.93	1.07E-01	86.93%
37.03	9.57E-02	82.75%
43.12	9.17E-02	78.88%
49.20	8.78E-02	75.18%
55.28	7.97E-02	71.73%
61.37	7.42E-02	68.56%
67.47	7.05E-02	65.57%
73.55	6.43E-02	62.79%
79.63	6.35E-02	60.15%
85.72	5.85E-02	57.64%
91.80	5.62E-02	55.28%
97.88	5.00E-02	53.09%
110.95	4.36E-02	48.94%
126.03	3.89E-02	44.72%
141.10	3.46E-02	40.97%
163.67	2.81E-02	36.18%
188.75	2.51E-02	31.66%
213.82	1.93E-02	27.89%
246.38	1.58E-02	24.02%
281.45	1.15E-02	20.77%
316.52	9.17E-03	18.32%
366.60	4.81E-03	15.94%
426.67	2.34E-03	14.49%
496.73	1.36E-03	13.61%
586.80	9.23E-04	12.91%
676.88	7.14E-04	12.41%
766.95	5.99E-04	12.01%
897.02	4.76E-04	11.54%
1057.08	4.37E-04	11.04%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Suk undelivered\20060310_3a_93.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3a		
Instruments:	VTS#2/GCMSD		
Date/Expenment #:	03/10/06	93	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	78.2%	
Number of drops:	1		
Nominal drop volume:	6 µL		
Mass of agent disseminated:	7.62 mg		
Corrected mass on 100% agent purity:	5.96 mg		
Average substrate temperature:	34.51 °C		
Average air temperature above drop:	34.64 °C		
Average air flow rate:	18.12 SLPM		
Test section air flow speed:	0.22 m/s		
Crude Evap Rate:	9.9 ug/min		
Mass % recovery in vapor:	38.6 %		
Mass % recovery by extraction:	n/a %		
Total agent % mass recovery:	38.6 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.3	0.74%	Go
0.3	0.95%	Go
0.1	0.52%	Go
-	-	Go

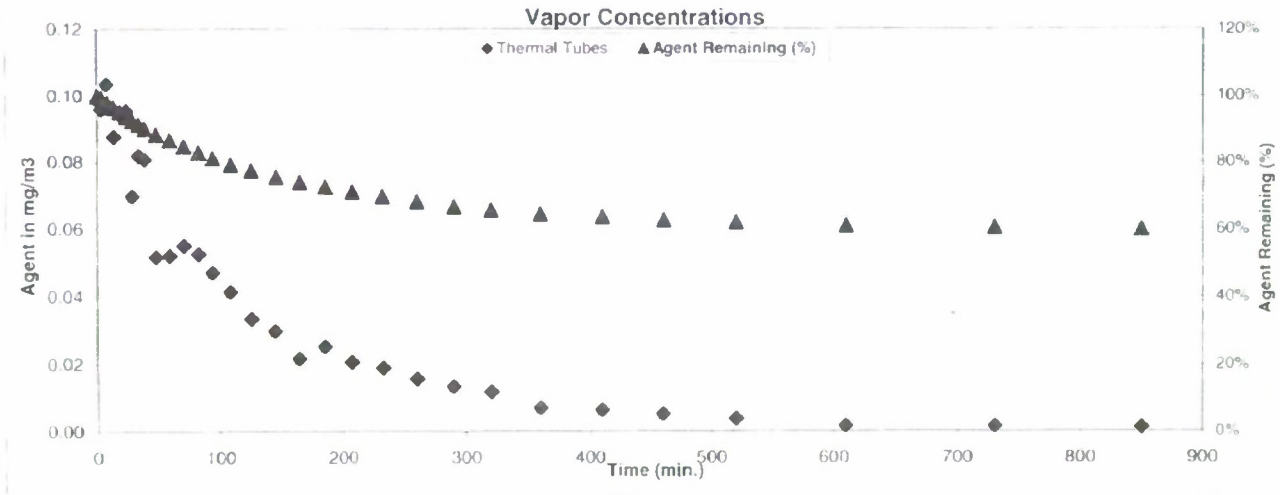


Time (min)	Conc. mg/m³	HD rem. (%)
1.79	3.86E-01	99.89%
9.22	4.70E-01	98.93%
16.69	6.33E-01	97.68%
24.16	6.76E-01	96.19%
34.96	5.22E-01	94.22%
45.76	5.27E-01	92.50%
56.56	6.59E-01	90.55%
72.36	4.10E-01	87.98%
88.16	3.64E-01	86.12%
103.96	3.73E-01	84.35%
124.68	3.35E-01	82.10%
146.18	2.69E-01	80.15%
167.73	2.68E-01	78.39%
209.53	2.57E-01	75.05%
251.58	2.38E-01	71.88%
294.13	1.48E-01	69.38%
338.18	1.12E-01	67.64%
385.73	9.53E-02	66.14%
440.78	2.20E-04	65.34%
530.83	2.66E-02	64.97%
630.88	1.59E-02	64.32%
730.93	1.24E-02	63.89%
900.98	8.90E-03	63.34%
1081.03	7.39E-03	62.89%
1261.08	6.14E-03	62.52%
1441.13	4.24E-03	62.24%
1711.18	2.63E-03	61.96%
2011.23	2.30E-03	61.73%
2311.28	1.50E-03	61.56%
2631.33	1.18E-03	61.43%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Ssaudi undelivered\20060802_3c_154.xls

Data Evaluation Grade: Test Grade (requires further evaluation)

Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Experiment #:	08/02/06	154			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		78.2%		
Number of drops:	1				
Nominal drop volume:	6 µL				
Mass of agent disseminated:	7.75 mg		Data Evaluation		
Corrected mass on 100% agent purity:	6.06 mg		SD	%SD	Status
Average substrate temperature:	35.29 °C		0.2	0.62%	Go
Average air temperature above drop:	35.46 °C		0.1	0.31%	Go
Average air flow rate:	181.11 SLPM		5.9	3.24%	Flag
Test section air flow speed:	1.72 m/s		-	-	Go
Crude Evap Rate:	15.0 ug/min				
Mass % recovery in vapor:	40.1 %				
Mass % recovery by extraction:	n/a %				
Total agent % mass recovery:	40.1 %				
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				

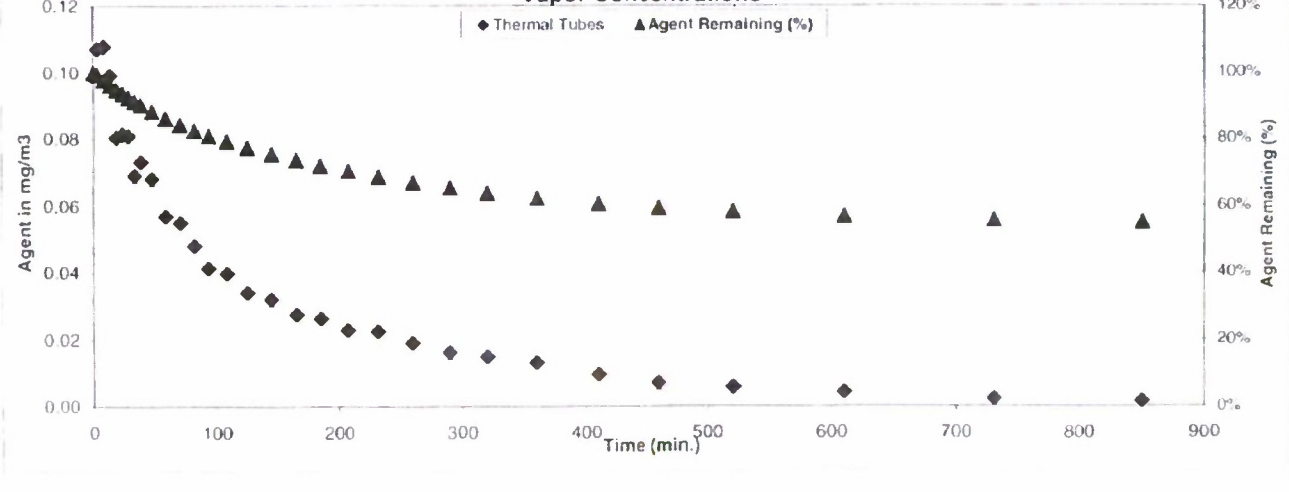


Time (min)	Conc. mg/m^3	HD rem. (%)
3.13	9.60E-02	99.55%
8.18	1.04E-01	98.04%
13.23	8.76E-02	96.60%
18.27	9.44E-02	95.23%
23.32	9.55E-02	93.80%
28.37	6.96E-02	92.55%
33.42	8.19E-02	91.41%
38.47	8.07E-02	90.18%
47.77	5.17E-02	88.34%
58.98	5.21E-02	86.60%
70.45	5.51E-02	84.76%
82.17	5.26E-02	82.88%
93.88	4.70E-02	81.13%
108.93	4.15E-02	79.14%
125.65	3.33E-02	77.28%
144.87	2.97E-02	75.47%
164.92	2.15E-02	73.93%
184.97	2.52E-02	72.53%
207.52	2.08E-02	70.98%
232.57	1.91E-02	69.49%
260.12	1.57E-02	68.06%
290.17	1.34E-02	66.75%
320.22	1.18E-02	65.62%
360.27	7.11E-03	64.49%
410.32	6.50E-03	63.48%
460.37	5.15E-03	62.60%
520.42	3.81E-03	61.80%
610.47	1.85E-03	61.04%
730.52	1.60E-03	60.42%
850.57	1.22E-03	59.91%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Ssaudi undelivered\20060802_3a_112.xls

Data Evaluation Grade: **Test Grade (requires further evaluation)**

Tunnel:	3a				
Instruments:	VTS#2/GCMSD				
Date/Experiment #:	08/02/06	112			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		78.2%		
Number of drops:	1				
Nominal drop volume:	6	µL			
Mass of agent disseminated:	7.75	mg	Data Evaluation		
Corrected mass on 100% agent purity:	6.06	mg	SD	%SD	Status
Average substrate temperature:	34.67	°C	0.2	0.62%	Go
Average air temperature above drop:	34.84	°C	0.2	0.54%	Go
Average air flow rate:	181.44	SLPM	8.7	4.82%	Flag
Test section air flow speed:	1.72	m/s	-	-	Go
Crude Evap Rate:	14.5	ug/min			
Mass % recovery in vapor:	44.9	%			
Mass % recovery by extraction:	n/a	%			
Total agent % mass recovery:	44.9	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				

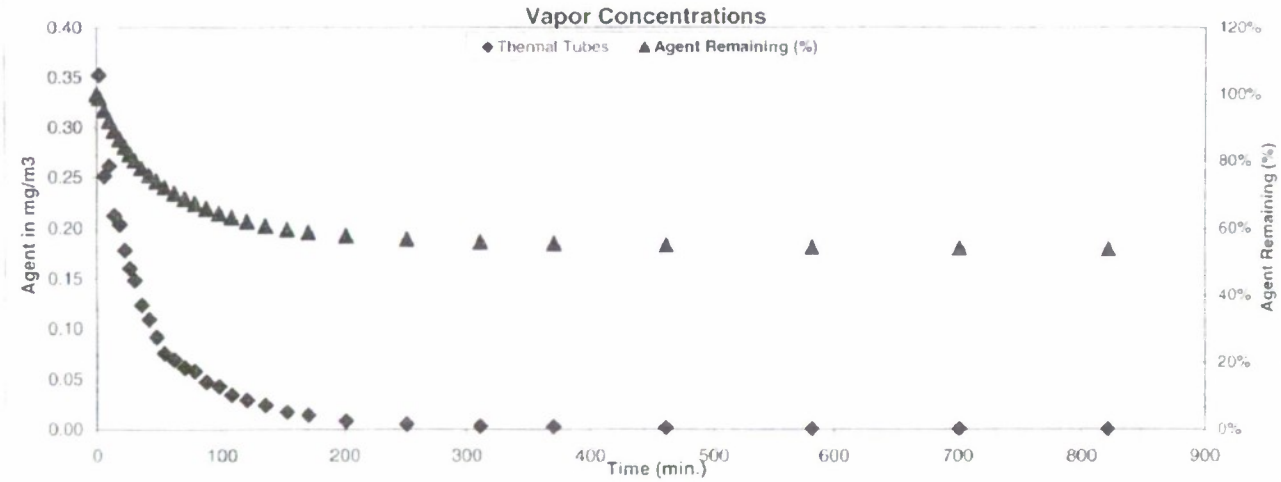


Time (min)	Conc. mg/m^3	HD rem. (%)
3.28	1.07E-01	99.47%
8.33	1.08E-01	97.85%
13.38	9.92E-02	96.28%
18.43	8.04E-02	94.92%
23.48	8.14E-02	93.70%
28.52	8.09E-02	92.48%
33.57	6.91E-02	91.34%
38.62	7.31E-02	90.27%
47.92	6.82E-02	88.30%
59.13	5.70E-02	86.20%
70.60	5.51E-02	84.27%
82.32	4.81E-02	82.46%
94.03	4.12E-02	80.89%
109.08	3.97E-02	79.07%
125.78	3.40E-02	77.22%
145.02	3.19E-02	75.33%
165.07	2.74E-02	73.55%
185.12	2.63E-02	71.93%
207.65	2.27E-02	70.28%
232.70	2.22E-02	68.59%
260.25	1.89E-02	66.90%
290.30	1.61E-02	65.32%
320.35	1.48E-02	63.93%
360.40	1.32E-02	62.25%
410.45	9.50E-03	60.55%
460.50	7.00E-03	59.32%
520.55	5.75E-03	58.17%
610.58	4.04E-03	56.85%
730.63	2.21E-03	55.73%
850.68	1.42E-03	55.07%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Ssaudi undelivered\20060419_3c_118.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Experiment #:	04/19/06	118			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		78.2%		
Number of drops:	1				
Nominal drop volume:	6 µL				
Mass of agent disseminated:	7.62 mg		Data Evaluation		
Corrected mass on 100% agent purity:	5.96 mg		SD	%SD	Status
Average substrate temperature:	50.35 °C		0.3	0.68%	Go
Average air temperature above drop:	50.37 °C		0.3	0.64%	Go
Average air flow rate:	181.81 SLPM		1.5	0.83%	Go
Test section air flow speed:	1.53 m/s		-	-	Go
Crude Evap Rate:	40.6 ug/min				
Mass % recovery in vapor:	46.0 %				
Mass % recovery by extraction:	n/a %				
Total agent % mass recovery:	46.0 %				
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				

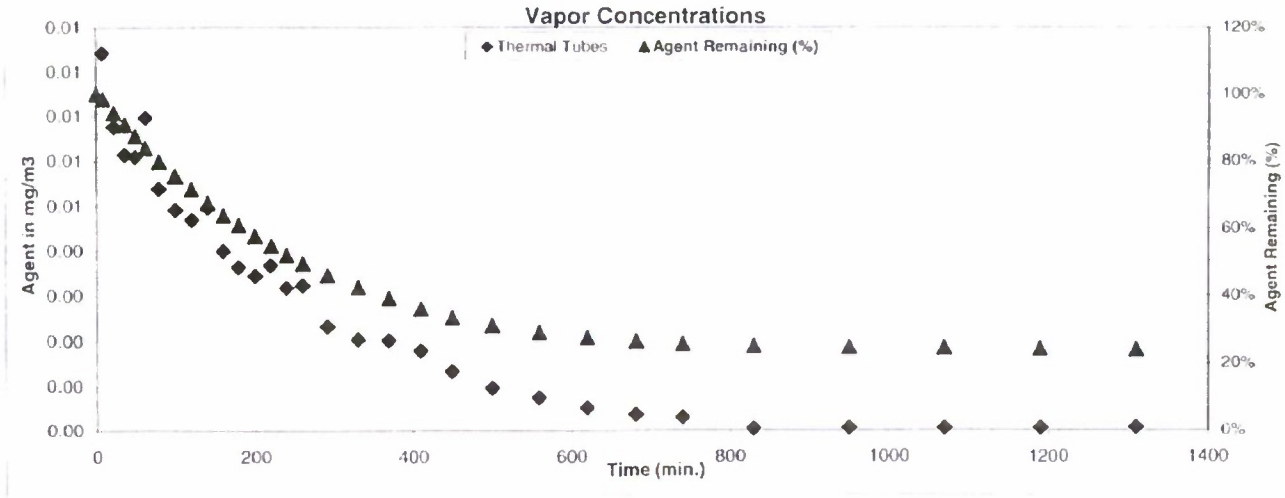


Time (min)	Conc. mg/m³	HD rem. (%)
1.95	3.53E-01	98.95%
6.00	2.51E-01	95.22%
10.05	2.61E-01	92.05%
14.10	2.13E-01	89.13%
18.15	2.04E-01	86.55%
22.20	1.79E-01	84.19%
26.25	1.60E-01	82.09%
30.30	1.49E-01	80.18%
35.85	1.24E-01	77.88%
41.90	1.09E-01	75.73%
47.95	9.17E-02	73.87%
54.48	7.59E-02	72.21%
62.53	6.95E-02	70.42%
70.58	6.14E-02	68.81%
78.80	5.79E-02	67.32%
88.03	4.73E-02	65.83%
98.08	4.29E-02	64.45%
108.13	3.44E-02	63.27%
120.68	2.92E-02	62.05%
135.73	2.41E-02	60.82%
153.28	1.72E-02	59.72%
170.85	1.41E-02	58.88%
200.92	8.32E-03	57.85%
250.98	5.09E-03	56.83%
311.03	3.24E-03	56.06%
371.10	2.33E-03	55.55%
461.17	1.59E-03	55.01%
581.23	9.79E-04	54.54%
701.30	7.39E-04	54.23%
821.37	5.26E-04	54.00%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Ssaudi undelivered\20060411_3d_54.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3d					
Instruments:	VTS#3/GCMSD					
Date/Experiment #:	04/11/06	54				
Type of substrate :	Sand		Purity			
Test agent/purity:	H		78.2%			
Number of drops:	1					
Nominal drop volume:	1	µL				
Mass of agent disseminated:	1.27	mg	Data Evaluation			
Corrected mass on 100% agent purity:	0.99	mg	SD	%SD	Status	
Average substrate temperature:	14.94	°C	0.4	2.87%	Go	
Average air temperature above drop:	14.98	°C	0.4	2.35%	Go	
Average air flow rate:	405.29	SLPM	0.5	0.13%	Go	
Test section air flow speed:	3.14	m/s	-	-	Go	
Crude Evap Rate:	2.3	ug/min				
Mass % recovery in vapor:	75.8	%				
Mass % recovery by extraction:	n/a	%				
Total agent % mass recovery:	75.8	%				
Tube #s consistant:	Yes					
Daily CCV < +/- 15%:	Yes					
Comments:	n/a					



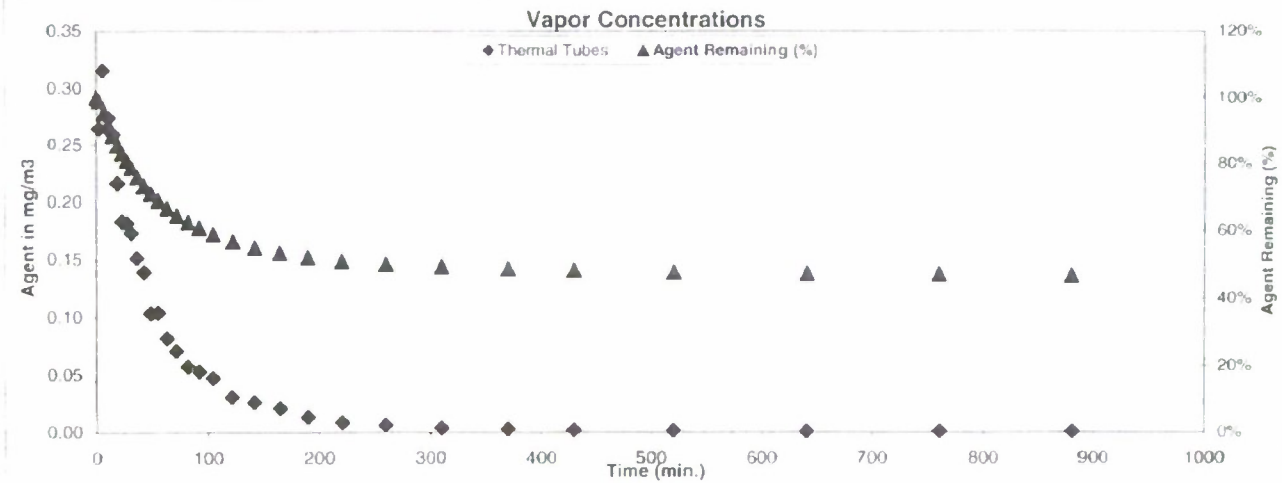
Time (min)	Conc. mg/m³	HD rem. (%)
8.38	8.43E-03	98.56%
21.78	6.77E-03	94.40%
35.18	6.14E-03	90.87%
48.58	6.09E-03	87.53%
61.96	6.96E-03	83.96%
78.70	5.37E-03	79.75%
98.77	4.92E-03	75.54%
118.83	4.70E-03	71.61%
138.90	4.97E-03	67.65%
158.97	4.00E-03	63.97%
179.03	3.64E-03	60.84%
199.10	3.45E-03	57.94%
219.15	3.68E-03	55.02%
239.22	3.18E-03	52.21%
259.28	3.23E-03	49.58%
289.35	2.33E-03	46.17%
329.42	2.04E-03	42.60%
369.48	2.01E-03	39.30%
409.55	1.79E-03	36.19%
449.62	1.33E-03	33.64%
499.68	9.58E-04	31.30%
559.75	7.30E-04	29.23%
619.82	5.11E-04	27.71%
679.87	3.51E-04	26.65%
739.93	2.88E-04	25.87%
830.00	5.17E-05	25.24%
950.07	5.47E-05	24.98%
1070.13	5.51E-05	24.71%
1190.20	5.72E-05	24.44%
1310.27	5.76E-05	24.16%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Ssaudi undelivered\20060411_3c_116.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3c		
Instruments:	VTS#1/GCMSD		
Date/Experiment #:	04/11/06 116		
Type of substrate:	Sand	Purity	
Test agent/purity:	H	78.2%	
Number of drops:	1		
Nominal drop volume:	6 µL		
Mass of agent disseminated:	7.62 mg		
Corrected mass on 100% agent purity:	5.96 mg		
Average substrate temperature:	49.68 °C		
Average air temperature above drop:	50.13 °C		
Average air flow rate:	181.80 SLPM		
Test section air flow speed:	1.53 m/s		
Crude Evap Rate:	45.5 ug/min		
Mass % recovery in vapor:	53.2 %		
Mass % recovery by extraction:	n/a %		
Total agent % mass recovery:	53.2 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.2	0.34%	Go
0.2	0.45%	Go
0.9	0.52%	Go
-	-	Go



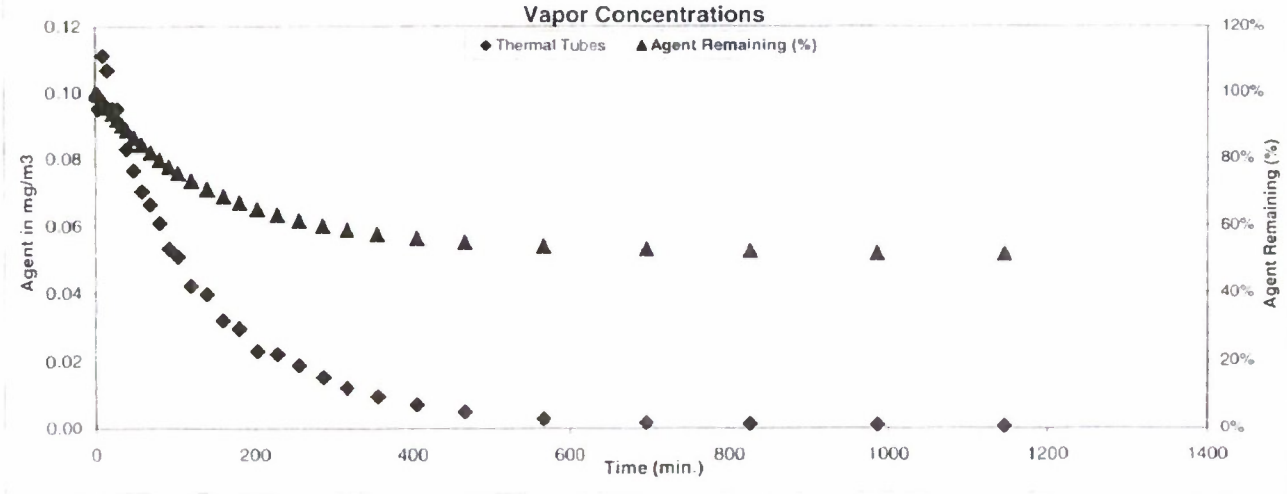
Time (min)	Conc. mg/m³	HD rem. (%)
2.52	2.64E-01	98.98%
6.57	3.15E-01	95.40%
10.62	2.74E-01	91.76%
14.65	2.59E-01	88.48%
18.70	2.16E-01	85.55%
22.75	1.83E-01	83.08%
26.80	1.81E-01	80.83%
30.85	1.73E-01	78.64%
36.40	1.51E-01	75.90%
42.45	1.39E-01	73.23%
48.50	1.03E-01	70.99%
55.05	1.04E-01	68.92%
63.10	8.22E-02	66.63%
72.15	7.06E-02	64.52%
82.20	5.73E-02	62.56%
92.27	5.32E-02	60.86%
104.80	4.76E-02	58.94%
122.35	3.09E-02	56.83%
142.40	2.62E-02	55.09%
164.95	2.10E-02	53.47%
190.00	1.35E-02	52.14%
220.07	8.49E-03	51.13%
260.13	6.45E-03	50.22%
310.20	3.78E-03	49.44%
370.27	3.20E-03	48.80%
430.33	2.14E-03	48.31%
520.40	1.39E-03	47.83%
640.47	1.11E-03	47.37%
760.53	6.95E-04	47.04%
880.60	5.37E-04	46.81%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Ssaudi undelivered\20060407_3c_114v.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3c		
Instruments:	VTS#1/GCMSD		
Date/Experiment #:	04/07/06	114	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	78.2%	
Number of drops:	1		
Nominal drop volume:	6 µL		
Mass of agent disseminated:	7.62 mg		
Corrected mass on 100% agent purity:	5.96 mg		
Average substrate temperature:	35.09 °C		
Average air temperature above drop:	34.88 °C		
Average air flow rate:	181.80 SLPM		
Test section air flow speed:	1.51 m/s		
Crude Evap Rate:	16.2 ug/min		
Mass % recovery in vapor:	48.5 %		
Mass % recovery by extraction:	n/a %		
Total agent % mass recovery:	48.5 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation			
SD	%SD	Status	
0.3	0.77%	Go	
0.1	0.37%	Go	
0.9	0.52%	Go	
-	-	Go	

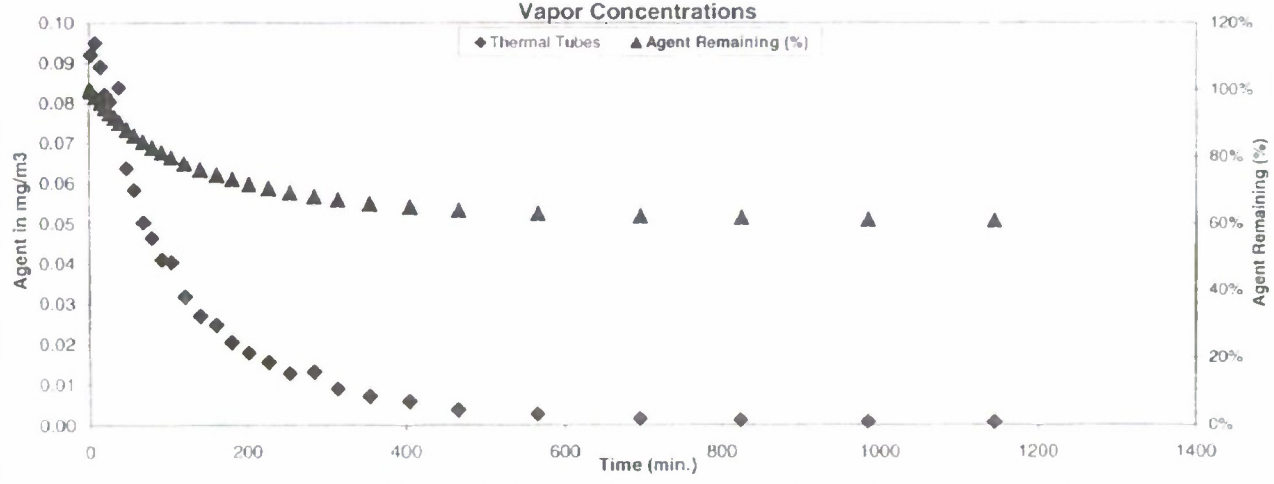


Time (min)	Conc. mg/m³	HD rem. (%)
3.28	9.52E-02	99.52%
9.33	1.11E-01	97.62%
15.38	1.07E-01	95.61%
21.43	9.51E-02	93.74%
27.48	9.50E-02	91.99%
33.53	8.98E-02	90.28%
39.58	8.29E-02	88.69%
48.88	7.66E-02	86.43%
58.43	7.02E-02	84.29%
69.90	6.65E-02	81.90%
81.62	6.09E-02	79.62%
93.33	5.32E-02	77.58%
105.05	5.08E-02	75.73%
121.77	4.21E-02	73.36%
140.98	3.96E-02	70.96%
161.03	3.20E-02	68.77%
181.08	2.96E-02	66.89%
203.63	2.30E-02	65.08%
228.68	2.21E-02	63.36%
256.23	1.87E-02	61.65%
286.28	1.53E-02	60.09%
316.33	1.21E-02	58.83%
356.37	9.53E-03	57.51%
406.42	7.16E-03	56.24%
466.47	5.02E-03	55.12%
566.52	2.83E-03	53.93%
696.57	1.71E-03	53.02%
826.62	1.26E-03	52.43%
986.67	9.30E-04	51.90%
1146.72	7.62E-04	51.49%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Ssaudi undelivered\20060406_3c_113v.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Experiment #:	04/06/06	113			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		78.2%		
Number of drops:	1				
Nominal drop volume:	6 µL				
Mass of agent disseminated:	7.62 mg		Data Evaluation		
Corrected mass on 100% agent purity:	5.96 mg		SD	%SD	Status
Average substrate temperature:	34.74 °C		0.1	0.27%	Go
Average air temperature above drop:	34.76 °C		0.1	0.30%	Go
Average air flow rate:	181.81 SLPM		0.6	0.34%	Go
Test section air flow speed:	1.51 m/s		-	-	Go
Crude Evap Rate:	14.1 ug/min				
Mass % recovery in vapor:	39.0 %				
Mass % recovery by extraction:	n/a %				
Total agent % mass recovery:	39.0 %				
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				

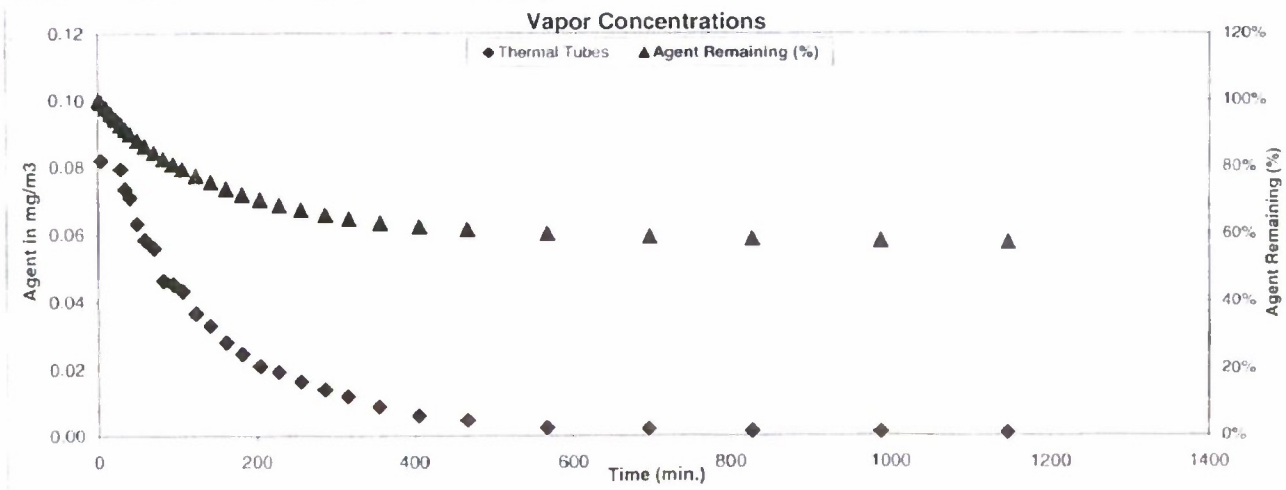


Time (min)	Conc. mg/m³	HD rem. (%)
2.08	9.21E-02	99.71%
8.13	9.51E-02	97.98%
14.18	8.91E-02	96.28%
20.23	8.22E-02	94.70%
26.28	8.04E-02	93.20%
32.33	7.60E-02	91.76%
38.38	8.40E-02	90.28%
47.68	6.37E-02	88.19%
57.23	5.84E-02	86.41%
68.70	5.03E-02	84.51%
80.42	4.65E-02	82.78%
92.13	4.11E-02	81.21%
103.85	4.04E-02	79.75%
120.57	3.19E-02	77.91%
139.78	2.70E-02	76.18%
159.83	2.48E-02	74.60%
179.88	2.06E-02	73.21%
202.45	1.79E-02	71.88%
227.50	1.56E-02	70.60%
255.05	1.26E-02	69.42%
285.10	1.32E-02	68.23%
315.15	9.11E-03	67.21%
355.20	7.33E-03	66.20%
405.25	5.85E-03	65.20%
465.30	3.79E-03	64.32%
565.35	2.72E-03	63.32%
695.40	1.59E-03	62.47%
825.45	1.20E-03	61.91%
985.50	8.77E-04	61.41%
1145.55	8.02E-04	61.00%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Ssaudi undelivered\20060405_3c_112v.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3c					
Instruments:	VTS#1/GCMSD					
Date/Expenment #:	04/05/06	112				
Type of substrate:	Sand		Purity			
Test agent/purity:	H		78.2%			
Number of drops:	1					
Nominal drop volume:	6	µL				
Mass of agent disseminated:	7.62	mg		Data Evaluation		
Corrected mass on 100% agent purity:	5.96	mg		SD	%SD	Status
Average substrate temperature:	35.10	°C		0.1	0.24%	Go
Average air temperature above drop:	34.81	°C		0.1	0.25%	Go
Average air flow rate:	181.79	SLPM		1.5	0.83%	Go
Test section air flow speed:	1.51	m/s		-	-	Go
Crude Evap Rate:	14.0	ug/min				
Mass % recovery in vapor:	42.3	%				
Mass % recovery by extraction:	n/a	%				
Total agent % mass recovery:	42.3	%				
Tube #s consistant:	Yes					
Daily CCV < +/- 15%:	Yes					
Comments:	n/a					

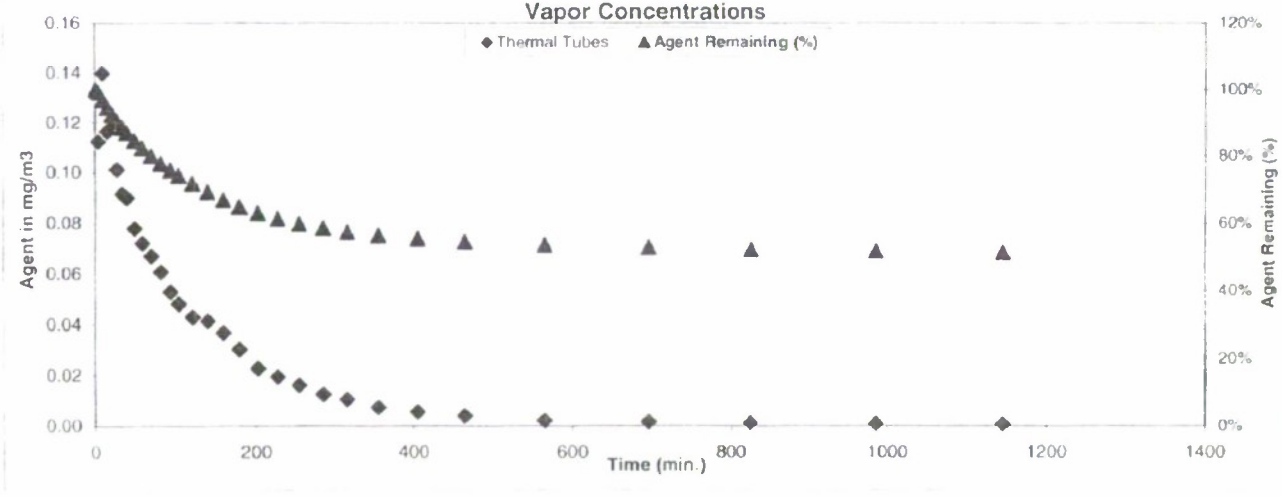


Time (min)	Conc. mg/m^3	HD rem. (%)
3.85	8.20E-02	99.52%
9.88	9.66E-02	97.88%
15.93	9.44E-02	96.11%
21.98	9.42E-02	94.37%
28.03	7.93E-02	92.77%
34.08	7.33E-02	91.36%
40.13	7.09E-02	90.03%
49.43	6.32E-02	88.13%
58.98	5.85E-02	86.35%
70.45	5.60E-02	84.35%
82.17	4.64E-02	82.52%
93.88	4.53E-02	80.88%
105.60	4.33E-02	79.30%
122.32	3.67E-02	77.26%
141.53	3.30E-02	75.22%
161.58	2.81E-02	73.35%
181.63	2.45E-02	71.74%
204.18	2.09E-02	70.18%
229.23	1.90E-02	68.65%
256.78	1.63E-02	67.17%
286.83	1.39E-02	65.79%
316.88	1.17E-02	64.62%
356.93	8.75E-03	63.37%
406.98	6.03E-03	62.24%
467.03	4.63E-03	61.26%
567.08	2.44E-03	60.18%
697.13	1.98E-03	59.31%
827.18	1.28E-03	58.66%
987.23	9.89E-04	58.11%
1147.28	7.84E-04	57.67%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Ssaudi undelivered\20060403_3c_110v.xls

Data Evaluation Grade: **Modeling Grade**

Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Experiment #:	04/03/06	110			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		78.2%		
Number of drops:	1				
Nominal drop volume:	6 µL				
Mass of agent disseminated:	7.62	mg			
Corrected mass on 100% agent purity:	5.96	mg	Data Evaluation		
Average substrate temperature:	34.77	°C	SD	%SD	Status
Average air temperature above drop:	34.90	°C	0.4	1.17%	Go
Average air flow rate:	181.79	SLPM	0.2	0.44%	Go
Test section air flow speed:	1.51	m/s	1.4	0.79%	Go
Crude Evap Rate:	17.7	ug/min	-	-	Go
Mass % recovery in vapor:	48.6	%			
Mass % recovery by extraction:	n/a	%			
Total agent % mass recovery:	48.6	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				



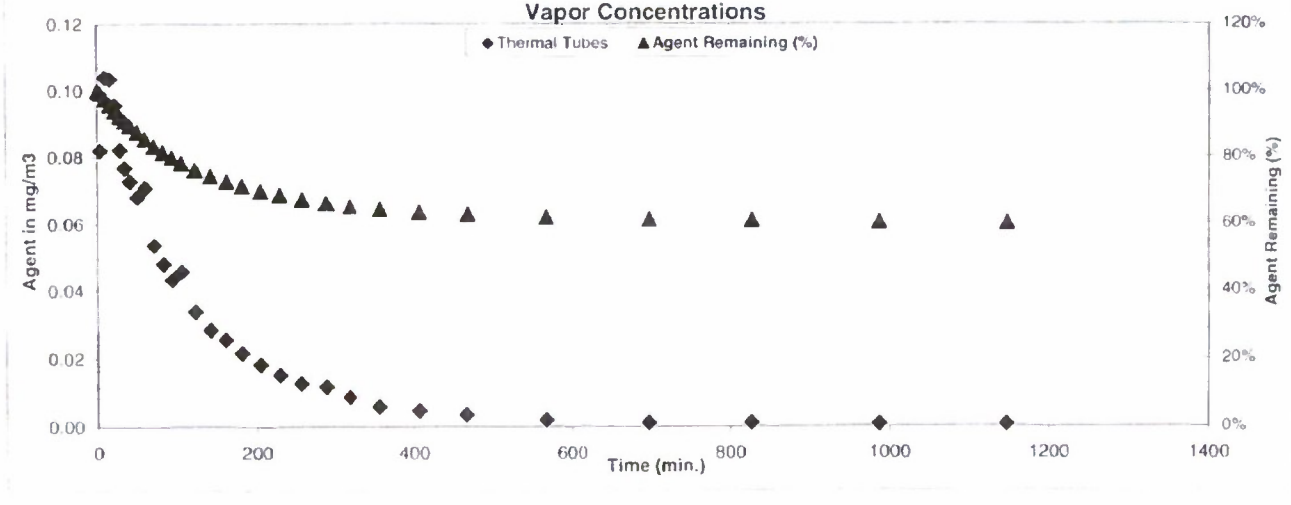
Time (min)	Conc. mg/m³	HD rem. (%)
3.58	1.12E-01	99.39%
9.63	1.40E-01	97.06%
15.68	1.16E-01	94.69%
21.73	1.21E-01	92.50%
27.78	1.01E-01	90.45%
33.83	9.16E-02	88.67%
39.88	9.01E-02	86.99%
49.18	7.80E-02	84.61%
58.73	7.21E-02	82.42%
70.18	6.70E-02	79.99%
81.92	6.08E-02	77.71%
93.62	5.29E-02	75.68%
103.67	4.82E-02	74.13%
120.38	4.30E-02	71.80%
139.60	4.15E-02	69.33%
159.67	3.69E-02	66.93%
179.72	3.04E-02	64.87%
202.27	2.29E-02	63.04%
227.32	1.96E-02	61.42%
254.87	1.62E-02	59.91%
284.90	1.26E-02	58.59%
314.95	1.06E-02	57.53%
355.00	7.36E-03	56.44%
405.05	5.55E-03	55.45%
465.10	3.96E-03	54.58%
565.15	2.17E-03	53.64%
695.20	1.61E-03	52.90%
825.25	1.16E-03	52.35%
985.30	9.18E-04	51.84%
1145.35	6.87E-04	51.45%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Ssaudi undelivered\20060330_3c_109v.xls

Data Evaluation Grade: **Test Grade (requires further evaluation)**

Tunnel:	3c		
Instruments:	VTS#1/GCMSD		
Date/Experiment #:	03/30/06	109	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	78.2%	
Number of drops:	1		
Nominal drop volume:	6 µL		
Mass of agent disseminated:	7.62 mg		
Corrected mass on 100% agent purity:	5.96 mg		
Average substrate temperature:	41.15 °C		
Average air temperature above drop:	34.97 °C		
Average air flow rate:	181.80 SLPM		
Test section air flow speed:	1.51 m/s		
Crude Evap Rate:	14.7 ug/min		
Mass % recovery in vapor:	39.8 %		
Mass % recovery by extraction:	n/a %		
Total agent % mass recovery:	39.8 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
4.1	9.90%	Flag
0.1	0.36%	Go
1.8	0.98%	Go
-	-	Go

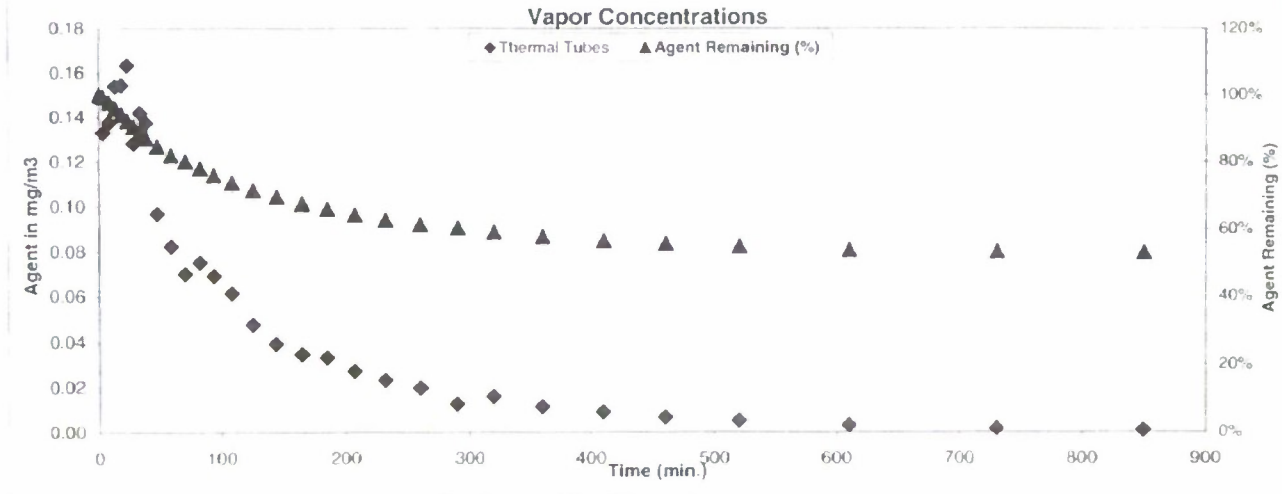


Time (min)	Conc. mg/m^3	HD rem. (%)
3.73	8.20E-02	99.53%
9.78	1.04E-01	97.82%
15.83	1.04E-01	95.90%
21.88	9.58E-02	94.06%
27.93	8.23E-02	92.42%
33.98	7.68E-02	90.95%
40.03	7.28E-02	89.57%
49.33	6.82E-02	87.57%
58.88	7.09E-02	85.54%
70.35	5.36E-02	83.36%
82.07	4.81E-02	81.55%
93.78	4.34E-02	79.91%
105.50	4.58E-02	78.32%
122.21	3.41E-02	76.28%
141.43	2.86E-02	74.44%
161.48	2.57E-02	72.78%
181.53	2.17E-02	71.33%
204.08	1.83E-02	69.96%
229.13	1.53E-02	68.68%
256.68	1.27E-02	67.50%
286.73	1.20E-02	66.36%
316.78	8.78E-03	65.41%
356.83	6.07E-03	64.51%
406.88	4.73E-03	63.68%
466.92	3.54E-03	62.93%
566.97	2.04E-03	62.07%
697.02	1.19E-03	61.43%
827.07	1.08E-03	60.98%
987.12	7.16E-04	60.54%
1147.17	5.68E-04	60.23%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Ssaudi undelivered\20060803_3a_113.xls

Data Evaluation Grade: **Modeling Grade**

Tunnel:	3a				
Instruments:	VTS#2/GCMSD				
Date/Experiment #:	08/03/06 113				
Type of substrate:	Sand	Purity			
Test agent/purity:	HD	97.4%			
Number of drops:	1				
Nominal drop volume:	6 µL				
Mass of agent disseminated:	7.75 mg		Data Evaluation		
Corrected mass on 100% agent purity:	7.54 mg		SD	%SD	Status
Average substrate temperature:	34.21 °C		0.1	0.33%	Go
Average air temperature above drop:	34.71 °C		0.1	0.42%	Go
Average air flow rate:	181.87 SLPM		2.2	1.19%	Go
Test section air flow speed:	1.72 m/s		-	-	Go
Crude Evap Rate:	25.8 ug/min				
Mass % recovery in vapor:	47.1 %				
Mass % recovery by extraction:	n/a %				
Total agent % mass recovery:	47.1 %				
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				



Time (min)	Conc. mg/m^3	HD rem. (%)
3.18	1.33E-01	99.49%
8.23	1.38E-01	97.84%
13.27	1.54E-01	96.08%
18.32	1.54E-01	94.20%
23.37	1.63E-01	92.27%
28.42	1.28E-01	90.49%
33.47	1.42E-01	88.85%
38.52	1.37E-01	87.15%
47.82	9.67E-02	84.53%
59.03	8.25E-02	82.10%
70.50	6.98E-02	80.00%
82.22	7.51E-02	77.95%
93.92	6.91E-02	75.92%
108.97	6.14E-02	73.55%
125.68	4.74E-02	71.36%
144.90	3.92E-02	69.36%
164.95	3.46E-02	67.57%
185.00	3.31E-02	65.94%
207.55	2.71E-02	64.30%
232.60	2.29E-02	62.79%
260.15	1.97E-02	61.38%
290.20	1.24E-02	60.21%
320.25	1.58E-02	59.19%
360.30	1.12E-02	57.89%
410.35	9.10E-03	56.67%
460.38	6.72E-03	55.72%
520.43	5.20E-03	54.85%
610.48	3.11E-03	53.95%
730.53	1.67E-03	53.26%
850.58	7.15E-04	52.92%

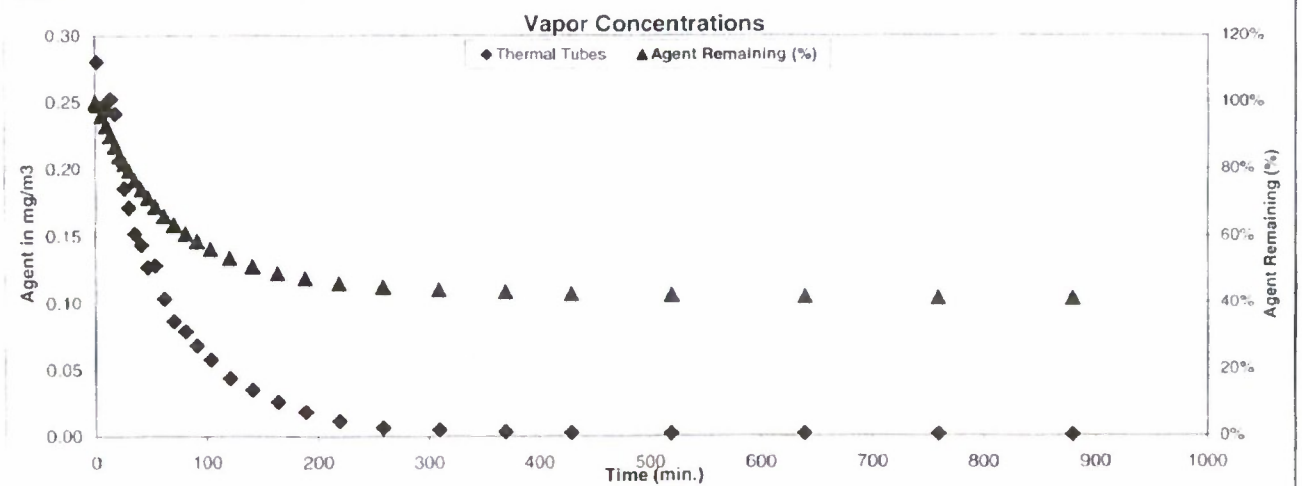
66.2% RH

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Ssaudi undelivered\20060410_3c_115.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3c		
Instruments:	VTS#1/GCMSD		
Date/Experiment #:	04/10/06	115	
Type of substrate:	Sand	Purity	
Test agent/purity:	H	78.2%	
Number of drops:	1		
Nominal drop volume:	6 µL		
Mass of agent disseminated:	7.62 mg		
Corrected mass on 100% agent purity:	5.96 mg		
Average substrate temperature:	49.86 °C		
Average air temperature above drop:	50.42 °C		
Average air flow rate:	181.84 SLPM		
Test section air flow speed:	1.53 m/s		
Crude Evap Rate:	39.0 ug/min		
Mass % recovery in vapor:	58.8 %		
Mass % recovery by extraction:	n/a %		
Total agent % mass recovery:	58.8 %		
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation			
SD	%SD	Status	
0.2	0.40%	Go	
0.2	0.45%	Go	
1.4	0.79%	Go	
-	-	Go	

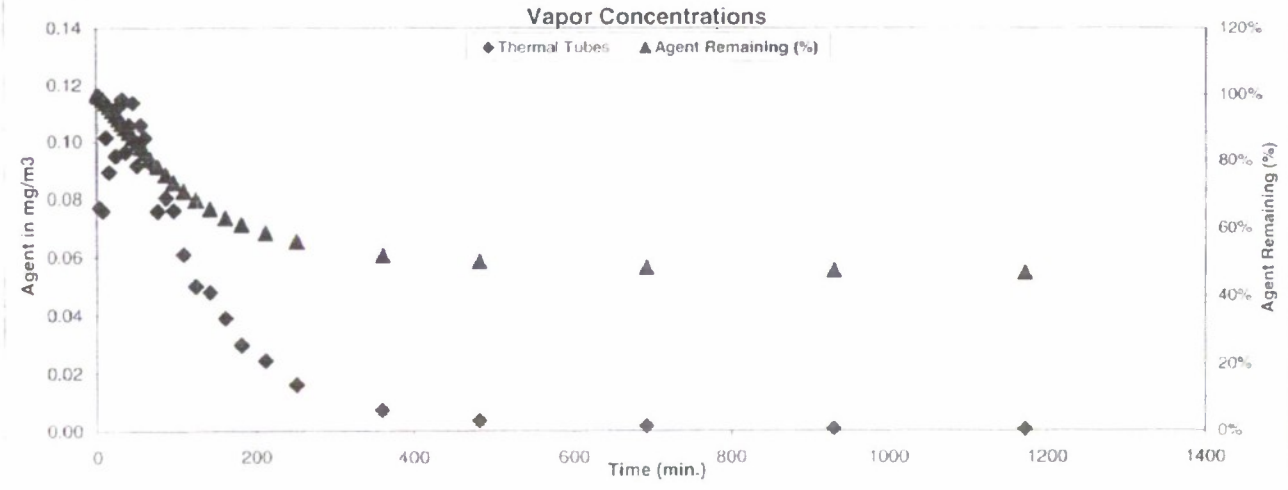


Time (min)	Conc. mg/m^3	HD rem. (%)
1.62	2.80E-01	99.31%
5.67	2.46E-01	96.06%
9.72	2.43E-01	93.03%
13.77	2.53E-01	89.97%
17.82	2.42E-01	86.92%
21.87	2.06E-01	84.15%
25.92	1.86E-01	81.73%
29.97	1.71E-01	79.53%
35.52	1.52E-01	76.79%
41.57	1.44E-01	74.05%
47.62	1.27E-01	71.55%
54.15	1.29E-01	69.00%
62.20	1.04E-01	66.15%
71.25	8.69E-02	63.52%
81.30	7.91E-02	60.98%
91.37	6.80E-02	58.72%
103.92	5.76E-02	56.31%
121.47	4.39E-02	53.59%
141.50	3.51E-02	51.18%
164.05	2.56E-02	49.09%
189.10	1.83E-02	47.41%
219.17	1.14E-02	46.05%
259.23	6.37E-03	44.96%
309.30	4.65E-03	44.12%
369.37	3.30E-03	43.39%
429.43	2.28E-03	42.88%
519.50	1.62E-03	42.34%
639.57	1.07E-03	41.85%
759.63	8.34E-04	41.50%
879.70	6.19E-04	41.23%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Ssw undelivered\20060914_3a_132.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3a				
Instruments:	VTS#2/GCMSD				
Date/Experiment #:	09/14/06	132			
Type of substrate:	SW Sand		Purity		
Test agent/purity:	H		78.2%		
Number of drops:	1				
Nominal drop volume:	6	µL			
Mass of agent disseminated:	7.75	mg	Data Evaluation		
Corrected mass on 100% agent purity:	6.06	mg	SD	%SD	Status
Average substrate temperature:	35.03	°C	0.1	0.31%	Go
Average air temperature above drop:	35.18	°C	0.1	0.38%	Go
Average air flow rate:	181.87	SLPM	1.7	0.91%	Go
Test section air flow speed:	1.72	m/s	-	-	Go
Crude Evap Rate:	17.3	ug/min			
Mass % recovery in vapor:	53.1	%			
Mass % recovery by extraction:	n/a	%			
Total agent % mass recovery:	53.1	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				



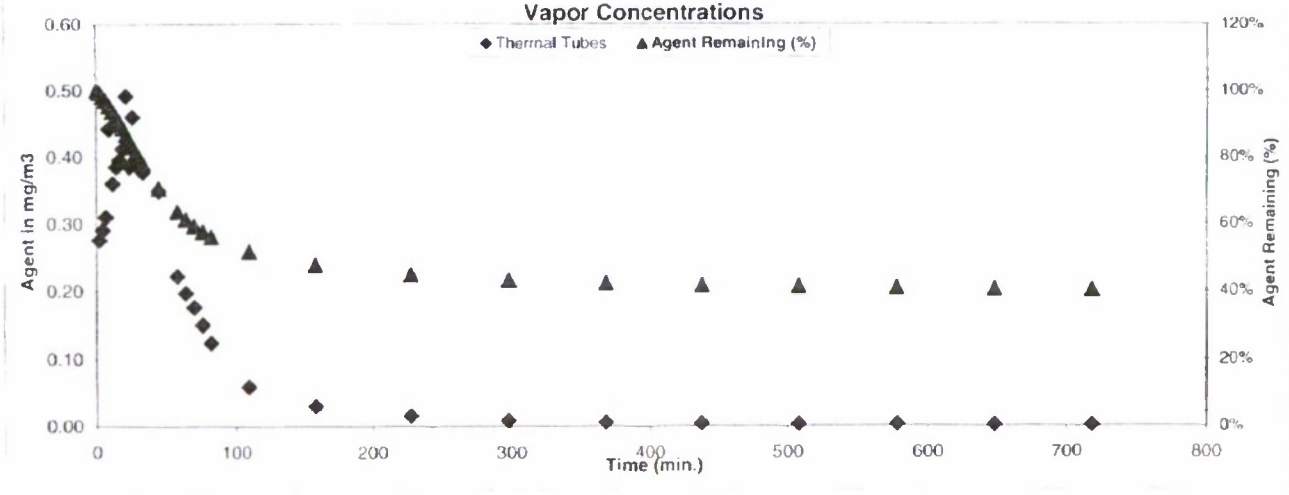
Time (min)	Conc. mg/m³	HD rem. (%)
3.30	7.71E-02	99.62%
7.33	7.60E-02	98.69%
11.38	1.01E-01	97.61%
15.43	8.92E-02	96.45%
19.48	1.11E-01	95.24%
23.53	9.49E-02	93.98%
27.58	1.13E-01	92.72%
31.63	1.15E-01	91.34%
35.93	9.63E-02	89.97%
40.48	1.06E-01	88.59%
45.27	1.14E-01	87.02%
50.32	9.15E-02	85.46%
55.37	1.06E-01	83.96%
60.42	1.01E-01	82.39%
67.13	9.25E-02	80.44%
76.35	7.58E-02	78.11%
86.40	8.04E-02	75.76%
96.45	7.61E-02	73.39%
109.00	6.09E-02	70.81%
124.05	5.01E-02	68.30%
141.60	4.80E-02	65.72%
161.65	3.90E-02	63.10%
181.70	2.99E-02	61.03%
211.73	2.45E-02	58.58%
251.78	1.61E-02	56.13%
361.83	7.45E-03	52.24%
481.88	3.62E-03	50.25%
691.93	1.82E-03	48.53%
931.98	9.48E-04	47.53%
1172.03	6.90E-04	46.94%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Ssw undelivered\20060830_3a_126.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3a		
Instruments:	VTS#2/GCMSD		
Date/Experiment #:	08/30/06	126	
Type of substrate :	SW Sand		Purity
Test agent/purity:	H		78.2%
Number of drops:	1		
Nominal drop volume:	1	µL	
Mass of agent disseminated:	1.29	mg	
Corrected mass on 100% agent purity:	1.01	mg	
Average substrate temperature:	50.36	°C	
Average air temperature above drop:	49.66	°C	
Average air flow rate:	18.04	SLPM	
Test section air flow speed:	0.21	m/s	
Crude Evap Rate:	7.3	ug/min	
Mass % recovery in vapor:	59.6	%	
Mass % recovery by extraction:	n/a	%	
Total agent % mass recovery:	59.6	%	
Tube #s consistant:	Yes		
Daily CCV < +/- 15%:	Yes		
Comments:	n/a		

Data Evaluation		
SD	%SD	Status
0.3	0.67%	Go
0.2	0.39%	Go
0.1	0.75%	Go
-	-	Go

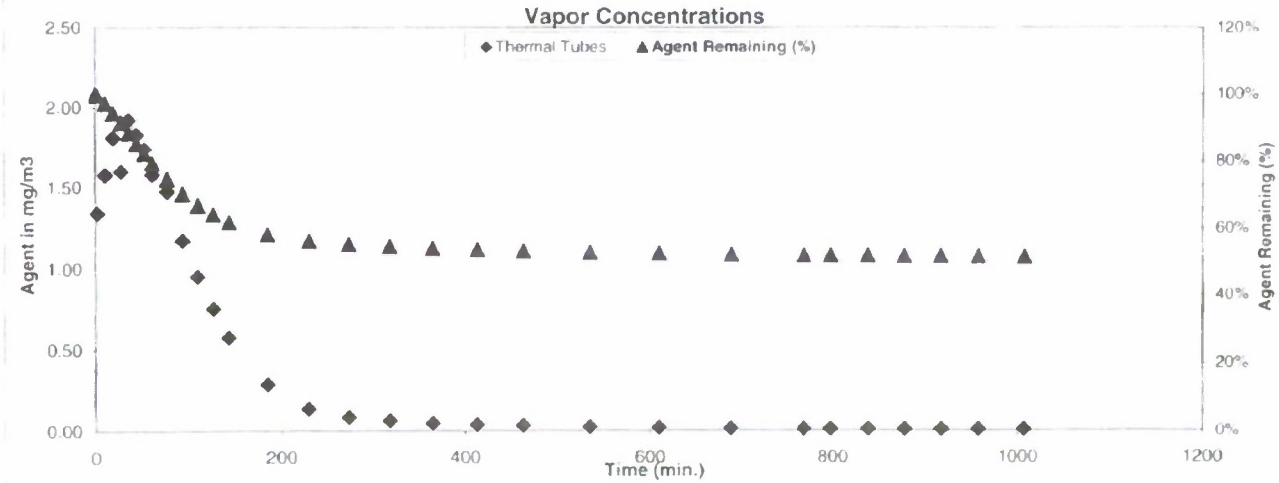


Time (min)	Conc. mg/m^3	HD rem. (%)
1.72	2.76E-01	99.58%
4.08	2.91E-01	98.38%
6.47	3.10E-01	97.10%
8.85	4.42E-01	95.49%
11.24	3.60E-01	93.78%
13.62	3.85E-01	92.20%
16.00	3.95E-01	90.53%
18.38	4.13E-01	88.81%
20.77	4.92E-01	86.89%
23.15	3.85E-01	85.02%
25.52	4.60E-01	83.23%
27.90	3.98E-01	81.40%
30.29	3.84E-01	79.74%
32.67	3.77E-01	78.12%
44.05	3.50E-01	70.72%
57.60	2.22E-01	63.80%
63.65	1.97E-01	61.53%
69.70	1.76E-01	59.51%
75.75	1.50E-01	57.74%
81.80	1.24E-01	56.26%
109.35	5.89E-02	51.76%
157.73	3.04E-02	47.90%
227.78	1.59E-02	44.99%
297.82	9.27E-03	43.42%
367.87	6.21E-03	42.45%
437.92	4.50E-03	41.78%
507.97	3.35E-03	41.29%
578.02	2.42E-03	40.92%
648.07	2.06E-03	40.64%
718.12	1.57E-03	40.42%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Ssw undelivered\20060830_3c_168.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3c				
Instruments:	VTS#1/GCMSD				
Date/Experiment #:	08/30/06	168			
Type of substrate:	SW Sand		Purity		
Test agent/purity:	H		78.2%		
Number of drops:	1				
Nominal drop volume:	9	µL			
Mass of agent disseminated:	11.62	mg	Data Evaluation		
Corrected mass on 100% agent purity:	9.09	mg	SD	%SD	Status
Average substrate temperature:	49.80	°C	0.1	0.20%	Go
Average air temperature above drop:	49.93	°C	0.1	0.27%	Go
Average air flow rate:	18.04	SLPM	0.6	3.19%	Go
Test section air flow speed:	0.21	m/s	-	-	Go
Crude Evap Rate:	31.1	ug/min			
Mass % recovery in vapor:	48.5	%			
Mass % recovery by extraction:	n/a	%			
Total agent % mass recovery:	48.5	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				

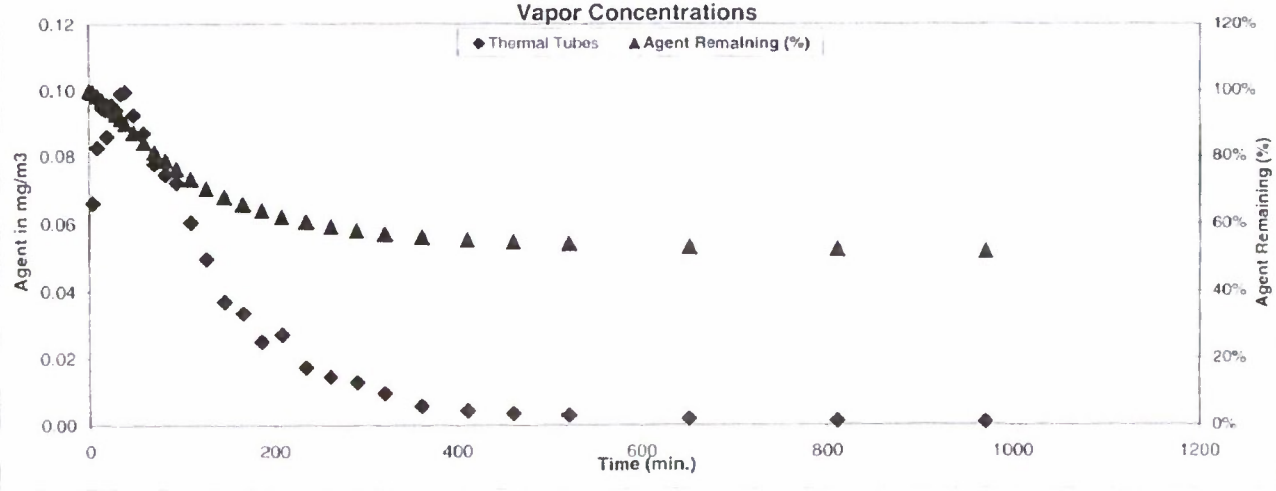


Time (min)	Conc. mg/m³	HD rem. (%)
1.77	1.35E+00	99.76%
10.32	1.58E+00	97.28%
18.87	1.81E+00	94.40%
27.42	1.60E+00	91.50%
35.97	1.92E+00	88.51%
44.52	1.83E+00	85.33%
53.07	1.74E+00	82.30%
61.62	1.58E+00	79.48%
77.67	1.48E+00	74.60%
93.72	1.18E+00	70.37%
109.77	9.52E-01	66.98%
126.32	7.50E-01	64.19%
143.37	5.74E-01	61.95%
185.92	2.90E-01	58.30%
229.97	1.40E-01	56.42%
274.02	8.80E-02	55.42%
318.07	6.57E-02	54.75%
364.78	5.04E-02	54.21%
413.17	4.08E-02	53.78%
462.38	3.59E-02	53.40%
534.93	2.57E-02	52.96%
609.98	2.08E-02	52.61%
687.53	1.75E-02	52.31%
767.58	1.39E-02	52.07%
797.63	1.27E-02	51.99%
837.68	1.20E-02	51.89%
877.73	1.09E-02	51.80%
917.78	9.96E-03	51.71%
957.83	1.00E-02	51.63%
1007.88	8.65E-03	51.54%

G:\AgentFateTech\Wind Tunnel\Processed Data\ECBC report\H Suk\H Ssw undelivered\20060913_3a_131.xls

Data Evaluation Grade: Modeling Grade

Tunnel:	3a				
Instruments:	VTS#2/GCMSD				
Date/Experiment #:	09/13/06	131			
Type of substrate:	Sand		Purity		
Test agent/purity:	H		78.2%		
Number of drops:	1				
Nominal drop volume:	6	µL			
Mass of agent disseminated:	7.75	mg	Data Evaluation		
Corrected mass on 100% agent purity:	6.06	mg	SD	%SD	Status
Average substrate temperature:	35.15	°C	0.1	0.27%	Go
Average air temperature above drop:	35.26	°C	0.2	0.59%	Go
Average air flow rate:	181.80	SLPM	2.2	1.19%	Go
Test section air flow speed:	1.72	m/s	-	-	Go
Crude Evap Rate:	15.6	ug/min			
Mass % recovery in vapor:	48.0	%			
Mass % recovery by extraction:	n/a	%			
Total agent % mass recovery:	48.0	%			
Tube #s consistant:	Yes				
Daily CCV < +/- 15%:	Yes				
Comments:	n/a				



Time (min)	Conc. mg/m^3	HD rem. (%)
3.68	6.61E-02	99.63%
8.73	8.27E-02	98.51%
13.78	9.48E-02	97.16%
18.83	8.60E-02	95.79%
23.88	9.56E-02	94.42%
28.93	9.42E-02	92.98%
33.97	9.90E-02	91.52%
39.02	9.97E-02	90.01%
48.32	9.26E-02	87.33%
59.53	8.71E-02	84.30%
71.00	7.77E-02	81.47%
82.72	7.45E-02	78.79%
94.43	7.22E-02	76.21%
109.48	6.05E-02	73.22%
126.20	4.97E-02	70.45%
145.42	3.73E-02	67.95%
165.47	3.37E-02	65.81%
185.52	2.52E-02	64.04%
208.05	2.72E-02	62.27%
233.10	1.72E-02	60.60%
260.65	1.45E-02	59.29%
290.70	1.28E-02	58.06%
320.75	9.55E-03	57.05%
360.80	5.72E-03	56.13%
410.85	4.42E-03	55.37%
460.90	3.54E-03	54.77%
520.95	2.92E-03	54.19%
650.98	1.86E-03	53.26%
811.03	1.18E-03	52.52%
971.08	8.97E-04	52.02%

APPENDIX C
UK SAND SOIL PROPERTIES AND CHEMICAL ANALYSIS

Table . Soil Properties Relevant to Environmental Fate for Medium-Textured Sand, AFS-50, Warmwell Quarry, UK*

Property	Units	UK-1	UK-2	MEAN	STD ERR
pH		6.2	5.9	6.05	0.15
OM	%	0.0	0.0	0.0	0.00
Sand	%	98.7	99.1	98.9	0.20
Silt	%	1.1	0.6	0.85	0.25
Clay	%	0.2	0.3	0.25	0.05
Texture	Soil	sand	sand		
Particle size range	mm	--	--	0.25-0.50	--
Surface area	m^2/g	--	--	0.33	
CEC	cmol/kg	2.3	2.2	2.25	0.05
% Saturation of Cation Exchange Capacity	K	0.3	0.5	0.4	0.1
	Mg	1.5	1.1	1.3	0.2
	Ca	9.5	9.3	9.4	0.1
Calcium Carbonate Equivalent	%	ND	ND		
C	%	ND	ND	ND	ND
P	mg/kg	2	2	2.0	0.0
K	mg/kg	3	4	3.5	0.5
Ca	mg/kg	43	42	42.5	0.5
Acidity	cmol/100g	2.0	2.0	2.0	0.0
Conductivity	mmhos/cm	0.07	0.06	0.065	0.005
Mg	mg/kg	4	3	3.5	0.5
Cd	mg/kg	ND	ND	ND	ND
Cu	mg/kg	0.3	0.3	0.3	0.0
Cr	mg/kg	ND	ND	ND	ND
Pb	mg/kg	ND	ND	ND	ND
Ni	mg/kg	ND	ND	ND	ND
Zn	mg/kg	0.2	0.3	0.25	0.05

* All values were based on soil test results analyzed by The Agricultural Analytical Services Laboratory, Penn State University, University Park, PA, except particle size range and surface area, which were supplied by the manufacturer; ND – Not Determined.

BARDON
AGGREGATES

Technical Data Sheet – Chemical Analysis
Warmwell Quarry – AFS 50

Supplying Unit	BARDON AGGREGATES WARMWELL QUARRY: Warmwell, Dorset
Aggregate Type	Quartz AFS 50

XRF Analysis		%
Silica	(SiO_2)	98.55
Titania	(TiO_2)	0.06
Alumina	(Al_2O_3)	0.39
Ferric Oxide	(Fe_2O_3)	0.09
Lime	(CaO)	<0.01
Magnesia	(MgO)	<0.02
Potash	(K_2O)	0.04
Soda	(NaO_2)	<0.03
Phosphorus Pentoxide	(P_2O_5)	<0.02
Chromium Sesquioxide	(Cr_2O_3)	<0.01
Manganic Oxide	(Mn_3O_4)	<0.01
Zirconia	(ZrO_2)	<0.02
Hafinia	(HfO_2)	<0.01
Lead Monoxide	(PbO)	<0.02
Zinc Oxide	(ZnO)	<0.01
Barium Oxide	(BaO)	0.01
Strontia	(SrO)	<0.01
Stannic Oxide	(SnO_2)	<0.01
Cupric Oxide	(CuO)	<0.01
Loss on Ignition at 1025 °C		0.21

APPENDIX D
CHEMICAL ANALYSIS OF UK SAND

Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\09SEPT\07-3696.SMP

Started: 9/25/2007 4:54:40PM
Completed: 9/26/2007 2:39:27AM
Report Time: 9/26/2007 2:49:19PM
Sample Mass: 0.5251 g
Cold Free Space: 87.6497 cm³
Low Pressure Dose: None

Analysis Adsorptive: Kr
Analysis Bath Temp.: 77.135 K
Thermal Correction: Yes
Warm Free Space: 28.4296 cm³ Measured
Equilibration Interval: 10 s
Automatic Degas: No

Summary Report

Surface Area

Single point surface area at P/Po = 0.230637900: 0.1944 m²/g

BET Surface Area: 0.2368 m²/g

Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\09SEPT\07-3696.SMP

Started:	9/25/2007 4:54:40PM	Analysis Adsorptive:	Kr
Completed:	9/26/2007 2:39:27AM	Analysis Bath Temp.:	77.135 K
Report Time:	9/26/2007 2:49:19PM	Thermal Correction:	Yes
Sample Mass:	0.5251 g	Warm Free Space:	28.4296 cm^3 Measured
Cold Free Space:	87.6497 cm^3	Equilibration Interval:	10 s
Low Pressure Dose:	None	Automatic Degas:	No

Summary Report

Surface Area

Single point surface area at P/Po = 0.230637900: 0.1944 m^2/g

BET Surface Area: 0.2368 m^2/g

Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\09SEPT\07-3696.SMP

Started: 9/25/2007 4:54:40PM
Completed: 9/26/2007 2:39:27AM
Report Time: 9/26/2007 2:49:19PM
Sample Mass: 0.5251 g
Cold Free Space: 87.6497 cm³
Low Pressure Dose: None

Analysis Adsorptive: Kr
Analysis Bath Temp.: 77.135 K
Thermal Correction: Yes
Warm Free Space: 28.4296 cm³ Measured
Equilibration Interval: 10 s
Automatic Degas: No

Isotherm Tabular Report

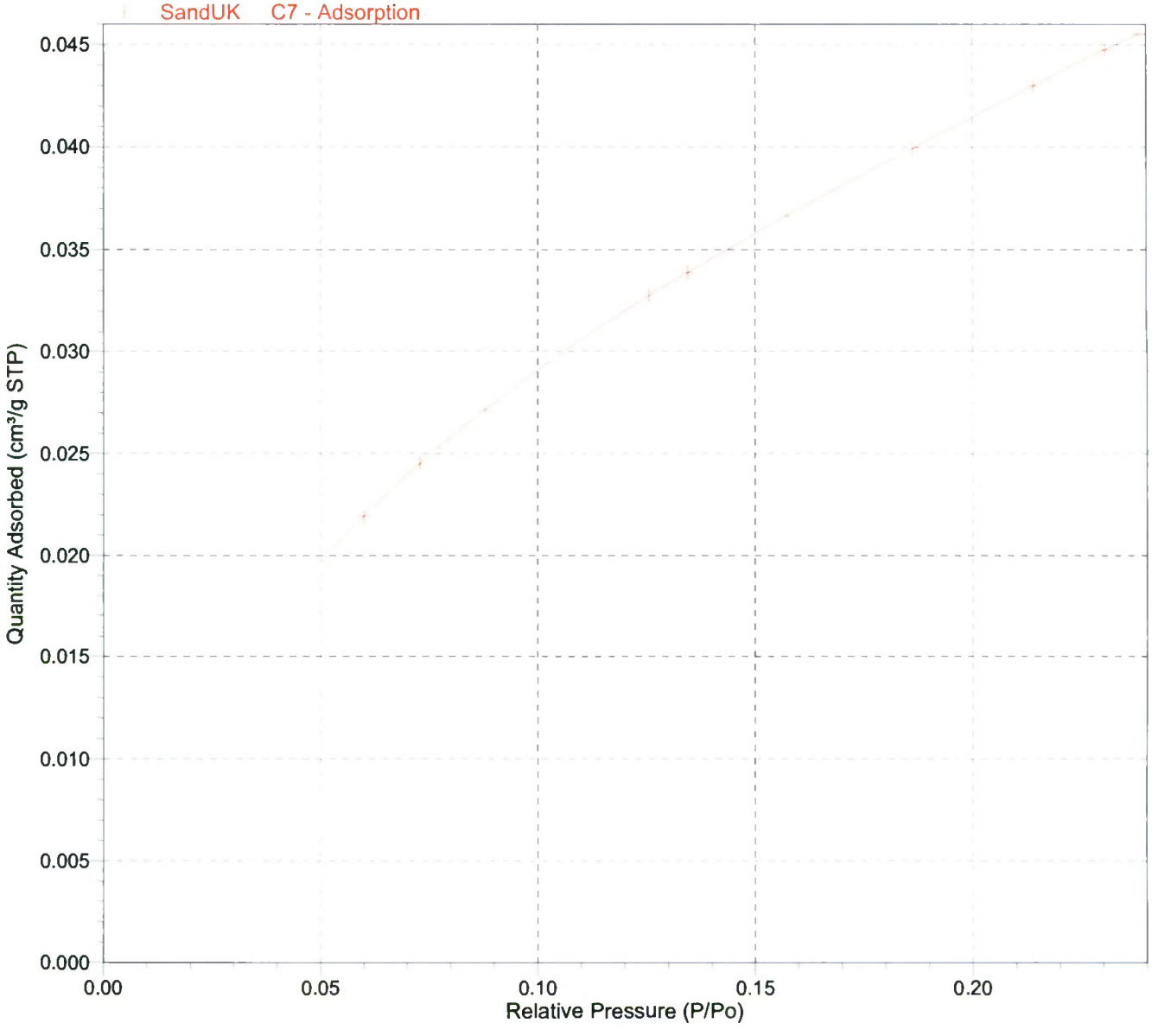
Relative Pressure (P/Po)	Absolute Pressure (mmHg)	Quantity Adsorbed (cm³/g STP)	Elapsed Time (h:min)	Saturation Pressure (mmHg)
			00:42	2.357326
0.050005240	0.118258	0.0197	05:41	
0.059969121	0.141830	0.0219	05:44	
0.072926427	0.172465	0.0245	05:48	
0.087945566	0.207972	0.0272	05:51	
0.125575763	0.296976	0.0328	05:55	
0.134488047	0.318026	0.0339	05:58	
0.157343561	0.372063	0.0367	06:02	
0.186277238	0.440457	0.0400	06:06	
0.214119775	0.506319	0.0430	06:10	
0.230637900	0.545318	0.0448	06:14	
0.238378337	0.563557	0.0455	06:17	

Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\09SEPT\07-3696.SMP

Started: 9/25/2007 4:54:40PM
Completed: 9/26/2007 2:39:27AM
Report Time: 9/26/2007 2:49:19PM
Sample Mass: 0.5251 g
Cold Free Space: 87.6497 cm³
Low Pressure Dose: None

Analysis Adsorptive: Kr
Analysis Bath Temp.: 77.135 K
Thermal Correction: Yes
Warm Free Space: 28.4296 cm³ Measured
Equilibration Interval: 10 s
Automatic Degas: No

Isotherm Linear Plot



Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\09SEPT\07-3696.SMP

Started: 9/25/2007 4:54:40PM
Completed: 9/26/2007 2:39:27AM
Report Time: 9/26/2007 2:49:19PM
Sample Mass: 0.5251 g
Cold Free Space: 87.6497 cm³
Low Pressure Dose: None

Analysis Adsorptive: Kr
Analysis Bath Temp.: 77.135 K
Thermal Correction: Yes
Warm Free Space: 28.4296 cm³ Measured
Equilibration Interval: 10 s
Automatic Degas: No

BET Surface Area Report

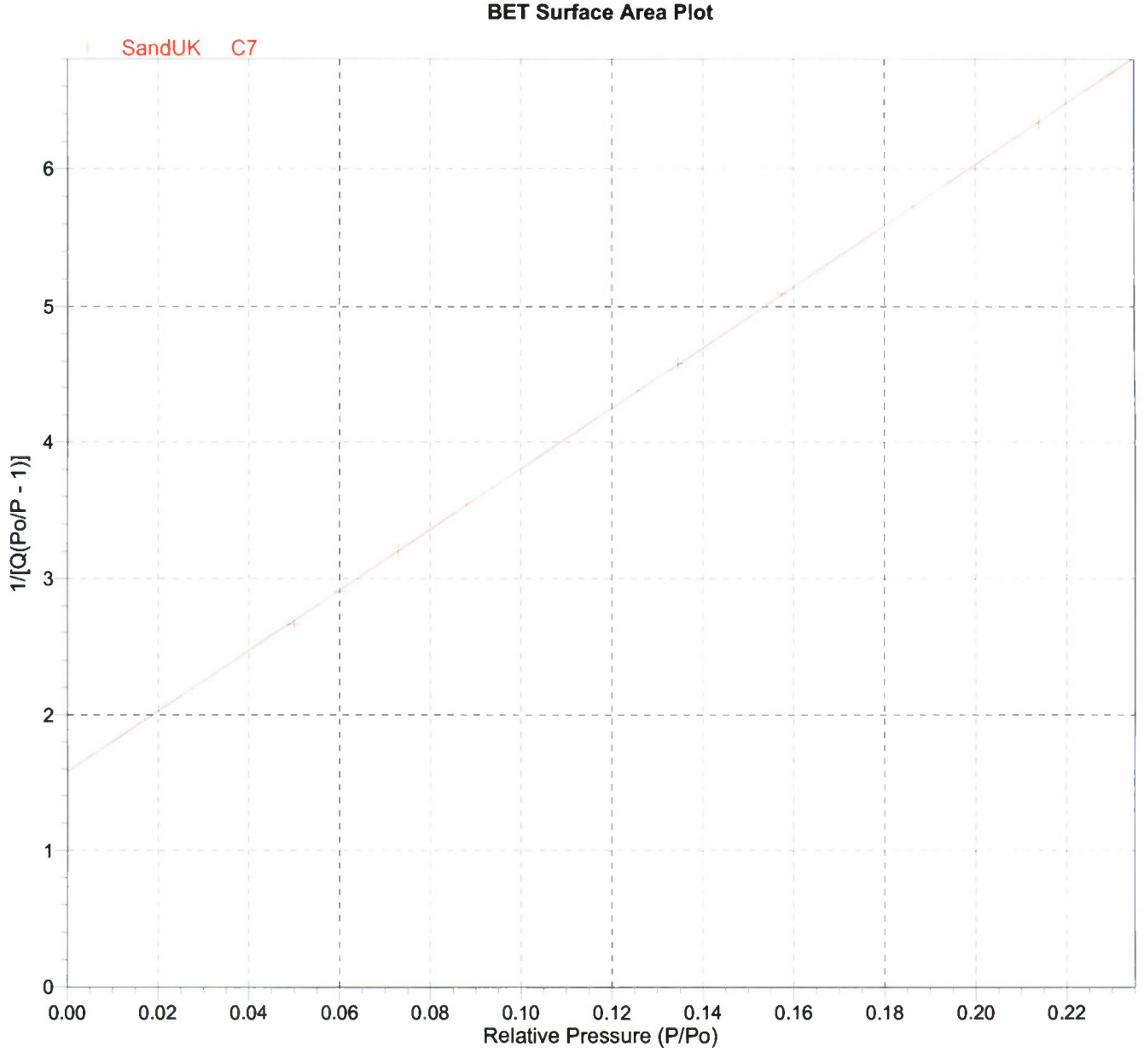
BET Surface Area: 0.2368 ± 0.0008 m²/g
Slope: 22.248804 ± 0.077295 g/cm³ STP
Y-Intercept: 1.580176 ± 0.011241 g/cm³ STP
C: 15.079953
Qm: 0.0420 cm³/g STP
Correlation Coefficient: 0.9999517
Molecular Cross-Sectional Area: 0.2100 nm²

Relative Pressure (P/Po)	Quantity Adsorbed (cm³/g STP)	1/[Q(Po/P - 1)]
0.050005240	0.0197	2.665982
0.059969121	0.0219	2.907127
0.072926427	0.0245	3.207672
0.087945566	0.0272	3.551177
0.125575763	0.0328	4.383491
0.134488047	0.0339	4.585470
0.157343561	0.0367	5.093980
0.186277238	0.0400	5.728853
0.214119775	0.0430	6.335270
0.230637900	0.0448	6.695331

Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\09SEPT\07-3696.SMP

Started: 9/25/2007 4:54:40PM
Completed: 9/26/2007 2:39:27AM
Report Time: 9/26/2007 2:49:19PM
Sample Mass: 0.5251 g
Cold Free Space: 87.6497 cm³
Low Pressure Dose: None

Analysis Adsorptive: Kr
Analysis Bath Temp.: 77.135 K
Thermal Correction: Yes
Warm Free Space: 28.4296 cm³ Measured
Equilibration Interval: 10 s
Automatic Degas: No



micromeritics®

Surface Area Reports

Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4317.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:01AM
Sample Mass: 0.5251 g
Cold Free Space: 87.6000 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 28.4000 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Summary Report

Surface Area

Single point surface area at P/Po = 0.170382577: 0.2232 m²/g

BET Surface Area: 0.2320 m²/g

t-Plot Micropore Area: 0.0382 m²/g

t-Plot External Surface Area: 0.1938 m²/g

BJH Adsorption cumulative surface area of pores between 17.000 Å and 3000.000 Å diameter: 0.108 m²/g

Pore Volume

Single point adsorption total pore volume of pores less than 3951.643 Å diameter at P/Po = 0.995100411: 0.001204 cm³/g

Single point desorption total pore volume of pores less than 869.973 Å diameter at P/Po = 0.977229981: 0.000873 cm³/g

t-Plot micropore volume: 0.000015 cm³/g

BJH Adsorption cumulative volume of pores between 17.000 Å and 3000.000 Å diameter: 0.000942 cm³/g

Pore Size

Adsorption average pore width (4V/A by BET): 207.5503 Å

Desorption average pore width (4V/A by BET): 150.4907 Å

BJH Adsorption average pore diameter (4V/A): 348.520 Å

DFT Pore Size

Volume in Pores	<	12.37 Å	:	0.00000 cm³/g
Total Volume in Pores	<=	123.90 Å	:	0.00006 cm³/g
Area in Pores	>	123.90 Å	:	0.000 m²/g
Total Area in Pores	>=	12.37 Å	:	0.160 m²/g

Horvath-Kawazoe

Maximum pore volume at P/Po = 0.170382577: 0.000096 cm³/g

Median pore width: 11.011 Å

micromeritics®

Surface Area Reports

Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4317.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:01AM
Sample Mass: 0.5251 g
Cold Free Space: 87.6000 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 28.4000 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Isotherm Tabular Report

Relative Pressure (P/Po)	Absolute Pressure (mmHg)	Quantity Adsorbed (cm³/g STP)	Elapsed Time (h:min)	Saturation Pressure (mmHg)
			00:42	738.893616
0.000788506	0.582761	0.0112	01:01	739.070068
0.001678797	1.240794	0.0150	01:18	739.097107
0.002500387	1.848045	0.0171	01:38	739.103333
0.003403232	2.515768	0.0191	01:56	739.228943
0.004318517	3.192449	0.0209	02:11	739.246582
0.005234925	3.870042	0.0223	02:29	739.273560
0.006134178	4.534969	0.0235	02:47	739.295349
0.100110616	74.117424	0.0556	06:51	740.355286
0.120272090	89.052689	0.0575	06:54	740.426880
0.170382577	126.152481	0.0618	06:58	740.407166
0.200292589	148.312836	0.0609	07:02	740.480896
0.230191476	170.450241	0.0606	07:05	740.471558
0.260152610	192.636688	0.0604	07:09	740.475708
0.290023126	214.764709	0.0585	07:13	740.508911
0.319953763	236.937576	0.0577	07:17	740.536926
0.339970385	251.753922	0.0525	07:20	740.517212
0.359897656	266.505554	0.0515	07:24	740.503723
0.399892179	296.138245	0.0446	07:28	740.545227
0.439884233	325.750061	0.0408	07:31	740.535889
0.479861548	355.356689	0.0339	07:35	740.540039
0.519826299	384.955963	0.0277	07:39	740.547302
0.559738489	414.525024	0.0230	07:43	740.569092
0.599689297	444.146240	0.0194	07:46	740.627258
0.639714414	473.772675	0.0180	07:50	740.600281
0.679628410	503.336517	0.0211	07:54	740.605469
0.719611653	532.953552	0.0197	07:57	740.612732
0.759579462	562.539246	0.0264	08:01	740.593018
0.799441574	592.107300	0.0379	08:05	740.651123
0.839435698	621.726379	0.0581	08:09	740.648010
0.879449270	651.304810	0.0936	08:12	740.582581
0.890048657	659.120361	0.1111	08:16	740.544189
0.900026983	666.532166	0.1216	08:20	740.569092
0.929275097	688.161560	0.1783	08:24	740.535889
0.930153522	688.806274	0.1837	08:28	740.529663
0.940142566	696.173218	0.2166	08:31	740.497498
0.968874463	717.424988	0.3518	08:35	740.472595
0.970272821	718.418091	0.3605	08:39	740.428955
0.975101474	721.936707	0.4034	08:43	740.370850
0.980003746	725.574341	0.4610	08:46	740.379150
0.982611801	727.459351	0.4979	08:50	740.332397
0.985041338	729.271362	0.5387	08:54	740.345947
0.987641401	731.149109	0.5817	08:58	740.298157
0.989969578	732.888062	0.6335	09:01	740.313721
0.992115499	734.465393	0.6752	09:05	740.302307
0.993972441	735.820496	0.7274	09:09	740.282593

Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4317.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:01AM
Sample Mass: 0.5251 g
Cold Free Space: 87.6000 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 28.4000 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Isotherm Tabular Report

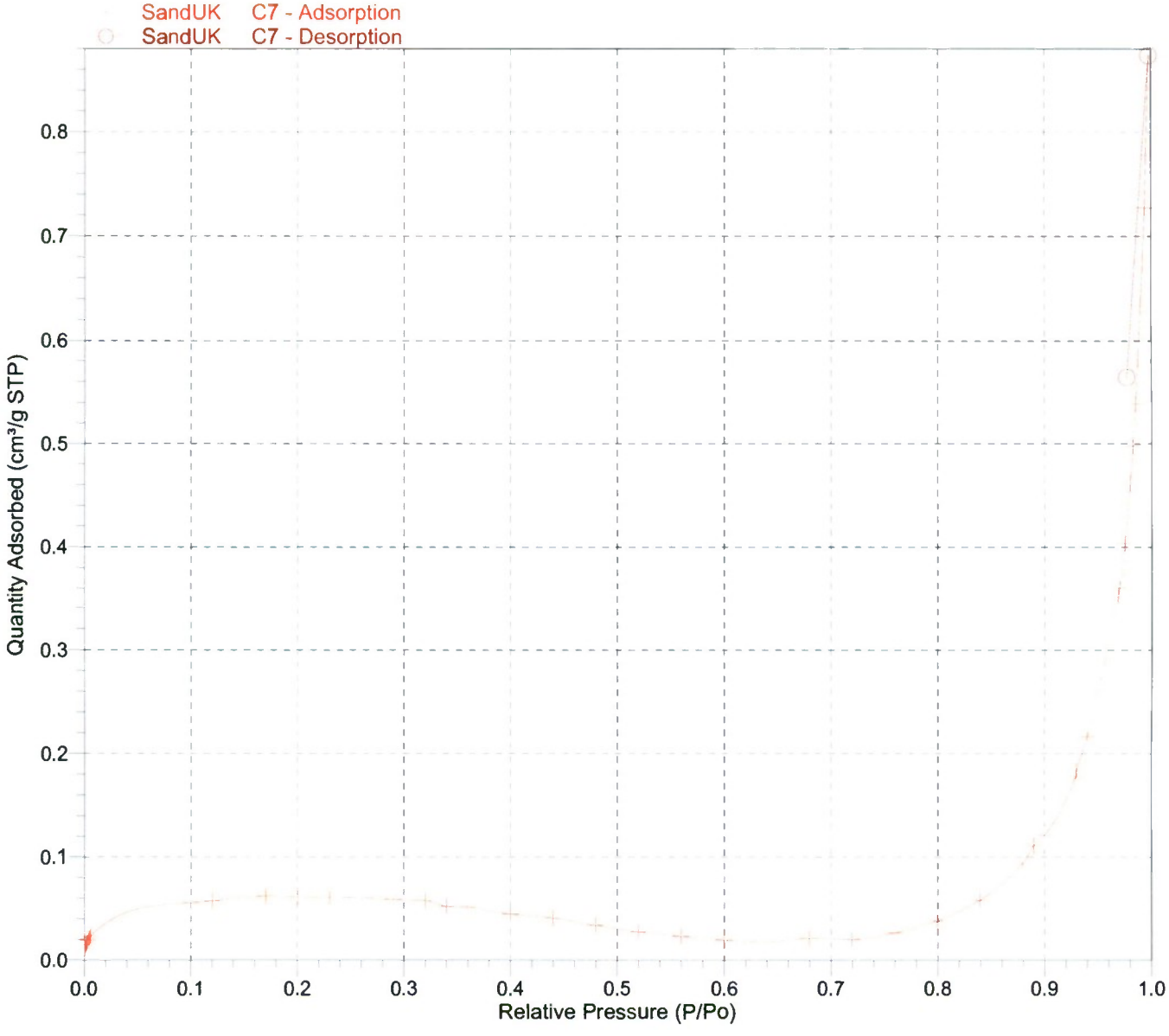
Relative Pressure (P/Po)	Absolute Pressure (mmHg)	Quantity Adsorbed (cm³/g STP)	Elapsed Time (h:min)	Saturation Pressure (mmHg)
0.995100411	736.604919	0.7782	09:19	740.231750
0.997771144	738.596375	0.8737	09:30	740.246277
0.977229981	723.424316	0.5643	09:33	740.280518

Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4317.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:01AM
Sample Mass: 0.5251 g
Cold Free Space: 87.6000 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 28.4000 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Isotherm Linear Plot



Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4317.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:01AM
Sample Mass: 0.5251 g
Cold Free Space: 87.6000 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 28.4000 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

BET Surface Area Report

BET Surface Area: 0.2320 ± 0.0009 m²/g
Slope: 18.620902 ± 0.069010 g/cm³ STP
Y-Intercept: 0.143725 ± 0.007985 g/cm³ STP
C: 130.559024
Qm: 0.0533 cm³/g STP
Correlation Coefficient: 0.9999863
Molecular Cross-Sectional Area: 0.1620 nm²

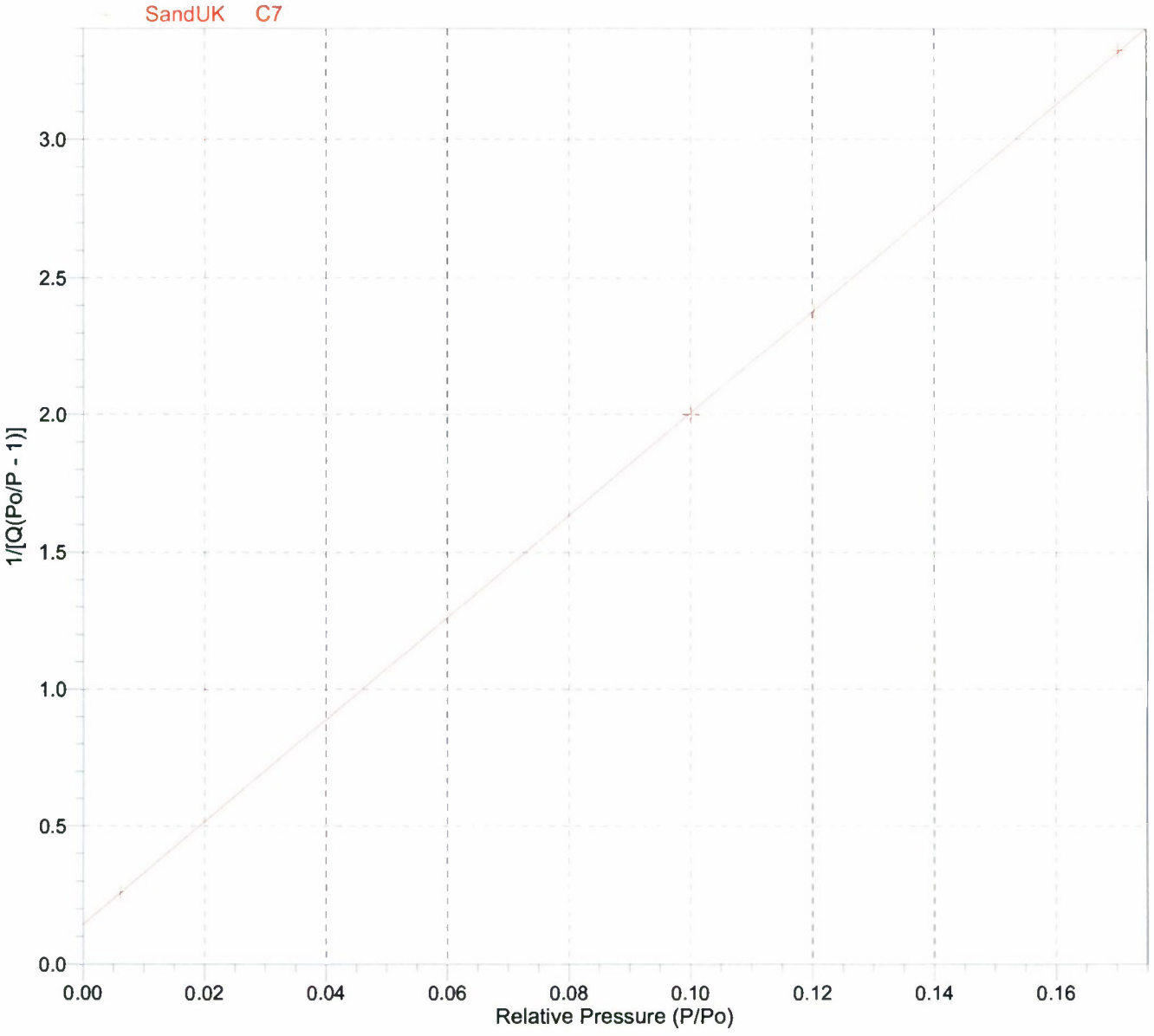
Relative Pressure (P/Po)	Quantity Adsorbed (cm³/g STP)	1/[Q(Po/P - 1)]
0.006134178	0.0235	0.262171
0.100110616	0.0556	2.001862
0.120272090	0.0575	2.377895
0.170382577	0.0618	3.323599

Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4317.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:01AM
Sample Mass: 0.5251 g
Cold Free Space: 87.6000 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 28.4000 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

BET Surface Area Plot



Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4317.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:01AM
Sample Mass: 0.5251 g
Cold Free Space: 87.6000 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 28.4000 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

t-Plot Report

Micropore Volume: 0.000015 cm³/g
Micropore Area: 0.0382 m²/g
External Surface Area: 0.1938 m²/g
Slope: 0.012527 ± 0.000073 cm³/g·Å STP
Y-Intercept: 0.009497 ± 0.000285 cm³/g STP
Correlation Coefficient: 0.999983
Surface Area Correction Factor: 1.000
Density Conversion Factor: 0.0015468
Total Surface Area (BET): 0.2320 m²/g
Thickness Range: 3.5000 Å to 4.2000 Å
Thickness Equation: Harkins and Jura

$$t = [\ 13.99 / (\ 0.034 - \log(P/Po)\ )\ ]^{0.5}$$

Relative Pressure (P/Po)	Statistical Thickness (Å)	Quantity Adsorbed (cm³/g STP)
0.000788506	2.1117	0.0112
0.001678797	2.2317	0.0150
0.002500387	2.3038	0.0171
0.003403232	2.3646	0.0191
0.004318517	2.4150	0.0209
0.005234925	2.4582	0.0223
0.006134178	2.4956	0.0235
0.100110616	3.6792	0.0556
0.120272090	3.8298	0.0575
0.170382577	4.1751	0.0618
0.200292589	4.3707	0.0609
0.230191476	4.5630	0.0606
0.260152610	4.7549	0.0604
0.290023126	4.9474	0.0585
0.319953763	5.1430	0.0577
0.339970385	5.2761	0.0525
0.359897656	5.4110	0.0515
0.399892179	5.6903	0.0446
0.439884233	5.9842	0.0408
0.479861548	6.2964	0.0339
0.519826299	6.6313	0.0277
0.559738489	6.9938	0.0230
0.599689297	7.3914	0.0194
0.639714414	7.8330	0.0180
0.679628410	8.3277	0.0211
0.719611653	8.8929	0.0197
0.759579462	9.5490	0.0264
0.799441574	10.3257	0.0379
0.839435698	11.2768	0.0581
0.879449270	12.4824	0.0936
0.890048657	12.8605	0.1111
0.900026983	13.2452	0.1216

Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4317.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:01AM
Sample Mass: 0.5251 g
Cold Free Space: 87.6000 cm³
Low Pressure Dose: 0.200 cm³/g STP

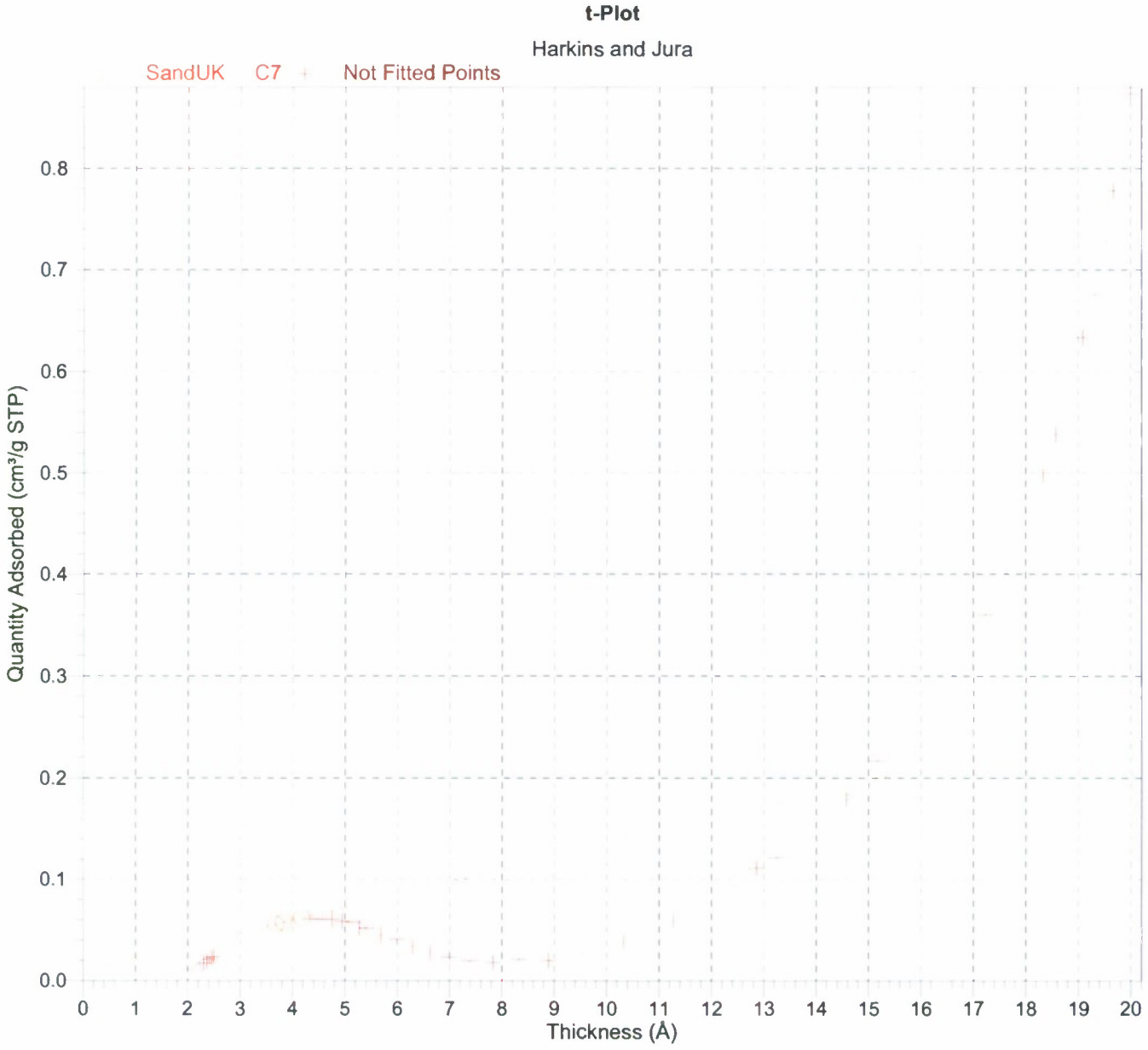
Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 28.4000 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Relative Pressure (P/Po)	Statistical Thickness (Å)	Quantity Adsorbed (cm³/g STP)
0.929275097	14.5751	0.1783
0.930153522	14.6207	0.1837
0.940142566	15.1682	0.2166
0.968874463	17.1199	0.3518
0.970272821	17.2334	0.3605
0.975101474	17.6418	0.4034
0.980003746	18.0854	0.4610
0.982611801	18.3345	0.4979
0.985041338	18.5754	0.5387
0.987641401	18.8433	0.5817
0.989969578	19.0927	0.6335
0.992115499	19.3310	0.6752
0.993972441	19.5441	0.7274
0.995100411	19.6769	0.7782
0.997771144	20.0017	0.8737

Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4317.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:01AM
Sample Mass: 0.5251 g
Cold Free Space: 87.6000 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 28.4000 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No



Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4317.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:01AM
Sample Mass: 0.5251 g
Cold Free Space: 87.6000 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 28.4000 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Porosity Distribution by Density Functional Theory
Model: N2 @ 77K, Cylindrical Pores in an Oxide Surface
Method: Non-negative Regularization; No Smoothing

Volume in Pores	<	12.37 Å	:	0.00000 cm³/g
Total Volume in Pores	<=	123.90 Å	:	0.00006 cm³/g
Area in Pores	>	123.90 Å	:	0.000 m²/g
Total Area in Pores	>=	12.37 Å	:	0.160 m²/g

Pore Size Table

Pore Width (Å)	Cumulative Volume (cm³/g)	Incremental Volume (cm³/g)	Cumulative Area (m²/g)	Incremental Area (m²/g)
12.37	0.00000	0.00000	0.000	0.000
12.73	0.00000	0.00000	0.000	0.000
13.08	0.00000	0.00000	0.000	0.000
13.44	0.00000	0.00000	0.000	0.000
13.80	0.00000	0.00000	0.000	0.000
14.16	0.00000	0.00000	0.000	0.000
14.51	0.00000	0.00000	0.000	0.000
14.87	0.00000	0.00000	0.000	0.000
15.23	0.00006	0.00006	0.160	0.160
15.59	0.00006	0.00000	0.160	0.000
15.94	0.00006	0.00000	0.160	0.000
16.30	0.00006	0.00000	0.160	0.000
16.66	0.00006	0.00000	0.160	0.000
17.02	0.00006	0.00000	0.160	0.000
17.37	0.00006	0.00000	0.160	0.000
17.73	0.00006	0.00000	0.160	0.000
18.09	0.00006	0.00000	0.160	0.000
18.44	0.00006	0.00000	0.160	0.000
18.80	0.00006	0.00000	0.160	0.000
19.16	0.00006	0.00000	0.160	0.000
19.52	0.00006	0.00000	0.160	0.000
19.87	0.00006	0.00000	0.160	0.000
20.23	0.00006	0.00000	0.160	0.000
20.59	0.00006	0.00000	0.160	0.000
20.95	0.00006	0.00000	0.160	0.000
21.30	0.00006	0.00000	0.160	0.000
21.66	0.00006	0.00000	0.160	0.000
22.38	0.00006	0.00000	0.160	0.000
23.09	0.00006	0.00000	0.160	0.000
23.81	0.00006	0.00000	0.160	0.000
24.52	0.00006	0.00000	0.160	0.000
25.24	0.00006	0.00000	0.160	0.000
25.95	0.00006	0.00000	0.160	0.000
26.67	0.00006	0.00000	0.160	0.000
27.38	0.00006	0.00000	0.160	0.000
28.10	0.00006	0.00000	0.160	0.000
28.81	0.00006	0.00000	0.160	0.000

Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4317.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:01AM
Sample Mass: 0.5251 g
Cold Free Space: 87.6000 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 28.4000 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Pore Size Table

Pore Width (Å)	Cumulative Volume (cm³/g)	Incremental Volume (cm³/g)	Cumulative Area (m²/g)	Incremental Area (m²/g)
29.53	0.00006	0.00000	0.160	0.000
30.24	0.00006	0.00000	0.160	0.000
30.96	0.00006	0.00000	0.160	0.000
31.67	0.00006	0.00000	0.160	0.000
32.39	0.00006	0.00000	0.160	0.000
33.10	0.00006	0.00000	0.160	0.000
33.82	0.00006	0.00000	0.160	0.000
34.53	0.00006	0.00000	0.160	0.000
35.25	0.00006	0.00000	0.160	0.000
35.96	0.00006	0.00000	0.160	0.000
36.68	0.00006	0.00000	0.160	0.000
37.39	0.00006	0.00000	0.160	0.000
38.11	0.00006	0.00000	0.160	0.000
38.82	0.00006	0.00000	0.160	0.000
39.54	0.00006	0.00000	0.160	0.000
40.25	0.00006	0.00000	0.160	0.000
40.96	0.00006	0.00000	0.160	0.000
41.68	0.00006	0.00000	0.160	0.000
42.39	0.00006	0.00000	0.160	0.000
43.11	0.00006	0.00000	0.160	0.000
43.82	0.00006	0.00000	0.160	0.000
44.54	0.00006	0.00000	0.160	0.000
45.25	0.00006	0.00000	0.160	0.000
45.97	0.00006	0.00000	0.160	0.000
46.68	0.00006	0.00000	0.160	0.000
47.40	0.00006	0.00000	0.160	0.000
48.11	0.00006	0.00000	0.160	0.000
48.83	0.00006	0.00000	0.160	0.000
49.54	0.00006	0.00000	0.160	0.000
50.26	0.00006	0.00000	0.160	0.000
52.05	0.00006	0.00000	0.160	0.000
54.91	0.00006	0.00000	0.160	0.000
57.77	0.00006	0.00000	0.160	0.000
60.98	0.00006	0.00000	0.160	0.000
64.20	0.00006	0.00000	0.160	0.000
67.42	0.00006	0.00000	0.160	0.000
70.99	0.00006	0.00000	0.160	0.000
74.57	0.00006	0.00000	0.160	0.000
78.50	0.00006	0.00000	0.160	0.000
82.79	0.00006	0.00000	0.160	0.000
87.08	0.00006	0.00000	0.160	0.000
91.37	0.00006	0.00000	0.160	0.000
96.37	0.00006	0.00000	0.160	0.000
101.38	0.00006	0.00000	0.160	0.000
106.38	0.00006	0.00000	0.160	0.000
112.10	0.00006	0.00000	0.160	0.000

Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4317.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:01AM
Sample Mass: 0.5251 g
Cold Free Space: 87.6000 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 28.4000 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Pore Size Table

Pore Width (Å)	Cumulative Volume (cm³/g)	Incremental Volume (cm³/g)	Cumulative Area (m²/g)	Incremental Area (m²/g)
117.82	0.00006	0.00000	0.160	0.000
123.90	0.00006	0.00000	0.160	0.000

Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4317.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:01AM
Sample Mass: 0.5251 g
Cold Free Space: 87.6000 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 28.4000 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Porosity Distribution by Density Functional Theory
Model: N2 @ 77K, Cylindrical Pores in an Oxide Surface
Method: Non-negative Regularization; No Smoothing

Standard Deviation of Fit: 0.01494, cm³/g STP

Isotherm Table

Relative Pressure	Experimental Quantity Adsorbed (cm³/g STP)	Fitted Quantity Adsorbed (cm³/g STP)	Absolute Residual (cm³/g STP)	Relative Residual
0.000794328	0.0113	0.0175	-0.0062	-0.549987
0.001000000	0.0123	0.0184	-0.0061	-0.495719
0.001258925	0.0135	0.0193	-0.0058	-0.433492
0.001584895	0.0147	0.0203	-0.0056	-0.377160
0.001995263	0.0159	0.0213	-0.0054	-0.337150
0.002511882	0.0172	0.0223	-0.0051	-0.296987
0.003162276	0.0186	0.0233	-0.0047	-0.252052
0.003981066	0.0203	0.0243	-0.0041	-0.202065
0.005011868	0.0219	0.0254	-0.0035	-0.158779
0.006309579	0.0237	0.0265	-0.0028	-0.119245
0.007943276	0.0253	0.0277	-0.0024	-0.094179
0.010000000	0.0272	0.0289	-0.0017	-0.060791
0.012355640	0.0293	0.0300	-0.0007	-0.023707
0.015186320	0.0317	0.0322	-0.0005	-0.016056
0.018485530	0.0343	0.0333	0.0009	0.026334
0.022294740	0.0369	0.0342	0.0028	0.074662
0.026653420	0.0397	0.0348	0.0048	0.121999
0.031598160	0.0424	0.0354	0.0070	0.165289
0.037162240	0.0450	0.0359	0.0091	0.202999
0.043374470	0.0474	0.0363	0.0111	0.234412
0.050259210	0.0495	0.0366	0.0128	0.259327
0.057835260	0.0512	0.0370	0.0142	0.277950
0.066115920	0.0525	0.0373	0.0153	0.290886
0.075109080	0.0536	0.0375	0.0160	0.299263
0.084815920	0.0543	0.0378	0.0166	0.304948
0.095232370	0.0551	0.0380	0.0171	0.310823
0.106348200	0.0562	0.0382	0.0180	0.319977
0.118147500	0.0573	0.0384	0.0189	0.329944
0.130609100	0.0585	0.0386	0.0199	0.340146
0.143706600	0.0597	0.0387	0.0210	0.351339
0.157410500	0.0609	0.0389	0.0220	0.361669
0.171685500	0.0618	0.0390	0.0228	0.368333
0.186492100	0.0615	0.0392	0.0223	0.362988
0.201792100	0.0608	0.0393	0.0216	0.354298
0.217539500	0.0607	0.0394	0.0213	0.351203
0.233689500	0.0606	0.0395	0.0211	0.348114
0.250196100	0.0605	0.0396	0.0209	0.344865
0.267011800	0.0601	0.0397	0.0204	0.339510
0.284089500	0.0589	0.0398	0.0191	0.324565

Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4317.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:01AM
Sample Mass: 0.5251 g
Cold Free Space: 87.6000 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 28.4000 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

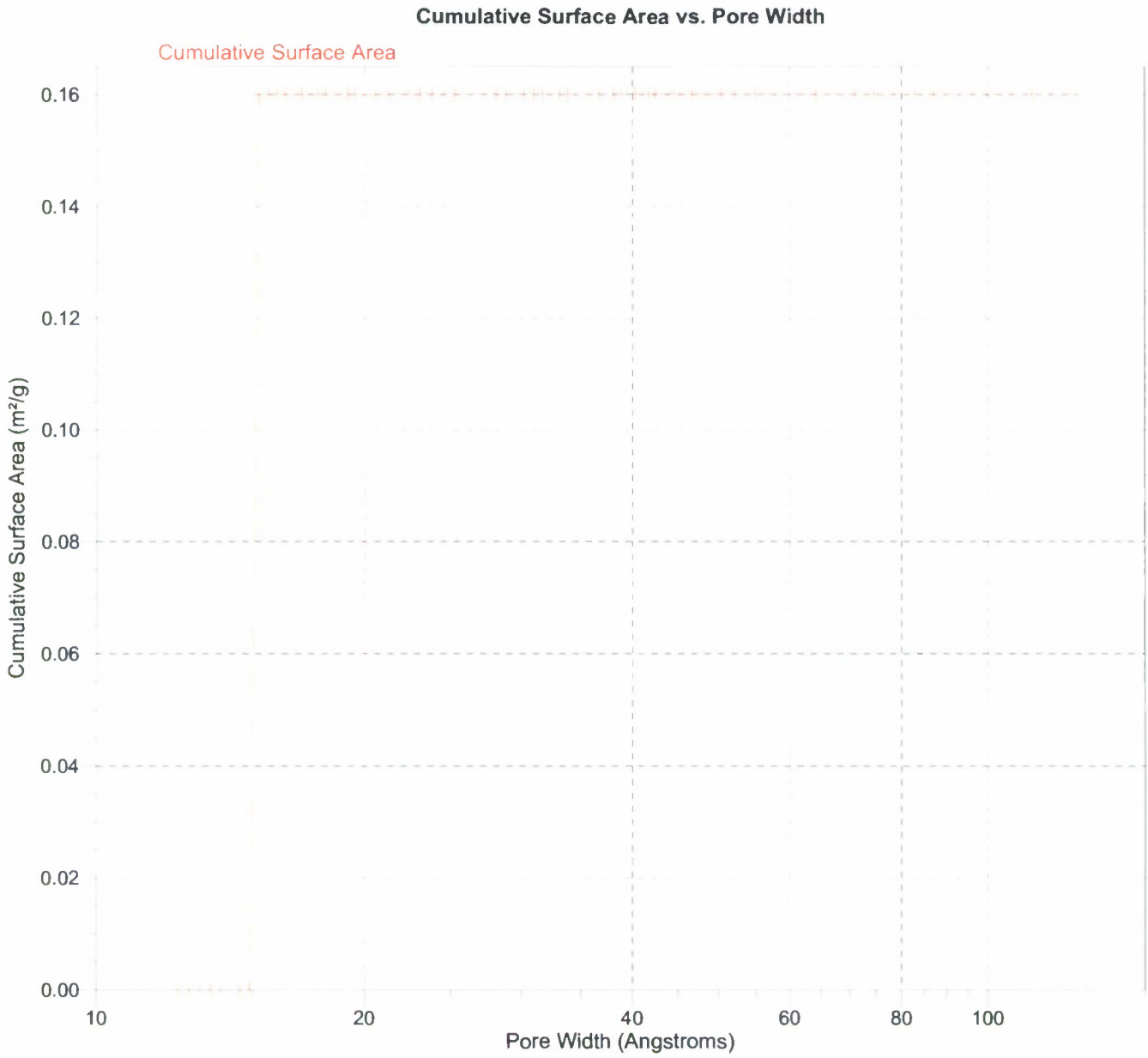
Isotherm Table

Relative Pressure	Experimental Quantity Adsorbed (cm³/g STP)	Fitted Quantity Adsorbed (cm³/g STP)	Absolute Residual (cm³/g STP)	Relative Residual
0.301380300	0.0582	0.0399	0.0183	0.314444
0.318838200	0.0577	0.0400	0.0178	0.307776
0.336417100	0.0532	0.0400	0.0131	0.246763
0.354071100	0.0520	0.0401	0.0119	0.228319
0.371757900	0.0496	0.0402	0.0094	0.189238
0.389435500	0.0462	0.0402	0.0060	0.129495
0.407065800	0.0439	0.0403	0.0036	0.081149
0.424610500	0.0425	0.0404	0.0021	0.050160
0.442034200	0.0404	0.0404	0.0000	0.000015
0.459305300	0.0374	0.0405	-0.0030	-0.081065
0.476393400	0.0344	0.0405	-0.0061	-0.176253
0.493271100	0.0317	0.0406	-0.0088	-0.278371
0.509911800	0.0291	0.0406	-0.0115	-0.393274
0.526293400	0.0268	0.0406	-0.0138	-0.515364
0.542394700	0.0249	0.0407	-0.0158	-0.635528
0.558200000	0.0232	0.0407	-0.0176	-0.758281
0.573690800	0.0216	0.0407	-0.0191	-0.884651
0.588853900	0.0203	0.0408	-0.0205	-1.007735
0.603677600	0.0191	0.0408	-0.0217	-1.131033
0.618153900	0.0184	0.0408	-0.0225	-1.223329
0.632272400	0.0180	0.0409	-0.0229	-1.269944
0.646028900	0.0181	0.0409	-0.0228	-1.256005
0.659417100	0.0193	0.0409	-0.0216	-1.121593
0.672435500	0.0206	0.0409	-0.0203	-0.986764
0.685081600	0.0211	0.0410	-0.0199	-0.945671
0.697355300	0.0204	0.0410	-0.0205	-1.004569
0.709256600	0.0197	0.0410	-0.0213	-1.076809
0.720789500	0.0198	0.0410	-0.0212	-1.069884
0.731953900	0.0209	0.0410	-0.0202	-0.968038
0.742756600	0.0225	0.0411	-0.0186	-0.827306
0.753200000	0.0247	0.0411	-0.0164	-0.663818
0.763289500	0.0275	0.0411	-0.0136	-0.496015
0.773030300	0.0303	0.0411	-0.0108	-0.357237
0.782430300	0.0330	0.0411	-0.0081	-0.245787
0.791496100	0.0356	0.0411	-0.0055	-0.154419

Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4317.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:01AM
Sample Mass: 0.5251 g
Cold Free Space: 87.6000 cm³
Low Pressure Dose: 0.200 cm³/g STP

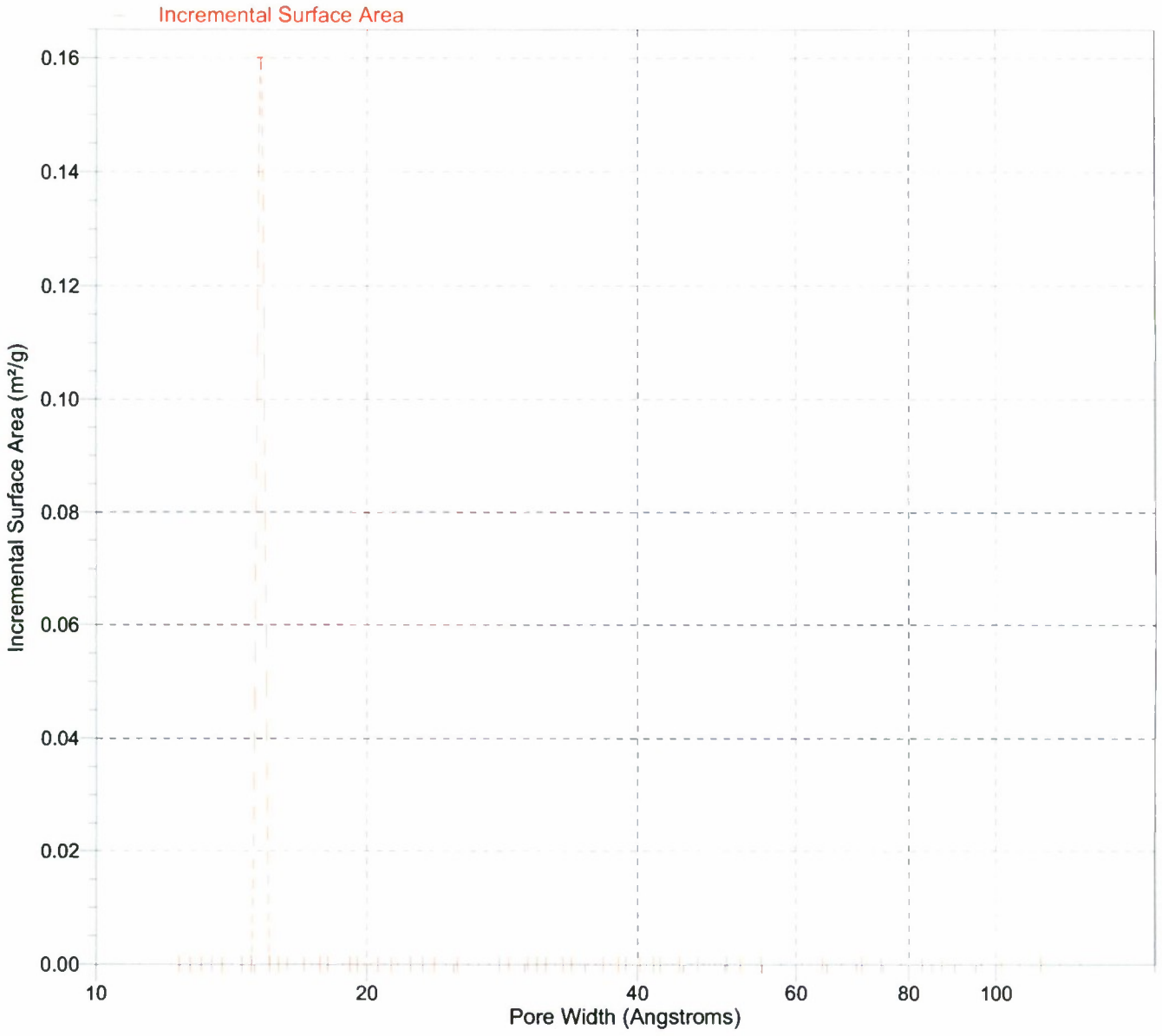
Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 28.4000 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No



Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4317.SMP

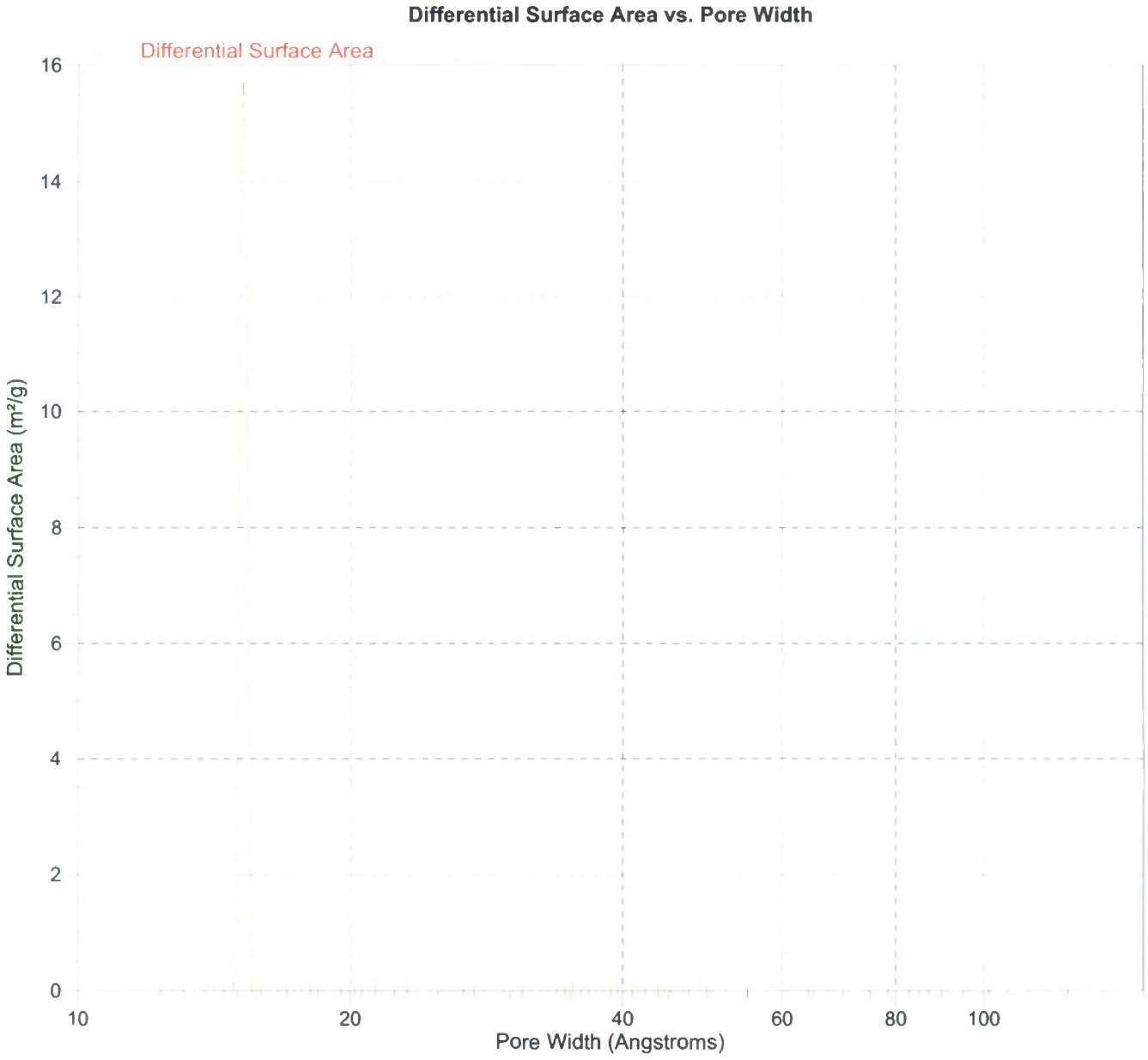
Started:	10/26/2007 3:36:45PM	Analysis Adsorptive:	N2
Completed:	10/27/2007 2:12:52AM	Analysis Bath Temp.:	77.300 K
Report Time:	10/30/2007 9:27:01AM	Thermal Correction:	No
Sample Mass:	0.5251 g	Warm Free Space:	28.4000 cm³ Entered
Cold Free Space:	87.6000 cm³	Equilibration Interval:	20 s
Low Pressure Dose:	0.200 cm³/g STP	Automatic Degas:	No

Incremental Surface Area vs. Pore Width



Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4317.SMP

Started:	10/26/2007 3:36:45PM	Analysis Adsorptive:	N2
Completed:	10/27/2007 2:12:52AM	Analysis Bath Temp.:	77.300 K
Report Time:	10/30/2007 9:27:01AM	Thermal Correction:	No
Sample Mass:	0.5251 g	Warm Free Space:	28.4000 cm³ Entered
Cold Free Space:	87.6000 cm³	Equilibration Interval:	20 s
Low Pressure Dose:	0.200 cm³/g STP	Automatic Degas:	No

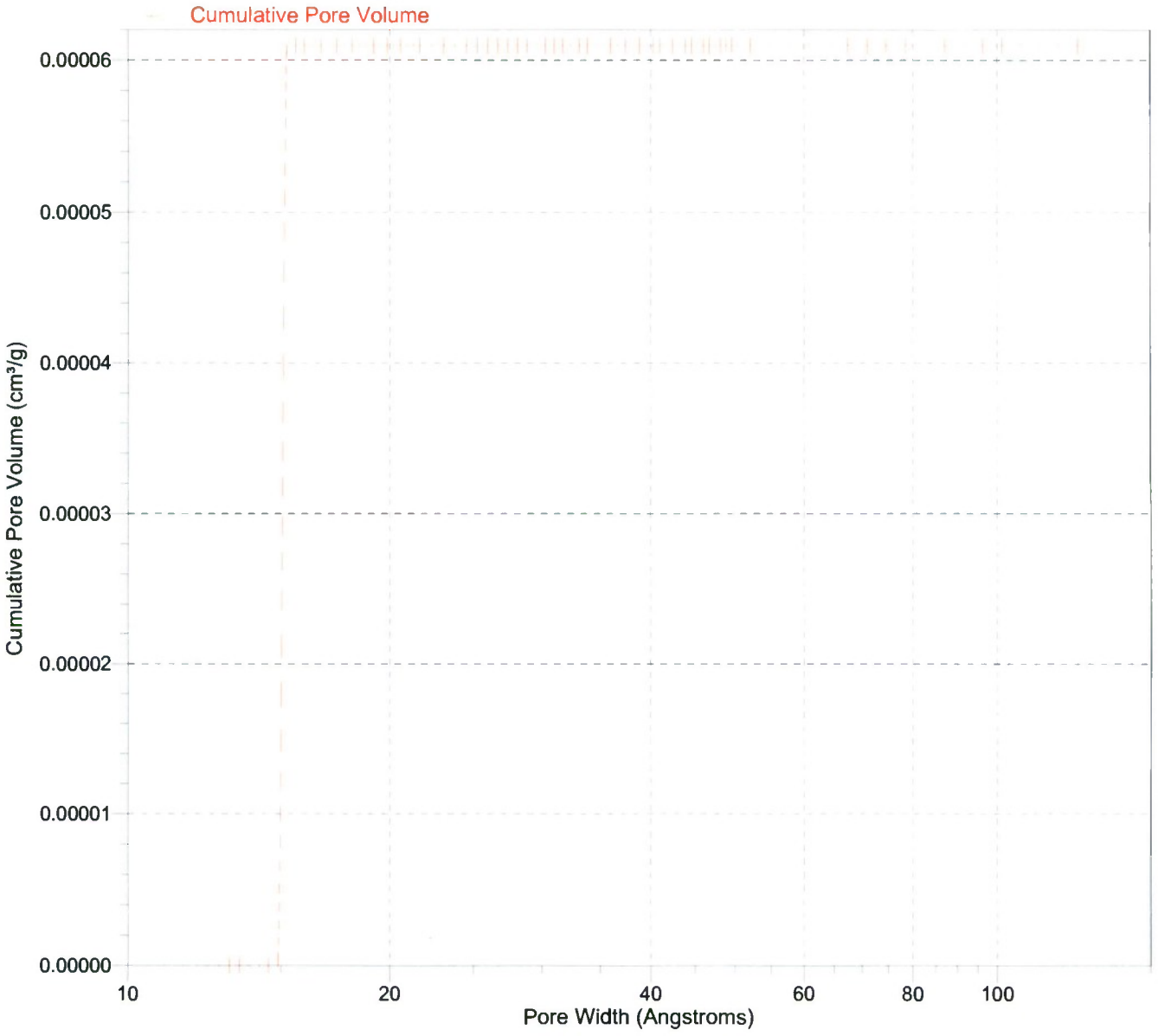


Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4317.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:01AM
Sample Mass: 0.5251 g
Cold Free Space: 87.6000 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 28.4000 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Cumulative Pore Volume vs. Pore Width

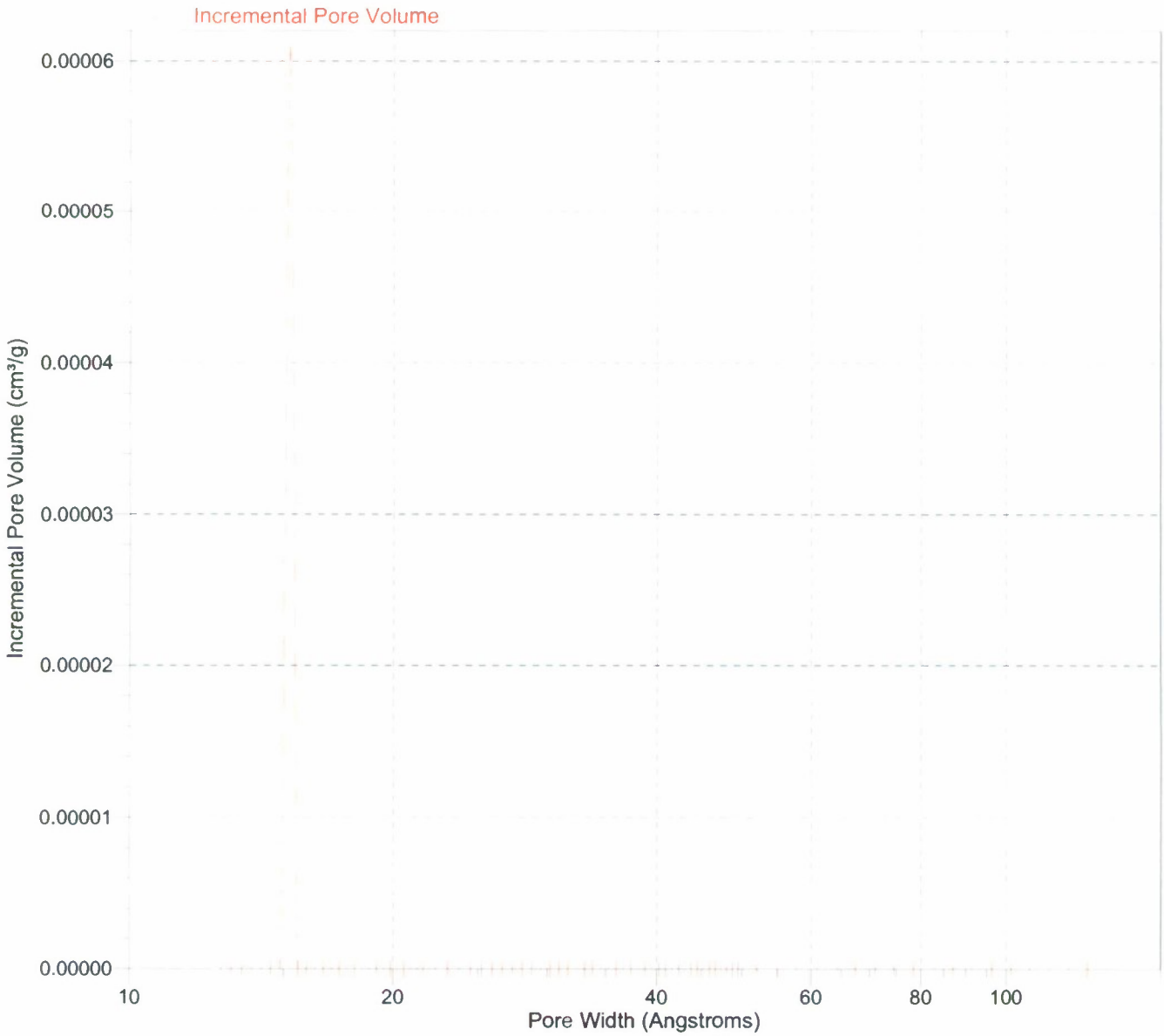


Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4317.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:01AM
Sample Mass: 0.5251 g
Cold Free Space: 87.6000 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 28.4000 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

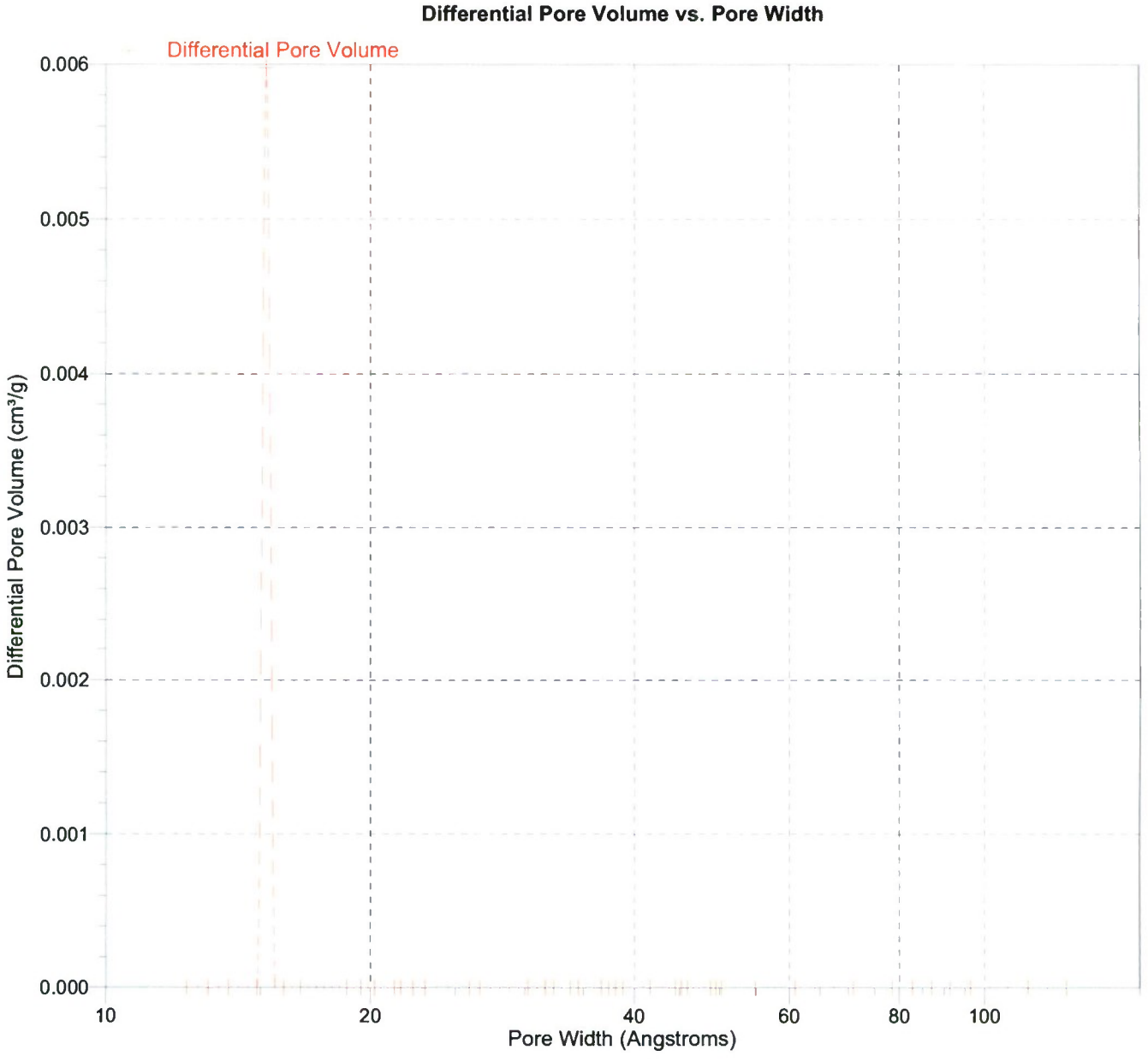
Incremental Pore Volume vs. Pore Width



Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4317.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:01AM
Sample Mass: 0.5251 g
Cold Free Space: 87.6000 cm³
Low Pressure Dose: 0.200 cm³/g STP

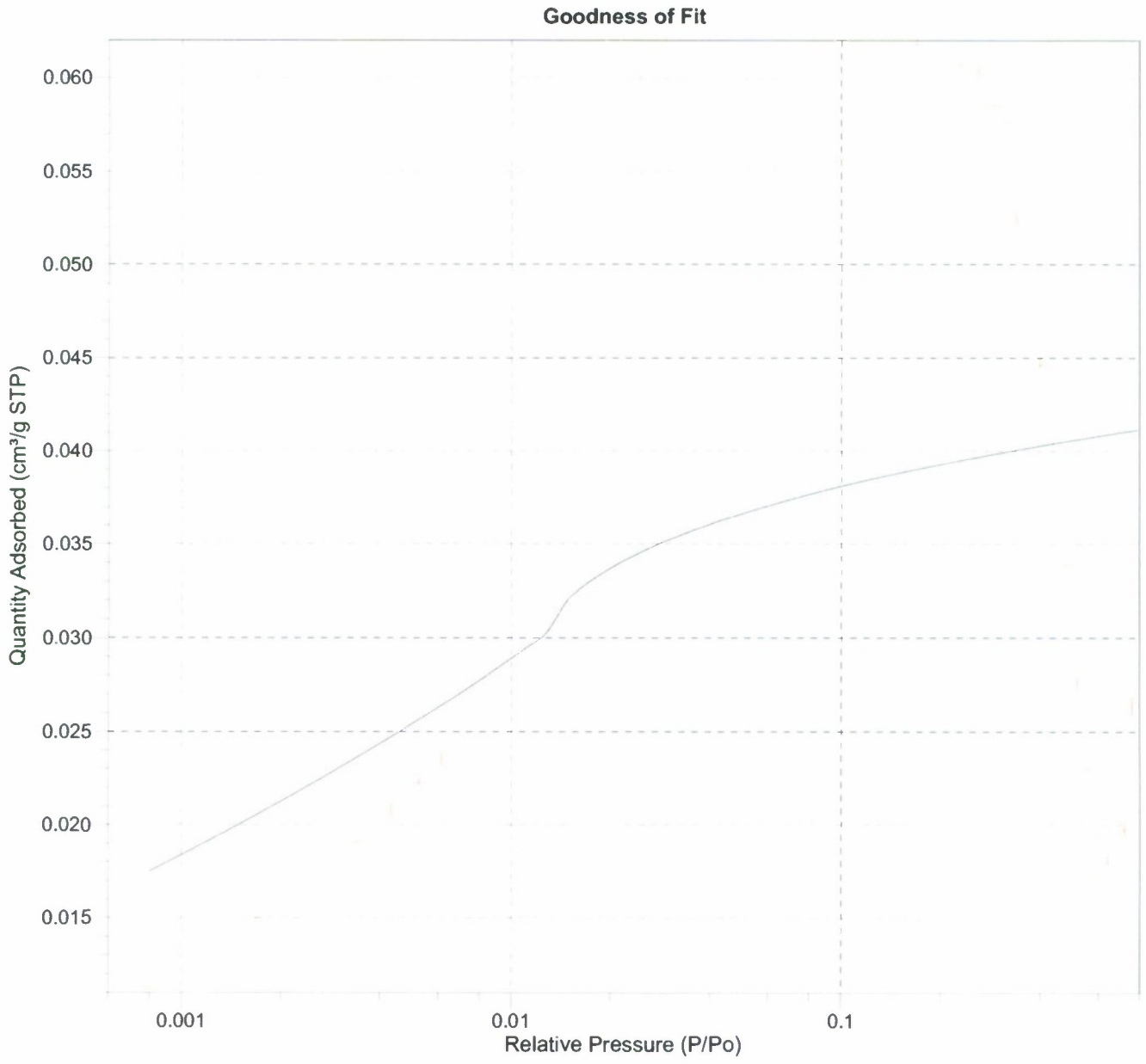
Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 28.4000 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No



Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4317.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:01AM
Sample Mass: 0.5251 g
Cold Free Space: 87.6000 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 28.4000 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No



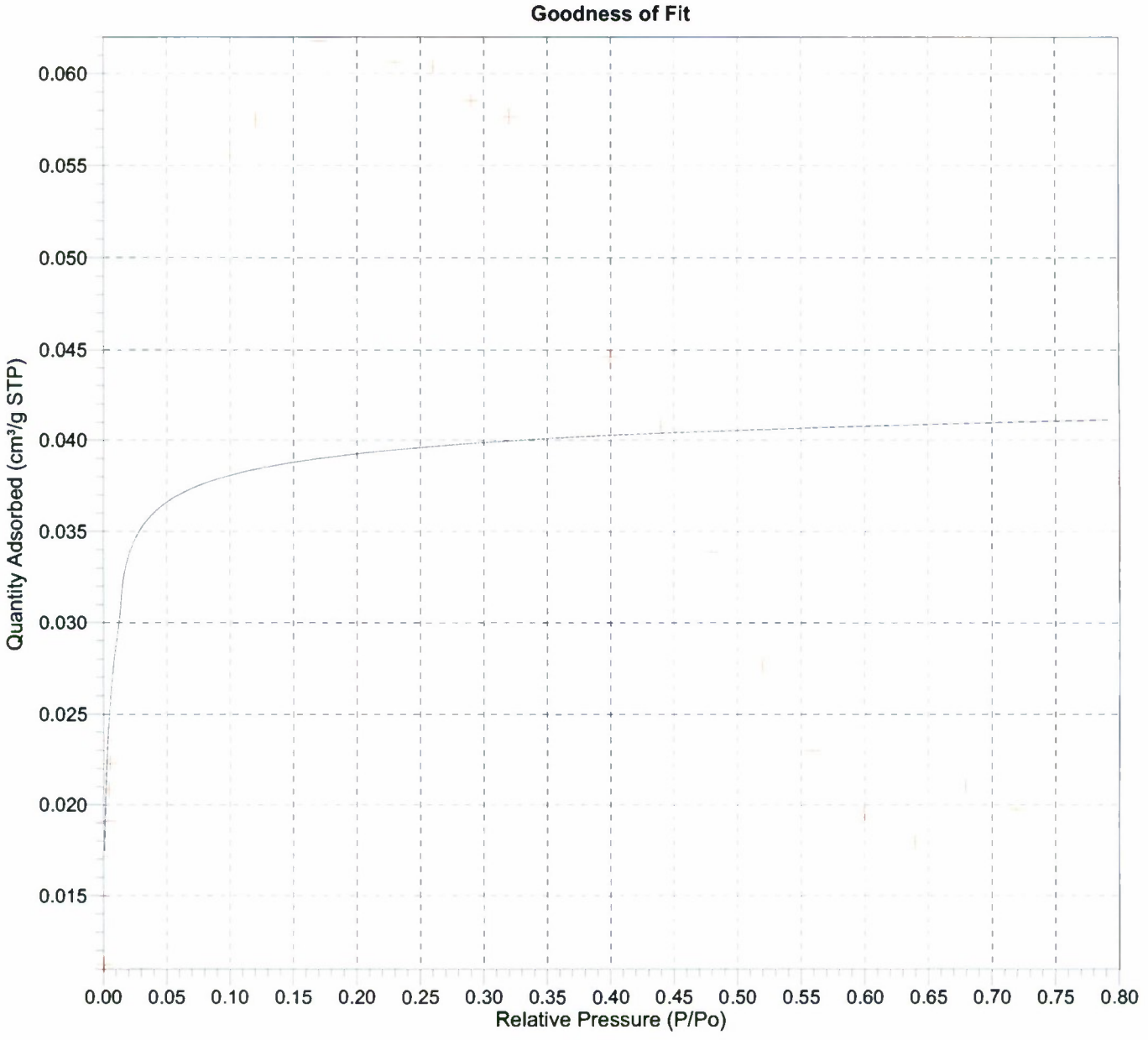
micromeritics®

Surface Area Reports

Sample: SandUK C7
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4317.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:01AM
Sample Mass: 0.5251 g
Cold Free Space: 87.6000 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 28.4000 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No



Sample: Sand 4/A A2
Operator: CMS
Submitter: SAIC
File: C:\...\06JUNE\06-2341.SMP

Started: 6/20/2006 11:49:02AM
Completed: 6/20/2006 2:54:50PM
Report Time: 6/20/2006 2:54:45PM
Warm Free Space: 5.4204 cm³ Measured
Equilibration Interval: 10 s
Sample Density: 1.000 g/cm³

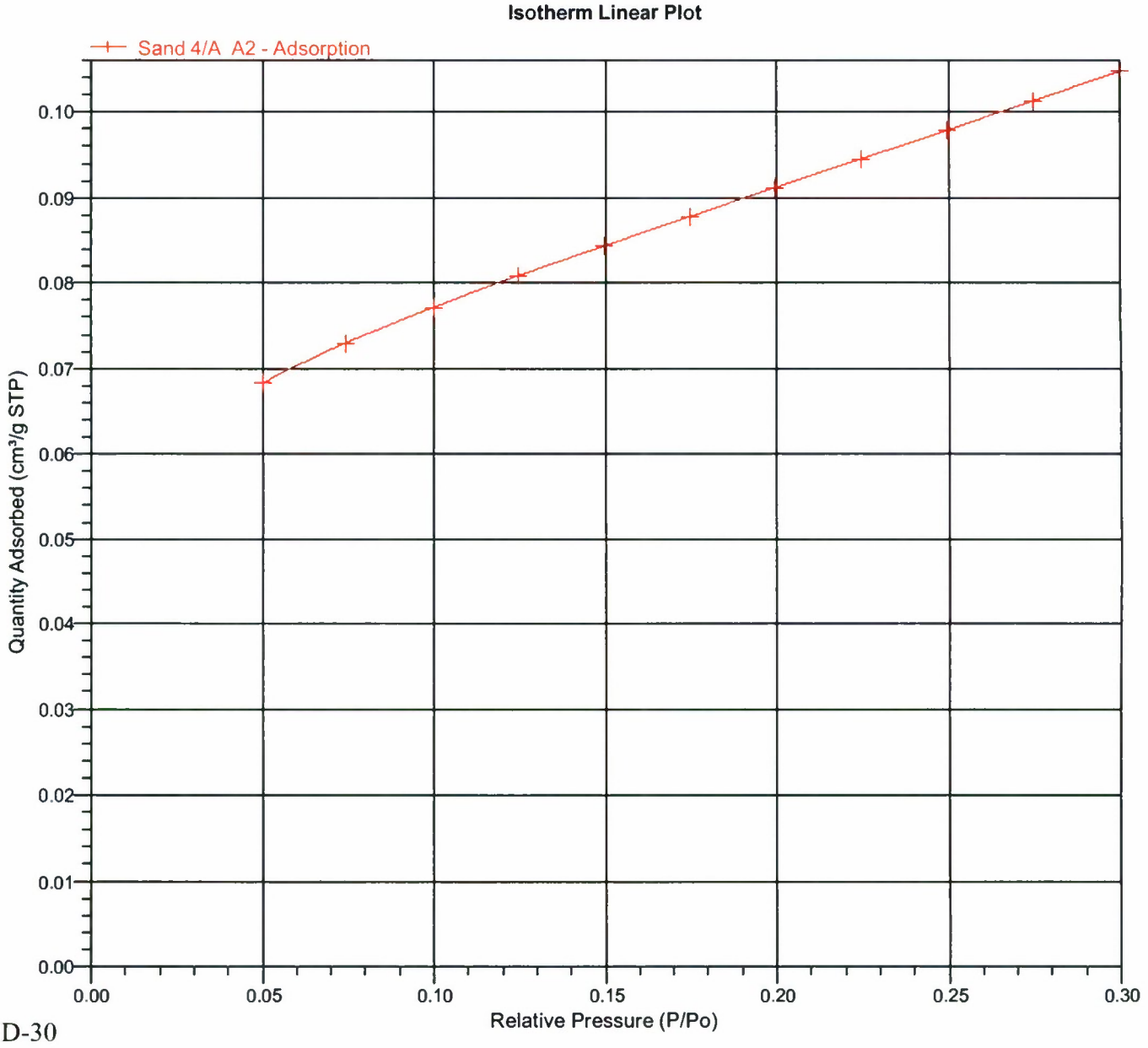
Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Sample Mass: 4.5785 g
Cold Free Space: 14.9987 cm³ Measured
Low Pressure Dose: None
Automatic Degas: No

Isotherm Tabular Report

Relative Pressure (P/Po)	Absolute Pressure (mmHg)	Quantity Adsorbed (cm³/g STP)	Elapsed Time (h:min)	Saturation Pressure (mmHg)
			01:04	737.91364
0.050417176	37.20352	0.0683	01:14	
0.074536137	55.00123	0.0730	01:16	
0.099855101	73.68444	0.0772	01:18	
0.124817462	92.10451	0.0809	01:20	
0.149779824	110.52457	0.0844	01:23	
0.174742185	128.94464	0.0878	01:25	
0.199721534	147.37724	0.0912	01:27	
0.224729170	165.83072	0.0945	01:29	
0.249736807	184.28419	0.0979	01:31	
0.274744464	202.73769	0.1013	01:33	
0.299769077	221.20369	0.1047	01:35	

Sample: Sand 4/A A2
Operator: CMS
Submitter: SAIC
File: C:\...\06JUNE\06-2341.SMP

Started:	6/20/2006 11:49:02AM	Analysis Adsorptive:	N2
Completed:	6/20/2006 2:54:50PM	Analysis Bath Temp.:	77.300 K
Report Time:	6/20/2006 2:54:45PM	Sample Mass:	4.5785 g
Warm Free Space:	5.4204 cm³ Measured	Cold Free Space:	14.9987 cm³ Measured
Equilibration Interval:	10 s	Low Pressure Dose:	None
Sample Density:	1.000 g/cm³	Automatic Degas:	No



Sample: Sand 4/A A2
Operator: CMS
Submitter: SAIC
File: C:\...\06JUNE\06-2341.SMP

Started: 6/20/2006 11:49:02AM
Completed: 6/20/2006 2:54:50PM
Report Time: 6/20/2006 2:54:45PM
Warm Free Space: 5.4204 cm³ Measured
Equilibration Interval: 10 s
Sample Density: 1.000 g/cm³

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Sample Mass: 4.5785 g
Cold Free Space: 14.9987 cm³ Measured
Low Pressure Dose: None
Automatic Degas: No

BET Surface Area Report

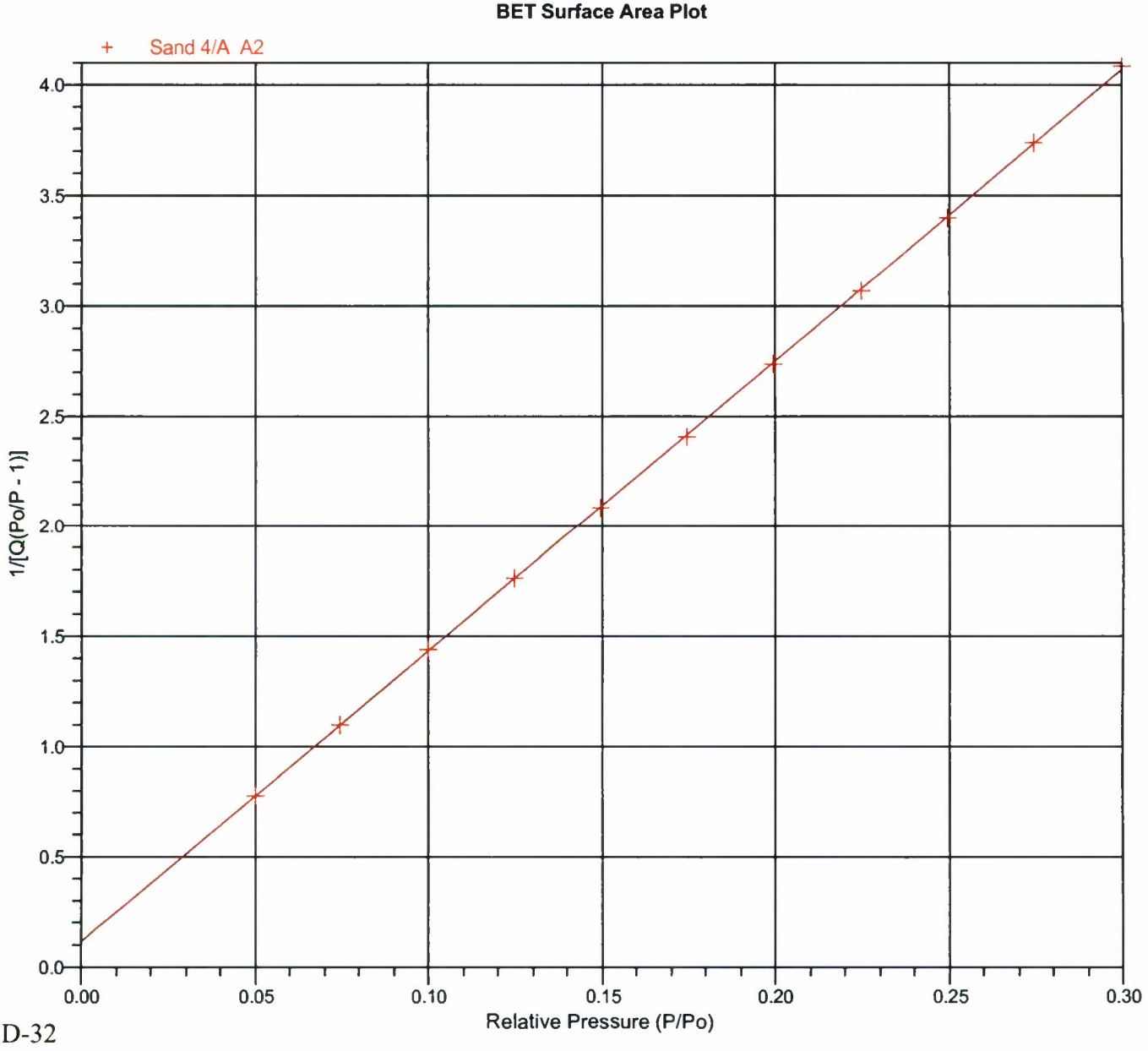
BET Surface Area: 0.3272 ± 0.0009 m²/g
Slope: 13.191522 ± 0.037907 g/cm³ STP
Y-Intercept: 0.112857 ± 0.007271 g/cm³ STP
C: 117.886852
Qm: 0.0752 cm³/g STP
Correlation Coefficient: 0.9999628
Molecular Cross-Sectional Area: 0.1620 nm²

Relative Pressure (P/Po)	Quantity Adsorbed (cm³/g STP)	1/[Q(Po/P - 1)]
0.050417176	0.0683	0.776899
0.074536137	0.0730	1.103155
0.099855101	0.0772	1.437721
0.124817462	0.0809	1.762955
0.149779824	0.0844	2.086881
0.174742185	0.0878	2.410658
0.199721534	0.0912	2.736295
0.224729170	0.0945	3.065858
0.249736807	0.0979	3.400281
0.274744464	0.1013	3.738778
0.299769077	0.1047	4.087253

Sample: Sand 4/A A2
Operator: CMS
Submitter: SAIC
File: C:\...\06JUNE\06-2341.SMP

Started: 6/20/2006 11:49:02AM
Completed: 6/20/2006 2:54:50PM
Report Time: 6/20/2006 2:54:45PM
Warm Free Space: 5.4204 cm³ Measured
Equilibration Interval: 10 s
Sample Density: 1.000 g/cm³

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Sample Mass: 4.5785 g
Cold Free Space: 14.9987 cm³ Measured
Low Pressure Dose: None
Automatic Degas: No



Sample: Sand 4/A A2
Operator: CMS
Submitter: SAIC
File: C:\...\06JUNE\06-2341.SMP

Started: 6/20/2006 11:49:02AM
Completed: 6/20/2006 2:54:50PM
Report Time: 6/20/2006 2:54:45PM
Warm Free Space: 5.4204 cm³ Measured
Equilibration Interval: 10 s
Sample Density: 1.000 g/cm³

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Sample Mass: 4.5785 g
Cold Free Space: 14.9987 cm³ Measured
Low Pressure Dose: None
Automatic Degas: No

Summary Report

Surface Area

Single point surface area at P/Po = 0.299769077: 0.3193 m²/g

BET Surface Area: 0.3272 m²/g

Blank

APPENDIX E: CHEMICAL ANALYSIS OF SW SAND

TABLE-1

Sample : SW_Sand
Operator:
Comment : SW Sand
Group : [Qual-Quant.]39620
Date : 2008-09-30 16:12

[Quantitative Result]

Analyte	Result	Proc-Calc	Line	Net Int.	BG Int.
SiO2	83.0618 %	Quant.-FP	SiKa	474.547	1.669
Al2O3	10.8474 %	Quant.-FP	AlKa	65.787	3.109
K2O	2.2416 %	Quant.-FP	K Ka	37.404	0.267
Fe2O3	1.5434 %	Quant.-FP	FeKa	43.055	0.523
MgO	0.8247 %	Quant.-FP	MgKa	1.855	0.215
TiO2	0.4749 %	Quant.-FP	TiKa	2.222	0.074
Na2O	0.4118 %	Quant.-FP	NaKa	0.516	0.053
CaO	0.3277 %	Quant.-FP	CaKa	4.109	0.178
ZrO2	0.0815 %	Quant.-FP	ZrKa	12.872	6.140
P2O5	0.0565 %	Quant.-FP	P Ka	0.414	0.209
BaO	0.0453 %	Quant.-FP	BaLa	0.097	0.067
Cr2O3	0.0222 %	Quant.-FP	CrKa	0.296	0.212
MnO	0.0221 %	Quant.-FP	MnKa	0.397	0.354
SO3	0.0212 %	Quant.-FP	S Ka	0.173	0.205
NiO	0.0062 %	Quant.-FP	NiKa	0.324	0.673
SrO	0.0059 %	Quant.-FP	SrKa	0.992	4.577
Rb2O	0.0056 %	Quant.-FP	RbKa	0.957	3.939

Blank

APPENDIX F
SURFACE AREA OF SW SAND

MICROMERITICS ANALYTICAL SERVICES The Particle Testing Authority

Sample: SW SAND E20
Operator: TN
Submitter: SAIC
File: C:\...\10OCT\08-5045.SMP

Started: 10/2/2008 9:33:45AM
Completed: 10/2/2008 11:29:18AM
Report Time: 10/2/2008 11:31:24AM
Warm Free Space: 7.3265 cm³ Measured
Equilibration Interval: 10 s
Sample Density: 1.000 g/cm³

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Sample Mass: 0.5305 g
Cold Free Space: 23.1963 cm³ Measured
Low Pressure Dose: None
Automatic Degas: No

Isotherm Tabular Report

Relative Pressure (P/Po)	Absolute Pressure (mmHg)	Quantity Adsorbed (cm³/g STP)	Elapsed Time (h:min)	Saturation Pressure (mmHg)
			01:28	739.31049
0.056965656	42.11531	1.2994	01:33	
0.074600499	55.15293	1.3479	01:36	
0.099744885	73.74244	1.4065	01:38	
0.124747871	92.22741	1.4573	01:40	
0.149790145	110.74142	1.5042	01:42	
0.174840271	129.26125	1.5469	01:44	
0.199898240	147.78687	1.5873	01:46	
0.224901227	166.27184	1.6259	01:48	
0.249841367	184.71034	1.6631	01:50	
0.274805098	203.16629	1.6984	01:52	
0.299737374	221.59898	1.7341	01:54	

MICROMERITICS ANALYTICAL SERVICES *The Particle Testing Authority*

Sample: SW SAND E20
Operator: TN
Submitter: SAIC
File: C:\...\10OCT\08-5045.SMP

Started: 10/2/2008 9:33:45AM
Completed: 10/2/2008 11:29:18AM
Report Time: 10/2/2008 11:31:24AM
Warm Free Space: 7.3265 cm³ Measured
Equilibration Interval: 10 s
Sample Density: 1.000 g/cm³

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Sample Mass: 0.5305 g
Cold Free Space: 23.1963 cm³ Measured
Low Pressure Dose: None
Automatic Degas: No

Isotherm Tabular Report

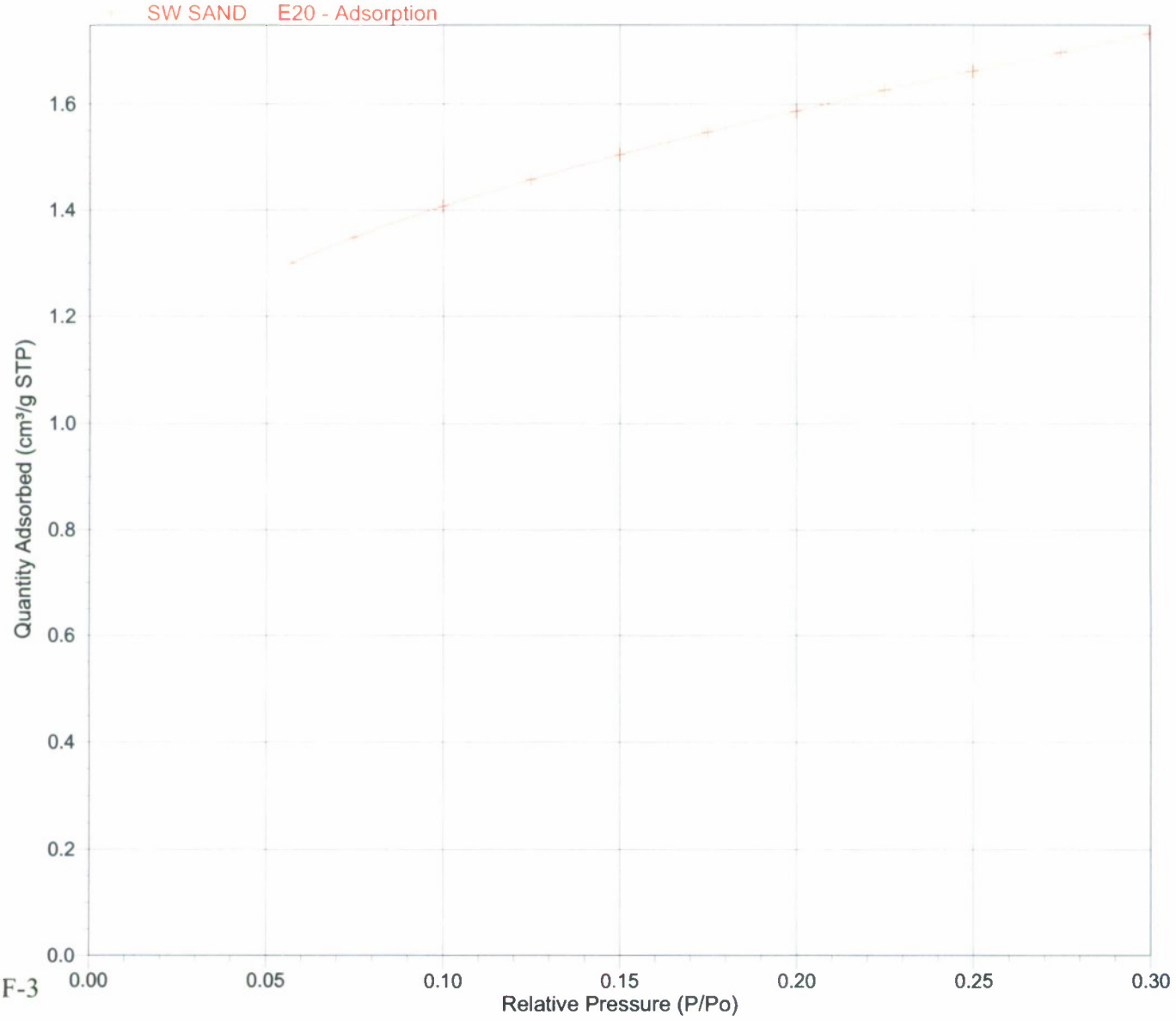
Relative Pressure (P/Po)	Absolute Pressure (mmHg)	Quantity Adsorbed (cm³/g STP)	Elapsed Time (h:min)	Saturation Pressure (mmHg)
			01:28	739.31049
0.056965656	42.11531	1.2994	01:33	
0.074600499	55.15293	1.3479	01:36	
0.099744885	73.74244	1.4065	01:38	
0.124747871	92.22741	1.4573	01:40	
0.149790145	110.74142	1.5042	01:42	
0.174840271	129.26125	1.5469	01:44	
0.199898240	147.78687	1.5873	01:46	
0.224901227	166.27184	1.6259	01:48	
0.249841367	184.71034	1.6631	01:50	
0.274805098	203.16629	1.6984	01:52	
0.299737374	221.59898	1.7341	01:54	

Sample: SW SAND E20
Operator: TN
Submitter: SAIC
File: C:\...\10OCT\08-5045.SMP

Started: 10/2/2008 9:33:45AM
Completed: 10/2/2008 11:29:18AM
Report Time: 10/2/2008 11:31:24AM
Warm Free Space: 7.3265 cm³ Measured
Equilibration Interval: 10 s
Sample Density: 1.000 g/cm³

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Sample Mass: 0.5305 g
Cold Free Space: 23.1963 cm³ Measured
Low Pressure Dose: None
Automatic Degas: No

Isotherm Linear Plot



Sample: SW SAND E20
Operator: TN
Submitter: SAIC
File: C:\...\10OCT\08-5045.SMP

Started: 10/2/2008 9:33:45AM
Completed: 10/2/2008 11:29:18AM
Report Time: 10/2/2008 11:31:24AM
Warm Free Space: 7.3265 cm³ Measured
Equilibration Interval: 10 s
Sample Density: 1.000 g/cm³

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Sample Mass: 0.5305 g
Cold Free Space: 23.1963 cm³ Measured
Low Pressure Dose: None
Automatic Degas: No

BET Surface Area Report

BET Surface Area: 5.6130 ± 0.0354 m²/g
Slope: 0.773688 ± 0.004845 g/cm³ STP
Y-Intercept: 0.001868 ± 0.000653 g/cm³ STP
C: 415.247638
Qm: 1.2894 cm³/g STP
Correlation Coefficient: 0.9999020
Molecular Cross-Sectional Area: 0.1620 nm²

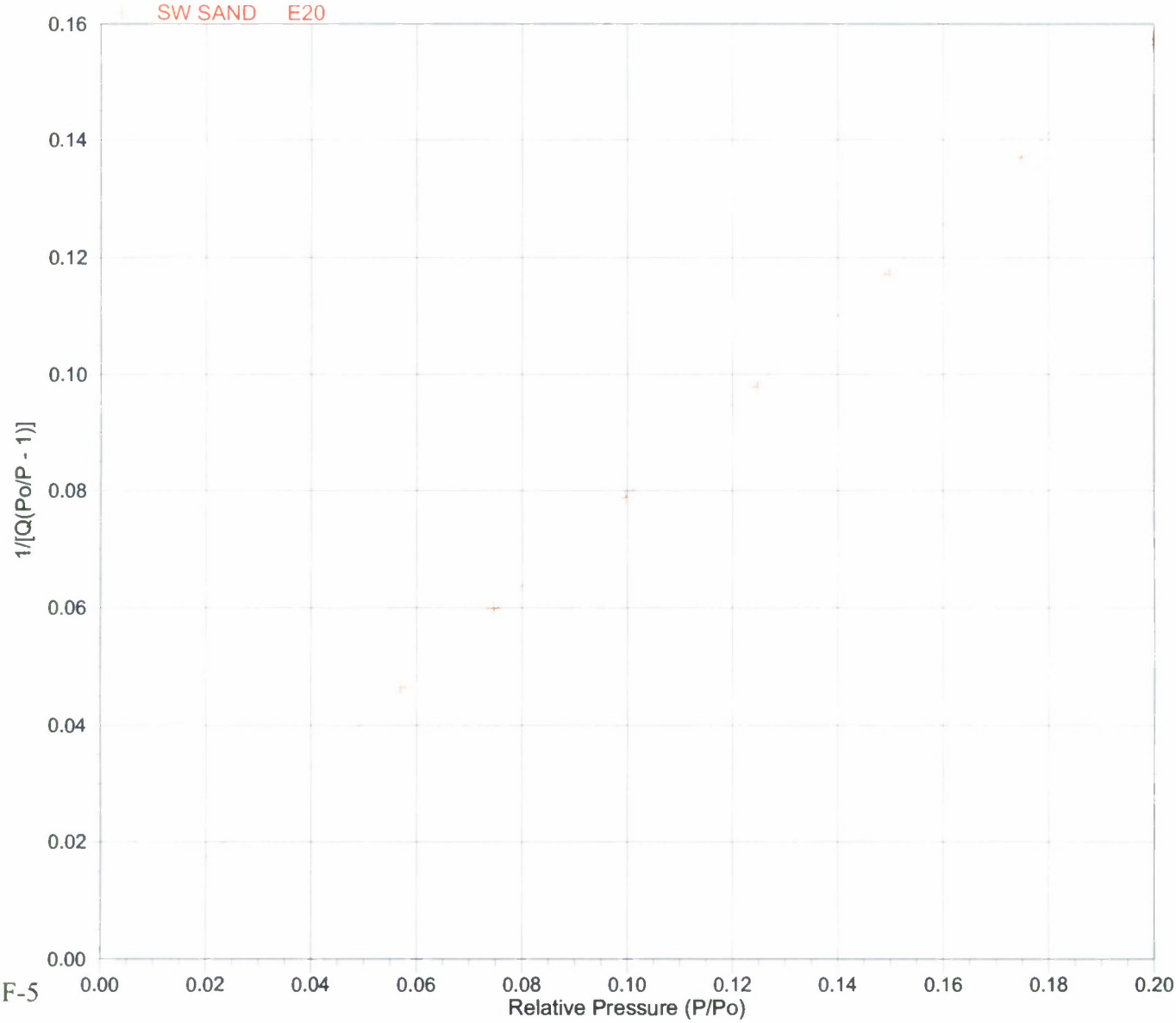
Relative Pressure (P/Po)	Quantity Adsorbed (cm³/g STP)	1/[Q(Po/P - 1)]
0.056965656	1.2994	0.046489
0.074600499	1.3479	0.059806
0.099744885	1.4065	0.078772
0.124747871	1.4573	0.097804
0.149790145	1.5042	0.117128
0.174840271	1.5469	0.136978
0.199898240	1.5873	0.157397

Sample: SW SAND E20
Operator: TN
Submitter: SAIC
File: C:\...\10OCT\08-5045.SMP

Started: 10/2/2008 9:33:45AM
Completed: 10/2/2008 11:29:18AM
Report Time: 10/2/2008 11:31:24AM
Warm Free Space: 7.3265 cm³ Measured
Equilibration Interval: 10 s
Sample Density: 1.000 g/cm³

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Sample Mass: 0.5305 g
Cold Free Space: 23.1963 cm³ Measured
Low Pressure Dose: None
Automatic Degas: No

BET Surface Area Plot



Sample: SW SAND E20
Operator: TN
Submitter: SAIC
File: C:\...\10OCT\08-5045.SMP

Started:	10/2/2008 9:33:45AM	Analysis Adsorptive:	N2
Completed:	10/2/2008 11:29:18AM	Analysis Bath Temp.:	77.300 K
Report Time:	10/2/2008 11:31:24AM	Sample Mass:	0.5305 g
Warm Free Space:	7.3265 cm^3 Measured	Cold Free Space:	23.1963 cm^3 Measured
Equilibration Interval:	10 s	Low Pressure Dose:	None
Sample Density:	1.000 g/cm^3	Automatic Degas:	No

Summary Report

Surface Area

Single point surface area at P/Po = 0.199898240: 5.5287 m^2/g

BET Surface Area: 5.6130 m^2/g

APPENDIX G
SURFACE AREA OF SAUDI SAND

MICROMERITICS ANALYTICAL SERVICES The Particle Testing Authority

Sample: Sand 4/C R2
Operator: CMS
Submitter: SAIC
File: C:\...\06JUNE\06-2343.SMP

Started: 6/20/2006 11:49:02AM
Completed: 6/20/2006 2:54:50PM
Report Time: 6/20/2006 3:35:56PM
Warm Free Space: 5.6526 cm³ Measured
Equilibration Interval: 10 s
Sample Density: 1.000 g/cm³

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Sample Mass: 4.2775 g
Cold Free Space: 16.0030 cm³ Measured
Low Pressure Dose: None
Automatic Degas: No

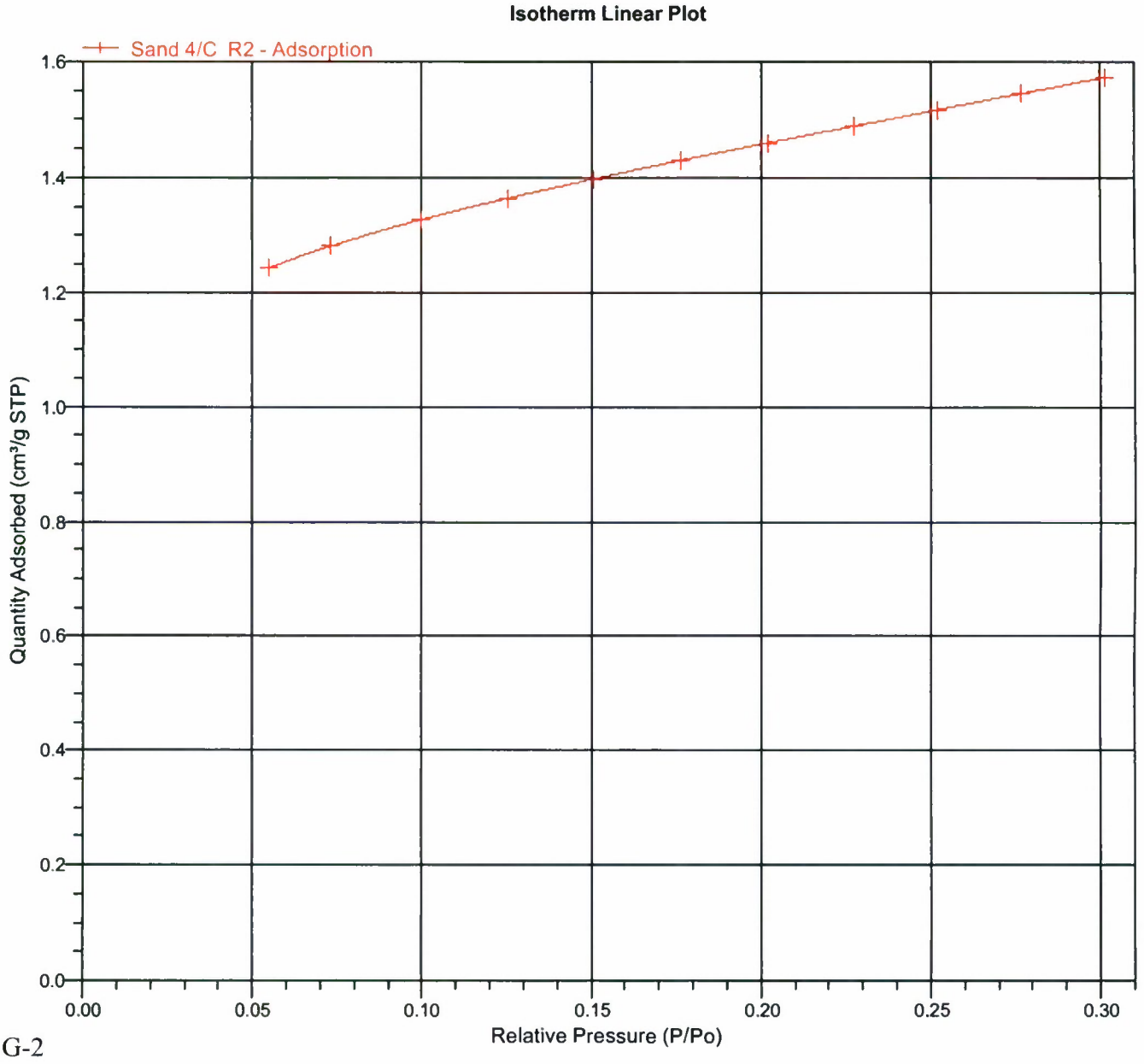
Isotherm Tabular Report

Relative Pressure (P/Po)	Absolute Pressure (mmHg)	Quantity Adsorbed (cm³/g STP)	Elapsed Time (h:min)	Saturation Pressure (mmHg)
			01:04	737.91364
0.054907533	40.51702	1.2435	02:14	
0.073075796	53.92363	1.2817	02:24	
0.099996375	73.78869	1.3275	02:33	
0.125430811	92.55711	1.3644	02:39	
0.150944663	111.38412	1.3980	02:43	
0.176367747	130.14417	1.4300	02:48	
0.202074454	149.11349	1.4605	02:52	
0.227111846	167.58893	1.4893	02:55	
0.251910984	185.88855	1.5175	02:58	
0.276522941	204.05005	1.5456	03:01	
0.301373133	222.38734	1.5737	03:04	

Sample: Sand 4/C R2
Operator: CMS
Submitter: SAIC
File: C:\...\06JUNE\06-2343.SMP

Started: 6/20/2006 11:49:02AM
Completed: 6/20/2006 2:54:50PM
Report Time: 6/20/2006 3:35:56PM
Warm Free Space: 5.6526 cm³ Measured
Equilibration Interval: 10 s
Sample Density: 1.000 g/cm³

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Sample Mass: 4.2775 g
Cold Free Space: 16.0030 cm³ Measured
Low Pressure Dose: None
Automatic Degas: No



Sample: Sand 4/C R2
Operator: CMS
Submitter: SAIC
File: C:\...\06JUNE\06-2343.SMP

Started: 6/20/2006 11:49:02AM
Completed: 6/20/2006 2:54:50PM
Report Time: 6/20/2006 3:35:56PM
Warm Free Space: 5.6526 cm³ Measured
Equilibration Interval: 10 s
Sample Density: 1.000 g/cm³

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Sample Mass: 4.2775 g
Cold Free Space: 16.0030 cm³ Measured
Low Pressure Dose: None
Automatic Degas: No

BET Surface Area Report

BET Surface Area: 5.1984 ± 0.0345 m²/g
Slope: 0.836989 ± 0.005519 g/cm³ STP
Y-Intercept: 0.000415 ± 0.000589 g/cm³ STP
C: 2017.726630
Qm: 1.1942 cm³/g STP
Correlation Coefficient: 0.9999348
Molecular Cross-Sectional Area: 0.1620 nm²

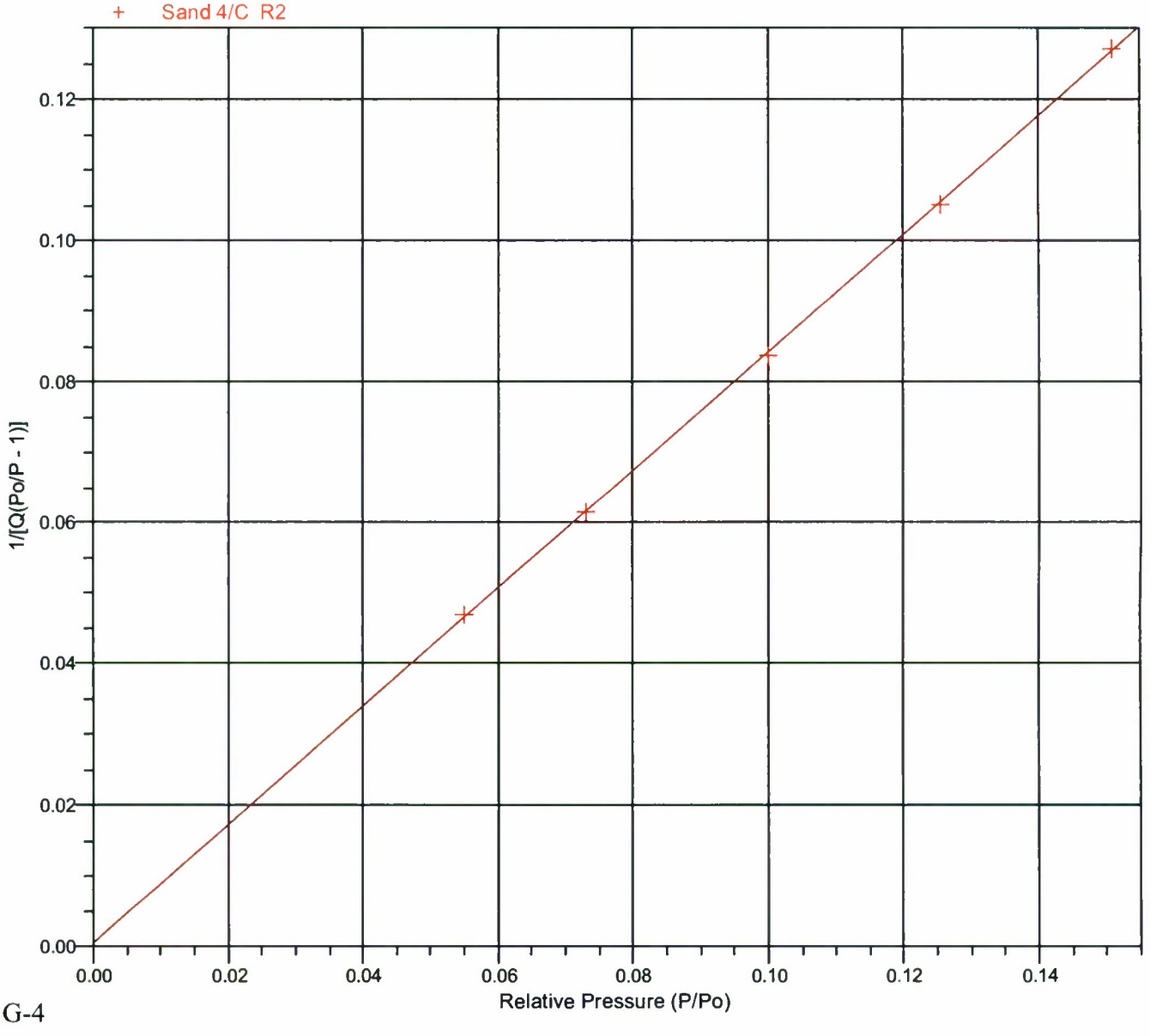
Relative Pressure (P/Po)	Quantity Adsorbed (cm³/g STP)	1/[Q(Po/P - 1)]
0.054907533	1.2435	0.046721
0.073075796	1.2817	0.061511
0.099996375	1.3275	0.083699
0.125430811	1.3644	0.105116
0.150944663	1.3980	0.127169

Sample: Sand 4/C R2
Operator: CMS
Submitter: SAIC
File: C:\...\06JUNE\06-2343.SMP

Started: 6/20/2006 11:49:02AM
Completed: 6/20/2006 2:54:50PM
Report Time: 6/20/2006 3:35:56PM
Warm Free Space: 5.6526 cm³ Measured
Equilibration Interval: 10 s
Sample Density: 1.000 g/cm³

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Sample Mass: 4.2775 g
Cold Free Space: 16.0030 cm³ Measured
Low Pressure Dose: None
Automatic Degas: No

BET Surface Area Plot



Sample: Sand 4/C R2
Operator: CMS
Submitter: SAIC
File: C:\...\06JUNE\06-2343.SMP

Started: 6/20/2006 11:49:02AM
Completed: 6/20/2006 2:54:50PM
Report Time: 6/20/2006 3:35:56PM
Warm Free Space: 5.6526 cm^3 Measured
Equilibration Interval: 10 s
Sample Density: 1.000 g/cm^3

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Sample Mass: 4.2775 g
Cold Free Space: 16.0030 cm^3 Measured
Low Pressure Dose: None
Automatic Degas: No

Summary Report

Surface Area

Single point surface area at P/Po = 0.150944663: 5.1671 m^2/g

BET Surface Area: 5.1984 m^2/g

micromeritics®

Surface Area Reports

Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4318.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:02AM
Sample Mass: 0.5005 g
Cold Free Space: 85.5700 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 27.7500 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Summary Report

Surface Area

Single point surface area at P/Po = 0.299963741: 5.8741 m²/g

BET Surface Area: 6.6002 m²/g

t-Plot Micropore Area: 1.5681 m²/g

t-Plot External Surface Area: 5.0321 m²/g

BJH Adsorption cumulative surface area of pores between 17.000 Å and 3000.000 Å diameter: 7.405 m²/g

Pore Volume

Single point adsorption total pore volume of pores less than 3757.514 Å diameter at P/Po = 0.994844735: 0.013665 cm³/g

Single point desorption total pore volume of pores less than 1050.410 Å diameter at P/Po = 0.981215282: 0.012592 cm³/g

t-Plot micropore volume: 0.001091 cm³/g

BJH Adsorption cumulative volume of pores between 17.000 Å and 3000.000 Å diameter: 0.012741 cm³/g

Pore Size

Adsorption average pore width (4V/A by BET): 82.8174 Å

Desorption average pore width (4V/A by BET): 76.3162 Å

BJH Adsorption average pore diameter (4V/A): 68.823 Å

DFT Pore Size

Volume in Pores	<	5.58 Å	:	0.00000 cm³/g
Total Volume in Pores	<=	387.34 Å	:	0.00885 cm³/g
Area in Pores	>	387.34 Å	:	0.000 m²/g
Total Area in Pores	>=	5.58 Å	:	4.687 m²/g

Horvath-Kawazoe

Maximum pore volume at P/Po = 0.299963741: 0.002982 cm³/g

Median pore width: 14.346 Å

Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4318.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:03AM
Sample Mass: 0.5005 g
Cold Free Space: 85.5700 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 27.7500 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Isotherm Tabular Report

Relative Pressure (P/Po)	Absolute Pressure (mmHg)	Quantity Adsorbed (cm³/g STP)	Elapsed Time (h:min)	Saturation Pressure (mmHg)
			00:46	739.625854
0.000001666	0.001232	0.1559	02:01	739.748535
0.000051916	0.038408	0.3255	03:10	739.804626
0.000277083	0.205086	0.4120	04:08	740.160156
0.000763473	0.565285	0.4870	05:35	740.412781
0.001421369	1.052613	0.5371	05:58	740.562500
0.002134094	1.580703	0.5739	06:19	740.690369
0.002892309	2.142371	0.6010	06:25	740.713196
0.003660298	2.711635	0.6228	06:32	740.823425
0.004462274	3.305929	0.6414	06:37	740.861877
0.005282738	3.913390	0.6576	06:42	740.788086
0.006106682	4.524208	0.6720	06:47	740.861877
0.098711869	73.131554	1.1592	06:51	740.858765
0.120059099	88.941216	1.2483	06:55	740.811951
0.150109027	111.209900	1.3665	06:59	740.860840
0.180061280	133.411209	1.4802	07:02	740.921143
0.210052465	155.638428	1.5946	07:06	740.950256
0.240016205	177.841812	1.7062	07:10	740.957520
0.270016531	200.037933	1.8182	07:14	740.835876
0.299963741	222.219543	1.9276	07:17	740.821350
0.320000311	237.075699	2.0037	07:21	740.860840
0.340016504	251.903854	2.0779	07:25	740.857727
0.379726313	281.334229	2.2234	07:28	740.886841
0.419915230	311.111847	2.3728	07:32	740.892029
0.459927699	340.762970	2.5216	07:36	740.905518
0.499902341	370.385101	2.6735	07:39	740.914917
0.539908057	400.052856	2.8252	07:43	740.964783
0.579904985	429.680145	2.9868	07:47	740.949219
0.619894927	459.320953	3.1550	07:51	740.965820
0.659970343	488.992828	3.3251	07:54	740.931519
0.699813964	518.545532	3.5109	07:58	740.976257
0.739886778	548.251587	3.7097	08:02	740.993896
0.779824710	577.873718	3.9279	08:05	741.030273
0.819962034	607.523804	4.1865	08:09	740.916992
0.859802128	637.040222	4.5045	08:13	740.914917
0.889821685	659.274719	4.8168	08:17	740.906555
0.900094288	666.910095	4.9468	08:21	740.933594
0.910100495	674.273926	5.0920	08:24	740.878540
0.919973685	681.523682	5.2507	08:28	740.807800
0.929872968	688.809814	5.4380	08:32	740.756897
0.939797977	696.257568	5.6593	08:36	740.858765
0.949860316	703.664917	5.9332	08:39	740.808838
0.955048326	707.491394	6.1021	08:43	740.791199
0.959976630	711.128235	6.2887	08:47	740.776611
0.964957596	714.759888	6.4938	08:51	740.716370
0.969863293	718.395630	6.7341	08:55	740.718445

Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4318.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:03AM
Sample Mass: 0.5005 g
Cold Free Space: 85.5700 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 27.7500 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Isotherm Tabular Report

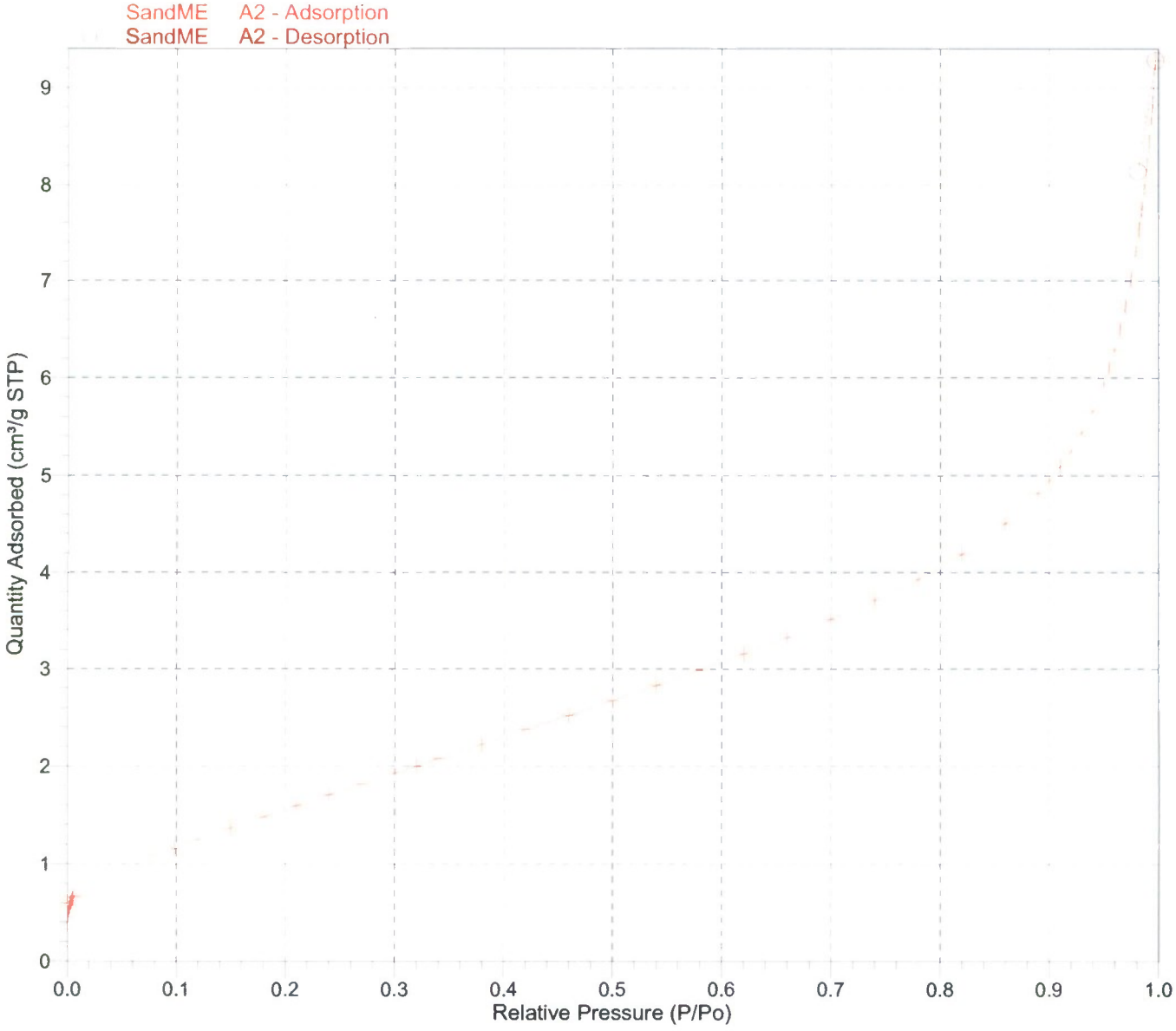
Relative Pressure (P/Po)	Absolute Pressure (mmHg)	Quantity Adsorbed (cm³/g STP)	Elapsed Time (h:min)	Saturation Pressure (mmHg)
0.974911155	722.071838	7.0130	08:58	740.653992
0.979448090	725.441284	7.3067	09:02	740.663330
0.982428389	727.638489	7.5289	09:06	740.652954
0.984952385	729.481262	7.7415	09:09	740.625916
0.987375088	731.295044	7.9650	09:13	740.645630
0.989852929	733.094238	8.2072	09:17	740.609253
0.991704677	734.504822	8.4425	09:21	740.648743
0.993963218	736.186951	8.7026	09:24	740.658142
0.994844735	736.818115	8.8345	09:28	740.636292
0.997482536	738.835022	9.2826	09:39	740.699707
0.981215282	726.807312	8.1410	09:44	740.721558

Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4318.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:03AM
Sample Mass: 0.5005 g
Cold Free Space: 85.5700 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 27.7500 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Isotherm Linear Plot



micromeritics®

Surface Area Reports

Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4318.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:03AM
Sample Mass: 0.5005 g
Cold Free Space: 85.5700 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 27.7500 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

BET Surface Area Report

BET Surface Area: 6.6002 ± 0.0377 m²/g
Slope: 0.624340 ± 0.003681 g/cm³ STP
Y-Intercept: 0.035219 ± 0.000804 g/cm³ STP
C: 18.727137
Qm: 1.5162 cm³/g STP
Correlation Coefficient: 0.9999131
Molecular Cross-Sectional Area: 0.1620 nm²

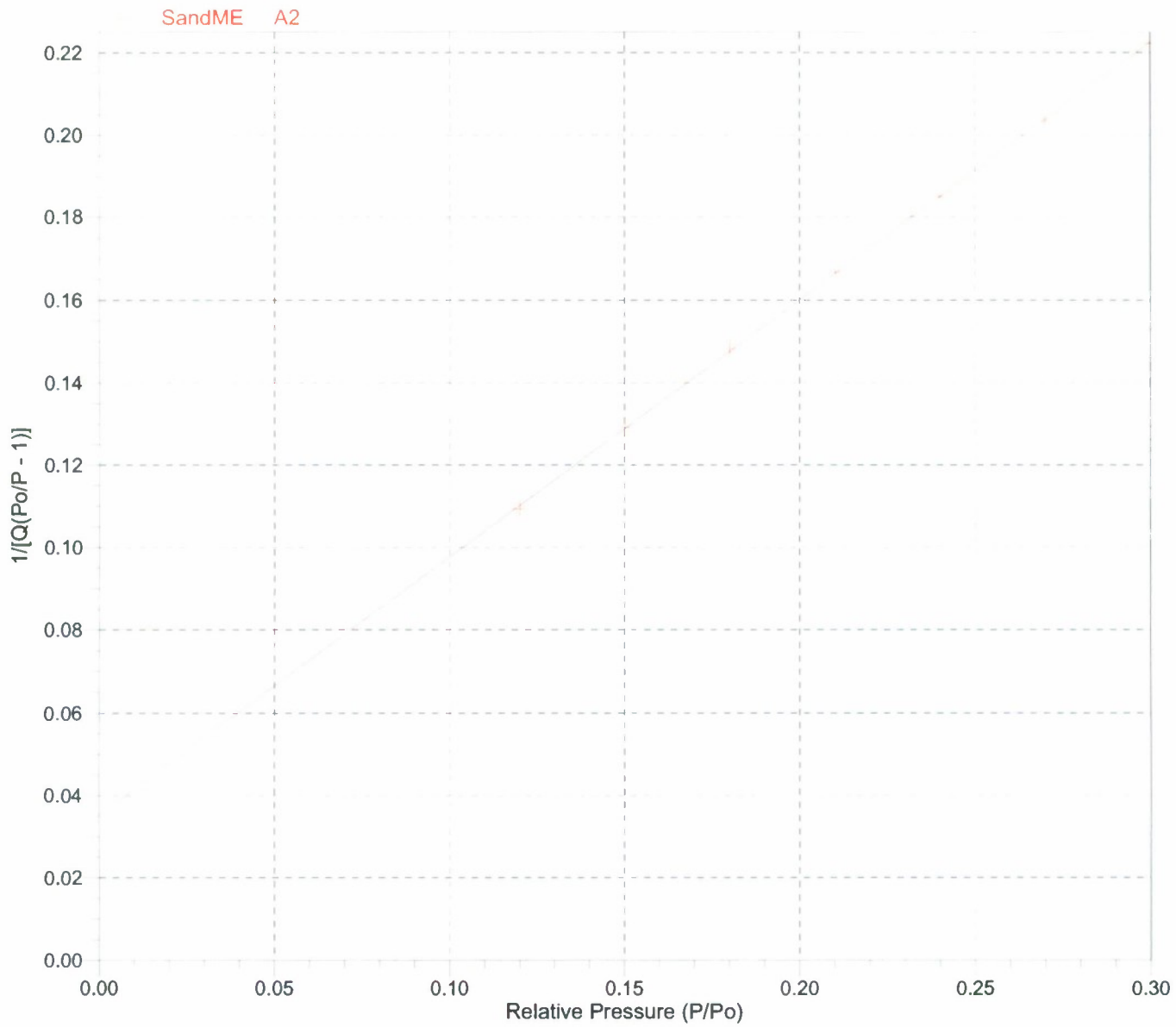
Relative Pressure (P/Po)	Quantity Adsorbed (cm³/g STP)	1/[Q(Po/P - 1)]
0.120059099	1.2483	0.109299
0.150109027	1.3665	0.129248
0.180061280	1.4802	0.148356
0.210052465	1.5946	0.166752
0.240016205	1.7062	0.185098
0.270016531	1.8182	0.203438
0.299963741	1.9276	0.222299

Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4318.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:03AM
Sample Mass: 0.5005 g
Cold Free Space: 85.5700 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 27.7500 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

BET Surface Area Plot



Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4318.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:03AM
Sample Mass: 0.5005 g
Cold Free Space: 85.5700 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 27.7500 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

t-Plot Report

Micropore Volume: 0.001091 cm³/g
Micropore Area: 1.5681 m²/g
External Surface Area: 5.0321 m²/g
Slope: 0.325323 ± 0.007240 cm³/g·Å STP
Y-Intercept: 0.705306 ± 0.065026 cm³/g STP
Correlation Coefficient: 0.999505
Surface Area Correction Factor: 1.000
Density Conversion Factor: 0.0015468
Total Surface Area (BET): 6.6002 m²/g
Thickness Range: 8.0000 Å to 10.0000 Å
Thickness Equation: Harkins and Jura

t = [13.99 / (0.034 - log(P/Po))] ^ 0.5

Relative Pressure (P/Po)	Statistical Thickness (Å)	Quantity Adsorbed (cm³/g STP)
0.000001666	1.5514	0.1559
0.000051916	1.7998	0.3255
0.000277083	1.9737	0.4120
0.000763473	2.1070	0.4870
0.001421369	2.2035	0.5371
0.002134094	2.2743	0.5739
0.002892309	2.3319	0.6010
0.003660298	2.3797	0.6228
0.004462274	2.4222	0.6414
0.005282738	2.4603	0.6576
0.006106682	2.4945	0.6720
0.098711869	3.6683	1.1592
0.120059099	3.8282	1.2483
0.150109027	4.0389	1.3665
0.180061280	4.2389	1.4802
0.210052465	4.4337	1.5946
0.240016205	4.6259	1.7062
0.270016531	4.8183	1.8182
0.299963741	5.0120	1.9276
0.320000311	5.1433	2.0037
0.340016504	5.2764	2.0779
0.379726313	5.5479	2.2234
0.419915230	5.8354	2.3728
0.459927699	6.1382	2.5216
0.499902341	6.4612	2.6735
0.539908057	6.8098	2.8252
0.579904985	7.1897	2.9868
0.619894927	7.6083	3.1550
0.659970343	8.0764	3.3251
0.699813964	8.6032	3.5109
0.739886778	9.2126	3.7097
0.779824710	9.9257	3.9279

Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4318.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:03AM
Sample Mass: 0.5005 g
Cold Free Space: 85.5700 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 27.7500 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Relative Pressure (P/Po)	Statistical Thickness (Å)	Quantity Adsorbed (cm³/g STP)
0.819962034	10.7881	4.1865
0.859802128	11.8516	4.5045
0.889821685	12.8521	4.8168
0.900094288	13.2479	4.9468
0.910100495	13.6659	5.0920
0.919973685	14.1145	5.2507
0.929872968	14.6061	5.4380
0.939797977	15.1484	5.6593
0.949860316	15.7579	5.9332
0.955048326	16.0996	6.1021
0.959976630	16.4437	6.2887
0.964957596	16.8129	6.4938
0.969863293	17.1999	6.7341
0.974911155	17.6252	7.0130
0.979448090	18.0335	7.3067
0.982428389	18.3166	7.5289
0.984952385	18.5664	7.7415
0.987375088	18.8153	7.9650
0.989852929	19.0800	8.2072
0.991704677	19.2847	8.4425
0.993963218	19.5430	8.7026
0.994844735	19.6466	8.8345
0.997482536	19.9659	9.2826

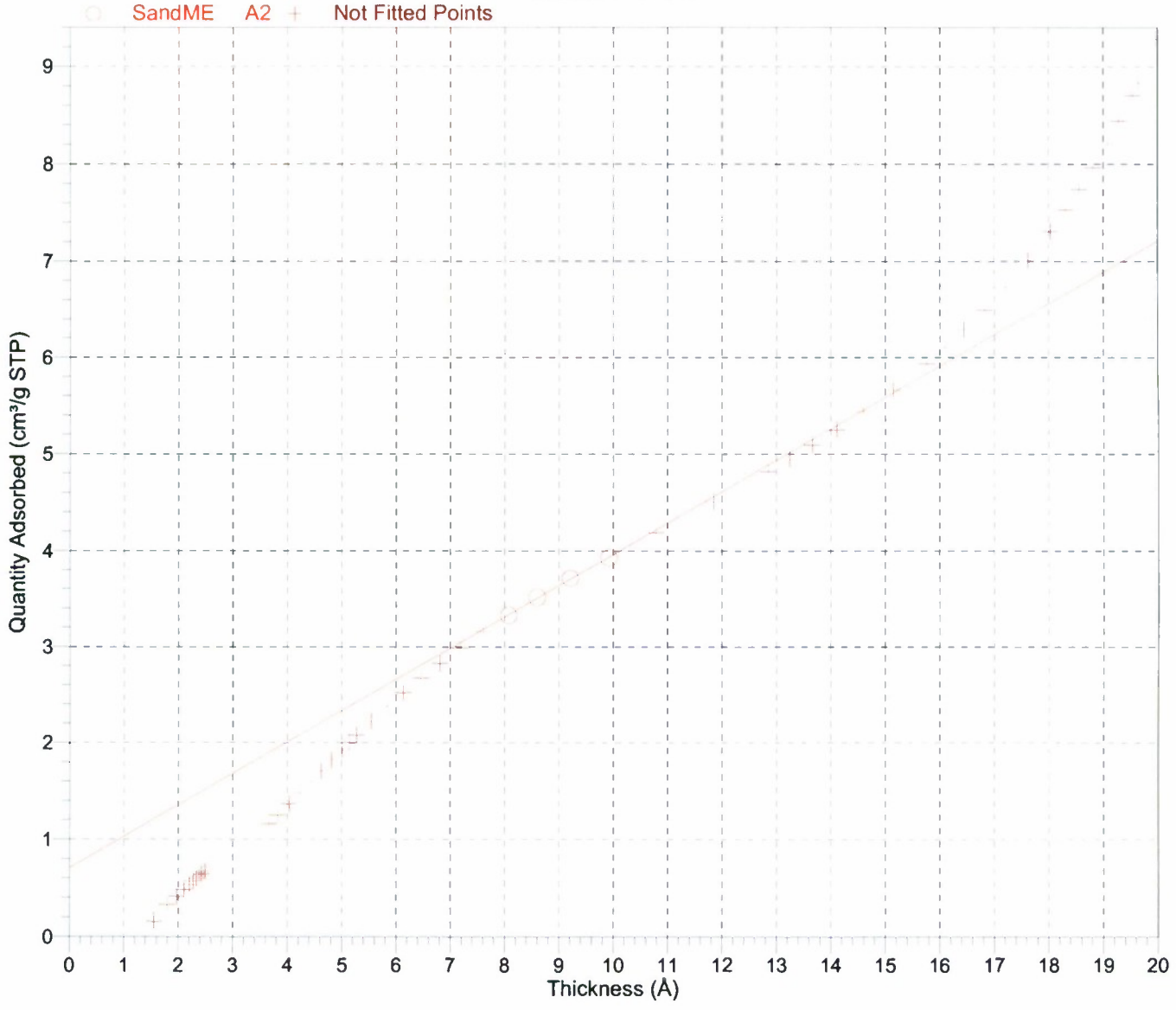
Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4318.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:03AM
Sample Mass: 0.5005 g
Cold Free Space: 85.5700 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 27.7500 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

t-Plot

Harkins and Jura



Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4318.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:03AM
Sample Mass: 0.5005 g
Cold Free Space: 85.5700 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 27.7500 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Porosity Distribution by Density Functional Theory
Model: N2 @ 77K, Cylindrical Pores in an Oxide Surface
Method: Non-negative Regularization; No Smoothing

Volume in Pores	<	5.58 Å	:	0.00000 cm³/g
Total Volume in Pores	<=	387.34 Å	:	0.00885 cm³/g
Area in Pores	>	387.34 Å	:	0.000 m²/g
Total Area in Pores	>=	5.58 Å	:	4.687 m²/g

Pore Size Table

Pore Width (Å)	Cumulative Volume (cm³/g)	Incremental Volume (cm³/g)	Cumulative Area (m²/g)	Incremental Area (m²/g)
5.58	0.00000	0.00000	0.000	0.000
5.93	0.00000	0.00000	0.000	0.000
6.29	0.00000	0.00000	0.000	0.000
6.65	0.00000	0.00000	0.000	0.000
7.01	0.00000	0.00000	0.000	0.000
7.36	0.00000	0.00000	0.000	0.000
7.72	0.00000	0.00000	0.000	0.000
8.08	0.00000	0.00000	0.000	0.000
8.44	0.00000	0.00000	0.000	0.000
8.79	0.00000	0.00000	0.000	0.000
9.15	0.00000	0.00000	0.000	0.000
9.51	0.00000	0.00000	0.000	0.000
9.87	0.00000	0.00000	0.000	0.000
10.22	0.00000	0.00000	0.000	0.000
10.58	0.00000	0.00000	0.000	0.000
10.94	0.00000	0.00000	0.000	0.000
11.30	0.00000	0.00000	0.000	0.000
11.65	0.00000	0.00000	0.000	0.000
12.01	0.00000	0.00000	0.000	0.000
12.37	0.00000	0.00000	0.000	0.000
12.73	0.00000	0.00000	0.000	0.000
13.08	0.00000	0.00000	0.000	0.000
13.44	0.00000	0.00000	0.000	0.000
13.80	0.00009	0.00009	0.273	0.273
14.16	0.00019	0.00010	0.545	0.273
14.51	0.00019	0.00000	0.545	0.000
14.87	0.00019	0.00000	0.545	0.000
15.23	0.00019	0.00000	0.545	0.000
15.59	0.00019	0.00000	0.545	0.000
15.94	0.00019	0.00000	0.545	0.000
16.30	0.00019	0.00000	0.545	0.000
16.66	0.00019	0.00000	0.545	0.000
17.02	0.00031	0.00012	0.818	0.273
17.37	0.00031	0.00000	0.818	0.000
17.73	0.00031	0.00000	0.818	0.000
18.09	0.00031	0.00000	0.818	0.000
18.44	0.00031	0.00000	0.818	0.000

Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4318.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:03AM
Sample Mass: 0.5005 g
Cold Free Space: 85.5700 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 27.7500 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Pore Size Table

Pore Width (Å)	Cumulative Volume (cm³/g)	Incremental Volume (cm³/g)	Cumulative Area (m²/g)	Incremental Area (m²/g)
18.80	0.00031	0.00000	0.818	0.000
19.16	0.00031	0.00000	0.818	0.000
19.52	0.00031	0.00000	0.818	0.000
19.87	0.00031	0.00000	0.818	0.000
20.23	0.00031	0.00000	0.818	0.000
20.59	0.00031	0.00000	0.818	0.000
20.95	0.00031	0.00000	0.818	0.000
21.30	0.00031	0.00000	0.818	0.000
21.66	0.00031	0.00000	0.818	0.000
22.38	0.00031	0.00000	0.818	0.000
23.09	0.00031	0.00000	0.818	0.000
23.81	0.00031	0.00000	0.818	0.000
24.52	0.00031	0.00000	0.818	0.000
25.24	0.00031	0.00000	0.818	0.000
25.95	0.00031	0.00000	0.818	0.000
26.67	0.00031	0.00000	0.818	0.000
27.38	0.00031	0.00000	0.818	0.000
28.10	0.00031	0.00000	0.818	0.000
28.81	0.00031	0.00000	0.818	0.000
29.53	0.00031	0.00000	0.818	0.000
30.24	0.00031	0.00000	0.818	0.000
30.96	0.00031	0.00000	0.818	0.000
31.67	0.00031	0.00000	0.818	0.000
32.39	0.00031	0.00000	0.818	0.000
33.10	0.00031	0.00000	0.818	0.000
33.82	0.00031	0.00000	0.818	0.000
34.53	0.00031	0.00000	0.818	0.000
35.25	0.00031	0.00000	0.818	0.000
35.96	0.00057	0.00026	1.107	0.290
36.68	0.00057	0.00000	1.107	0.000
37.39	0.00057	0.00000	1.107	0.000
38.11	0.00074	0.00018	1.292	0.185
38.82	0.00074	0.00000	1.292	0.000
39.54	0.00101	0.00027	1.563	0.270
40.25	0.00101	0.00000	1.563	0.000
40.96	0.00119	0.00018	1.743	0.180
41.68	0.00119	0.00000	1.743	0.000
42.39	0.00141	0.00021	1.944	0.201
43.11	0.00141	0.00000	1.944	0.000
43.82	0.00159	0.00018	2.107	0.164
44.54	0.00159	0.00000	2.107	0.000
45.25	0.00177	0.00018	2.266	0.159
45.97	0.00177	0.00000	2.266	0.000
46.68	0.00185	0.00009	2.340	0.074
47.40	0.00185	0.00000	2.340	0.000
48.11	0.00185	0.00000	2.340	0.000

Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4318.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:03AM
Sample Mass: 0.5005 g
Cold Free Space: 85.5700 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 27.7500 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Pore Size Table

Pore Width (Å)	Cumulative Volume (cm³/g)	Incremental Volume (cm³/g)	Cumulative Area (m²/g)	Incremental Area (m²/g)
48.83	0.00210	0.00025	2.541	0.201
49.54	0.00210	0.00000	2.541	0.000
50.26	0.00222	0.00012	2.639	0.098
52.05	0.00247	0.00025	2.833	0.194
54.91	0.00260	0.00013	2.926	0.093
57.77	0.00273	0.00013	3.017	0.092
60.98	0.00300	0.00026	3.191	0.173
64.20	0.00315	0.00015	3.285	0.095
67.42	0.00338	0.00023	3.420	0.134
70.99	0.00352	0.00014	3.501	0.081
74.57	0.00363	0.00011	3.561	0.060
78.50	0.00382	0.00019	3.657	0.095
82.79	0.00396	0.00014	3.726	0.070
87.08	0.00408	0.00011	3.778	0.052
91.37	0.00418	0.00010	3.823	0.045
96.37	0.00434	0.00017	3.891	0.069
101.38	0.00447	0.00013	3.941	0.050
106.38	0.00456	0.00009	3.976	0.034
112.10	0.00466	0.00009	4.009	0.034
117.82	0.00480	0.00014	4.057	0.047
123.90	0.00491	0.00011	4.092	0.035
130.33	0.00498	0.00007	4.115	0.023
136.76	0.00505	0.00007	4.135	0.021
143.91	0.00512	0.00007	4.155	0.020
151.06	0.00519	0.00007	4.174	0.019
158.93	0.00531	0.00012	4.205	0.030
167.15	0.00543	0.00012	4.234	0.029
175.73	0.00552	0.00009	4.254	0.020
184.66	0.00562	0.00009	4.274	0.020
193.96	0.00571	0.00010	4.294	0.020
203.97	0.00581	0.00010	4.313	0.020
214.33	0.00591	0.00010	4.332	0.019
225.06	0.00602	0.00011	4.351	0.019
236.50	0.00613	0.00011	4.369	0.018
248.29	0.00630	0.00017	4.396	0.027
261.16	0.00647	0.00017	4.422	0.026
274.39	0.00658	0.00012	4.439	0.017
287.97	0.00670	0.00012	4.455	0.016
302.63	0.00681	0.00011	4.470	0.015
318.00	0.00692	0.00011	4.485	0.014
334.08	0.00704	0.00011	4.498	0.013
350.88	0.00714	0.00011	4.510	0.012
368.76	0.00725	0.00011	4.522	0.012
387.34	0.00885	0.00159	4.687	0.164

Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4318.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:03AM
Sample Mass: 0.5005 g
Cold Free Space: 85.5700 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 27.7500 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Porosity Distribution by Density Functional Theory
Model: N2 @ 77K, Cylindrical Pores in an Oxide Surface
Method: Non-negative Regularization; No Smoothing

Standard Deviation of Fit: 0.24632, cm³/g STP

Isotherm Table

Relative Pressure	Experimental Quantity Adsorbed (cm³/g STP)	Fitted Quantity Adsorbed (cm³/g STP)	Absolute Residual (cm³/g STP)	Relative Residual
0.000001995	0.1575	0.0409	0.1166	0.740558
0.000002512	0.1600	0.0493	0.1107	0.691794
0.000003162	0.1631	0.0608	0.1024	0.627478
0.000003981	0.1671	0.0744	0.0928	0.555044
0.000005012	0.1721	0.0885	0.0836	0.485852
0.000006310	0.1783	0.1025	0.0758	0.424989
0.000007943	0.1861	0.1163	0.0699	0.375339
0.000010000	0.1959	0.1300	0.0659	0.336489
0.000012589	0.2079	0.1440	0.0639	0.307200
0.000015849	0.2227	0.1588	0.0638	0.286621
0.000019953	0.2404	0.1742	0.0662	0.275320
0.000025119	0.2612	0.1903	0.0710	0.271713
0.000031623	0.2844	0.2068	0.0775	0.272580
0.000039811	0.3074	0.2241	0.0833	0.270881
0.000050119	0.3242	0.2420	0.0822	0.253489
0.000063096	0.3321	0.2607	0.0714	0.215038
0.000079433	0.3413	0.2800	0.0612	0.179452
0.000100000	0.3522	0.3000	0.0521	0.148056
0.000125892	0.3647	0.3207	0.0440	0.120759
0.000158490	0.3787	0.3420	0.0367	0.096904
0.000199526	0.3935	0.3642	0.0293	0.074356
0.000251188	0.4072	0.3871	0.0201	0.049470
0.000316228	0.4185	0.4107	0.0078	0.018587
0.000398107	0.4327	0.4349	-0.0022	-0.005125
0.000501187	0.4509	0.4598	-0.0089	-0.019745
0.000630958	0.4717	0.4852	-0.0135	-0.028700
0.000794328	0.4896	0.5113	-0.0217	-0.044380
0.001000000	0.5069	0.5380	-0.0311	-0.061437
0.001258925	0.5269	0.5654	-0.0385	-0.073136
0.001584895	0.5463	0.5934	-0.0471	-0.086203
0.001995263	0.5679	0.6221	-0.0542	-0.095494
0.002511882	0.5883	0.6515	-0.0632	-0.107511
0.003162276	0.6091	0.6816	-0.0726	-0.119116
0.003981066	0.6306	0.7125	-0.0819	-0.129888
0.005011868	0.6524	0.7442	-0.0918	-0.140639
0.006309579	0.6738	0.7768	-0.1030	-0.152859
0.007943276	0.6884	0.8106	-0.1222	-0.177562
0.010000000	0.7062	0.8458	-0.1395	-0.197571
0.012355640	0.7260	0.8790	-0.1530	-0.210762

Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4318.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:03AM
Sample Mass: 0.5005 g
Cold Free Space: 85.5700 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 27.7500 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Isotherm Table

Relative Pressure	Experimental Quantity Adsorbed (cm³/g STP)	Fitted Quantity Adsorbed (cm³/g STP)	Absolute Residual (cm³/g STP)	Relative Residual
0.015186320	0.7487	0.9124	-0.1637	-0.218671
0.018485530	0.7740	0.9453	-0.1713	-0.221327
0.022294740	0.8016	0.9779	-0.1763	-0.219912
0.026653420	0.8312	1.0100	-0.1787	-0.215029
0.031598160	0.8625	1.0426	-0.1801	-0.208839
0.037162240	0.8950	1.0752	-0.1802	-0.201353
0.043374470	0.9283	1.1081	-0.1798	-0.193731
0.050259210	0.9620	1.1412	-0.1791	-0.186196
0.057835260	0.9961	1.1737	-0.1776	-0.178249
0.066115920	1.0306	1.2056	-0.1750	-0.169803
0.075109080	1.0661	1.2368	-0.1708	-0.160180
0.084815920	1.1036	1.2672	-0.1636	-0.148271
0.095232370	1.1448	1.2967	-0.1519	-0.132662
0.106348200	1.1915	1.3262	-0.1347	-0.113065
0.118147500	1.2407	1.3569	-0.1162	-0.093694
0.130609100	1.2902	1.3899	-0.0997	-0.077264
0.143706600	1.3419	1.4254	-0.0835	-0.062233
0.157410500	1.3943	1.4619	-0.0677	-0.048531
0.171685500	1.4484	1.4987	-0.0503	-0.034713
0.186492100	1.5048	1.5355	-0.0307	-0.020400
0.201792100	1.5634	1.5725	-0.0092	-0.005863
0.217539500	1.6226	1.6097	0.0129	0.007965
0.233689500	1.6827	1.6470	0.0356	0.021168
0.250196100	1.7442	1.6846	0.0597	0.034205
0.267011800	1.8070	1.7221	0.0849	0.046977
0.284089500	1.8697	1.7598	0.1099	0.058759
0.301380300	1.9329	1.8449	0.0880	0.045525
0.318838200	1.9993	1.8814	0.1179	0.058965
0.336417100	2.0646	1.9519	0.1127	0.054596
0.354071100	2.1294	2.0415	0.0879	0.041269
0.371757900	2.1940	2.1145	0.0795	0.036257
0.389435500	2.2595	2.1942	0.0653	0.028885
0.407065800	2.3250	2.2670	0.0580	0.024943
0.424610500	2.3902	2.3402	0.0500	0.020911
0.442034200	2.4549	2.3917	0.0632	0.025746
0.459305300	2.5193	2.4832	0.0360	0.014308
0.476393400	2.5838	2.5442	0.0396	0.015341
0.493271100	2.6483	2.6390	0.0093	0.003522
0.509911800	2.7115	2.6673	0.0442	0.016300
0.526293400	2.7735	2.7301	0.0434	0.015661
0.542394700	2.8347	2.7950	0.0397	0.013999
0.558200000	2.8972	2.8995	-0.0024	-0.000815
0.573690800	2.9609	2.9256	0.0352	0.011903
0.588853900	3.0243	2.9971	0.0272	0.008989
0.603677600	3.0866	3.0924	-0.0057	-0.001861

Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4318.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:03AM
Sample Mass: 0.5005 g
Cold Free Space: 85.5700 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 27.7500 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Isotherm Table

Relative Pressure	Experimental Quantity Adsorbed (cm³/g STP)	Fitted Quantity Adsorbed (cm³/g STP)	Absolute Residual (cm³/g STP)	Relative Residual
0.618153900	3.1476	3.1164	0.0313	0.009933
0.632272400	3.2072	3.1860	0.0212	0.006613
0.646028900	3.2655	3.2459	0.0196	0.005991
0.659417100	3.3227	3.3318	-0.0090	-0.002723
0.672435500	3.3807	3.3535	0.0272	0.008037
0.685081600	3.4402	3.4250	0.0151	0.004396
0.697355300	3.4991	3.4863	0.0129	0.003674
0.709256600	3.5568	3.5441	0.0127	0.003584
0.720789500	3.6141	3.6266	-0.0125	-0.003454
0.731953900	3.6701	3.6466	0.0235	0.006402
0.742756600	3.7241	3.7148	0.0093	0.002509
0.753200000	3.7792	3.7700	0.0092	0.002425
0.763289500	3.8350	3.8271	0.0079	0.002049
0.773030300	3.8898	3.9030	-0.0132	-0.003404
0.782430300	3.9424	3.9218	0.0206	0.005223
0.791496100	3.9923	3.9857	0.0066	0.001659
0.800232900	4.0407	4.0350	0.0057	0.001420
0.808648700	4.0886	4.0831	0.0055	0.001356
0.816752600	4.1371	4.1323	0.0048	0.001168
0.824552600	4.1868	4.1821	0.0046	0.001108
0.832053900	4.2381	4.2540	-0.0158	-0.003739
0.839267100	4.2916	4.2714	0.0202	0.004702
0.846200000	4.3473	4.3435	0.0039	0.000889
0.852860500	4.4055	4.4020	0.0035	0.000801
0.859257900	4.4662	4.4630	0.0032	0.000721
0.865398700	4.5293	4.5262	0.0031	0.000673
0.871292100	4.5946	4.5918	0.0028	0.000604
0.876947400	4.6621	4.6596	0.0025	0.000544
0.882369700	4.7316	4.7292	0.0024	0.000505
0.887569700	4.8029	4.8007	0.0022	0.000453
0.892553900	4.8757	4.9027	-0.0271	-0.005553
0.897328900	4.9497	4.9204	0.0293	0.005917
0.901905300	5.0248	5.0229	0.0019	0.000380
0.906286800	5.1007	5.0990	0.0017	0.000341
0.910484200	5.1772	5.1756	0.0017	0.000322
0.914501300	5.2541	5.2525	0.0016	0.000295
0.918347400	5.3310	5.3296	0.0014	0.000270
0.922026300	5.4078	5.4065	0.0013	0.000248
0.925547400	5.4844	5.4831	0.0013	0.000231
0.928915800	5.5605	5.5593	0.0012	0.000211
0.932136800	5.6359	6.4297	-0.7938	-0.140839
0.935218400	5.7106	6.4462	-0.7357	-0.128824
0.938163200	5.7842	6.4620	-0.6778	-0.117180
0.940978900	5.8569	6.4788	-0.6219	-0.106186
0.943669700	5.9283	6.4977	-0.5694	-0.096048

Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4318.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:03AM
Sample Mass: 0.5005 g
Cold Free Space: 85.5700 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 27.7500 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Isotherm Table

Relative Pressure	Experimental Quantity Adsorbed (cm³/g STP)	Fitted Quantity Adsorbed (cm³/g STP)	Absolute Residual (cm³/g STP)	Relative Residual
0.946242100	5.9984	6.5157	-0.5173	-0.086239
0.948700000	6.0672	6.5330	-0.4658	-0.076768
0.951048700	6.1346	6.5518	-0.4172	-0.068007
0.953292100	6.2004	6.5724	-0.3720	-0.059996
0.955435500	6.2647	6.5921	-0.3274	-0.052266
0.957482900	6.3274	6.6109	-0.2836	-0.044816
0.959438200	6.3884	6.6289	-0.2405	-0.037645
0.961305300	6.4478	6.6506	-0.2028	-0.031450
0.963088200	6.5055	6.6732	-0.1676	-0.025767
0.964789500	6.5615	6.6947	-0.1332	-0.020293
0.966414500	6.6159	6.7153	-0.0994	-0.015019
0.967965800	6.6686	6.7349	-0.0663	-0.009945
0.969447400	6.7196	6.7536	-0.0340	-0.005065
0.970860500	6.7748	6.7792	-0.0044	-0.000643
0.972209200	6.8455	6.8083	0.0372	0.005439
0.973496100	6.9234	6.8360	0.0874	0.012618
0.974725000	7.0012	6.8625	0.1387	0.019816
0.975897400	7.0749	6.8878	0.1871	0.026446
0.977015800	7.1455	6.9119	0.2337	0.032699
0.978082900	7.2145	6.9349	0.2796	0.038757
0.979101300	7.2827	6.9568	0.3259	0.044748
0.980072400	7.3507	6.9777	0.3730	0.050747
0.980998700	7.4185	6.9971	0.4214	0.056802
0.981882900	7.4859	7.0156	0.4703	0.062825
0.982726300	7.5529	7.0333	0.5196	0.068794
0.983530300	7.6188	7.0501	0.5687	0.074647
0.984297400	7.6840	7.0662	0.6178	0.080398
0.985028900	7.7483	7.1294	0.6190	0.079883
0.985727600	7.8118	7.1897	0.6220	0.079626
0.986392100	7.8732	7.2472	0.6261	0.079518
0.987027600	7.9325	7.3021	0.6305	0.079479
0.987632900	7.9891	7.3544	0.6347	0.079452
0.988209200	8.0432	7.4558	0.5875	0.073037
0.988760500	8.0961	7.6395	0.4566	0.056397
0.989285500	8.1482	7.8145	0.3337	0.040957
0.989785500	8.2001	7.9811	0.2189	0.026700
0.990263200	8.2548	8.2311	0.0237	0.002871
0.990718400	8.3135	8.5398	-0.2263	-0.027222
0.991151300	8.3713	8.8333	-0.4620	-0.055186
0.991565800	8.4253	9.1144	-0.6891	-0.081791
0.991959200	8.4727	9.3812	-0.9084	-0.107216

micromeritics®

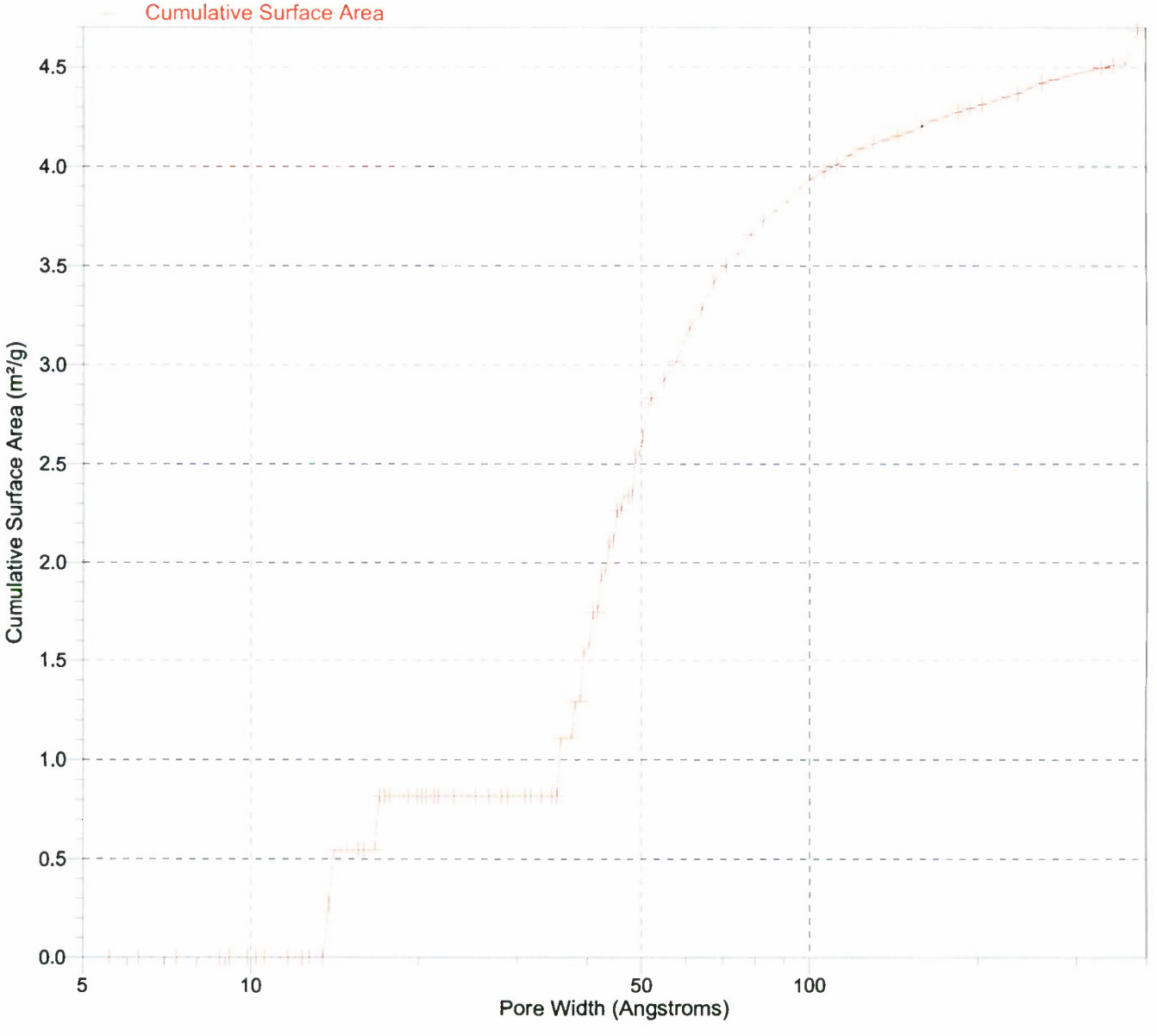
Surface Area Reports

Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4318.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:03AM
Sample Mass: 0.5005 g
Cold Free Space: 85.5700 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 27.7500 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Cumulative Surface Area vs. Pore Width

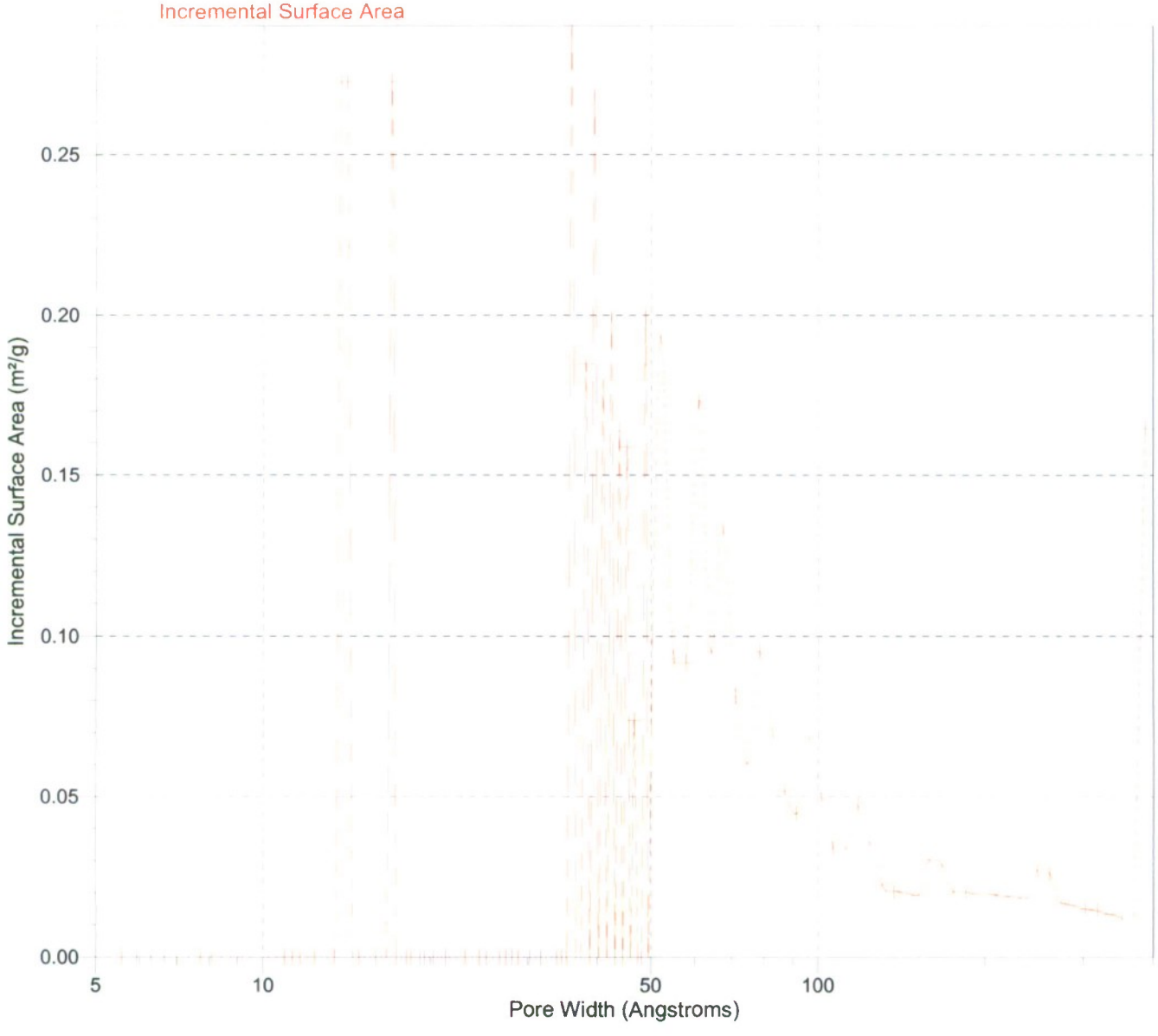


Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4318.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:03AM
Sample Mass: 0.5005 g
Cold Free Space: 85.5700 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 27.7500 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Incremental Surface Area vs. Pore Width

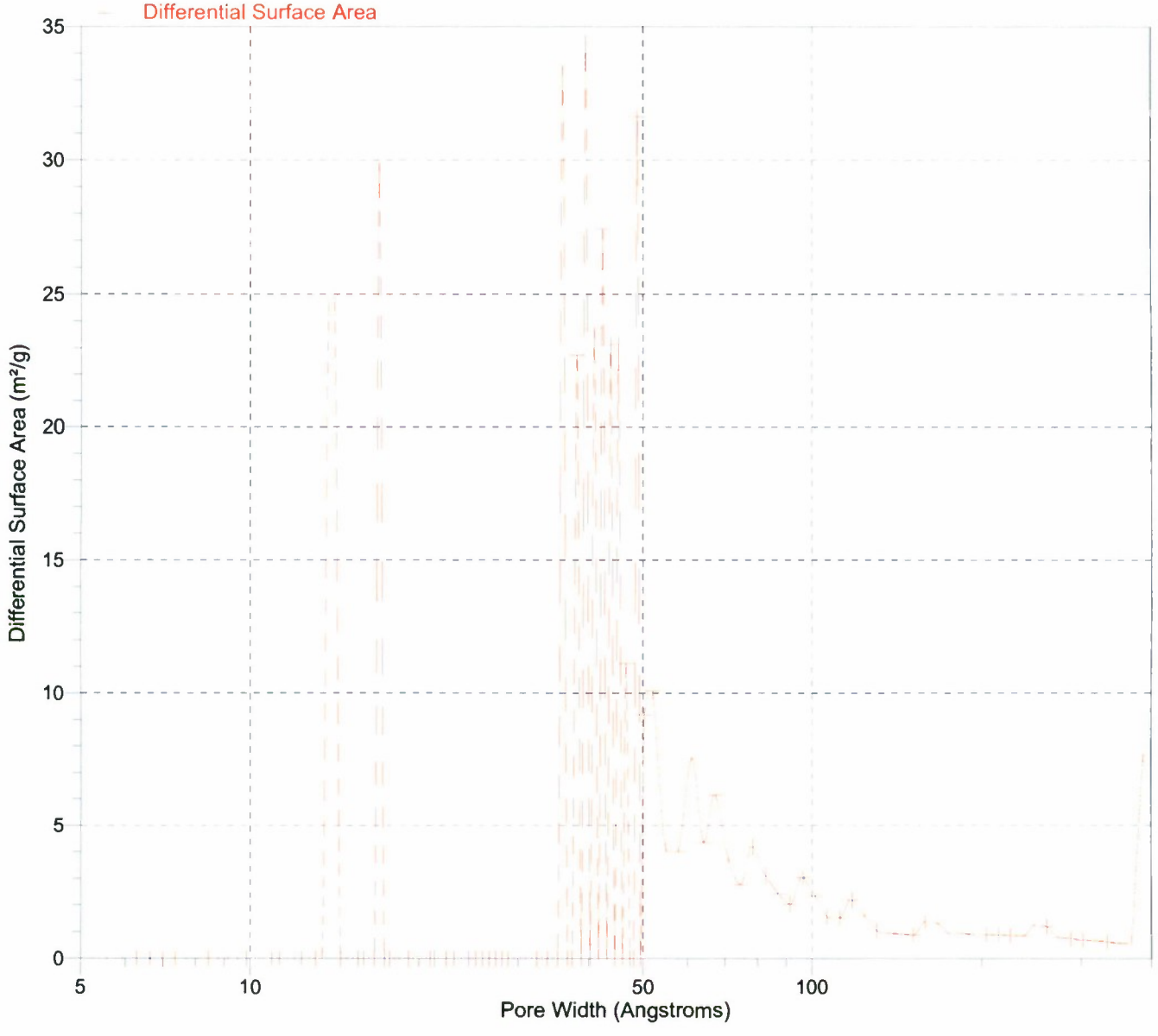


Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4318.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:03AM
Sample Mass: 0.5005 g
Cold Free Space: 85.5700 cm³
Low Pressure Dose: 0.200 cm³/g STP

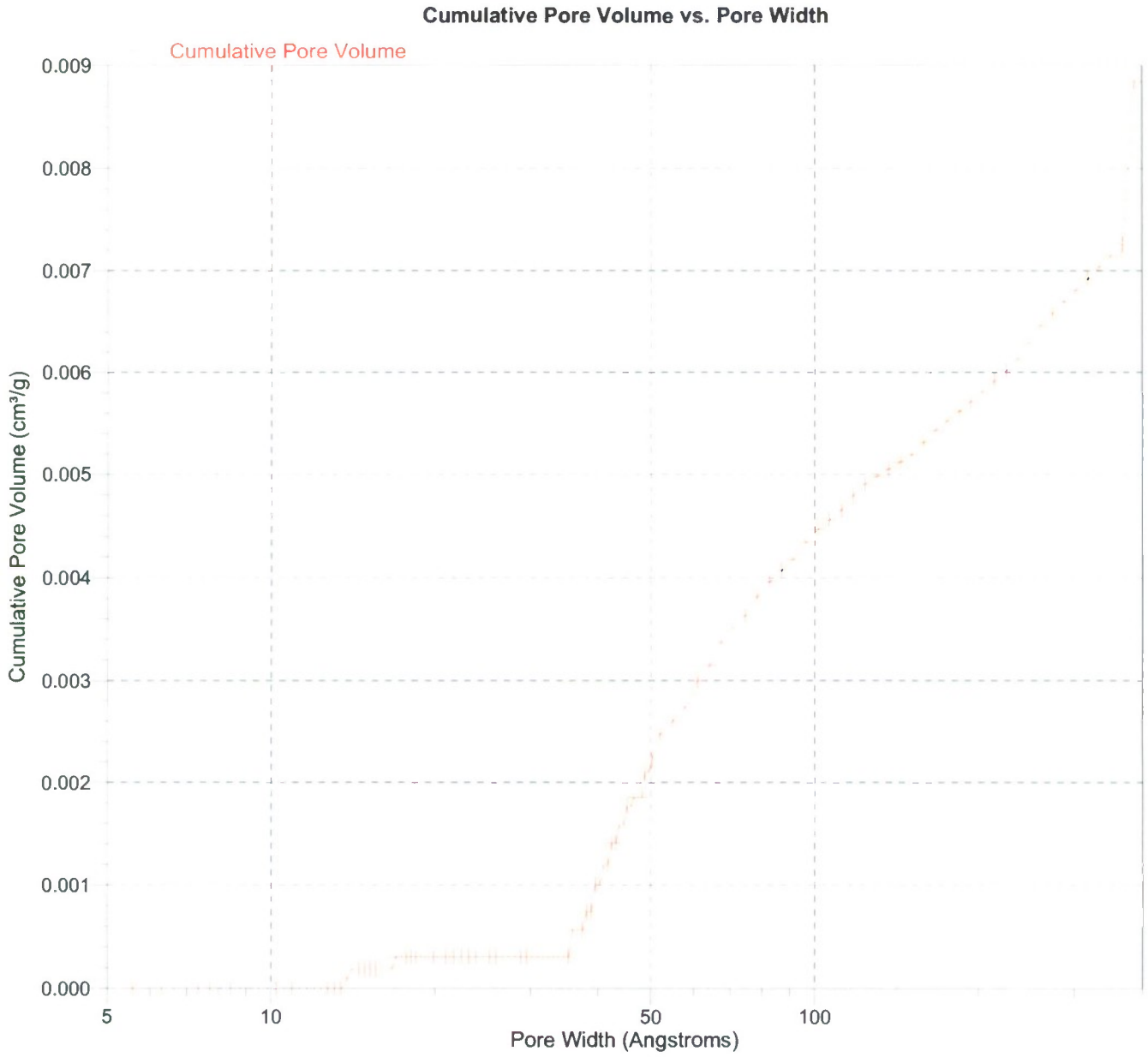
Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 27.7500 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Differential Surface Area vs. Pore Width



Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4318.SMP

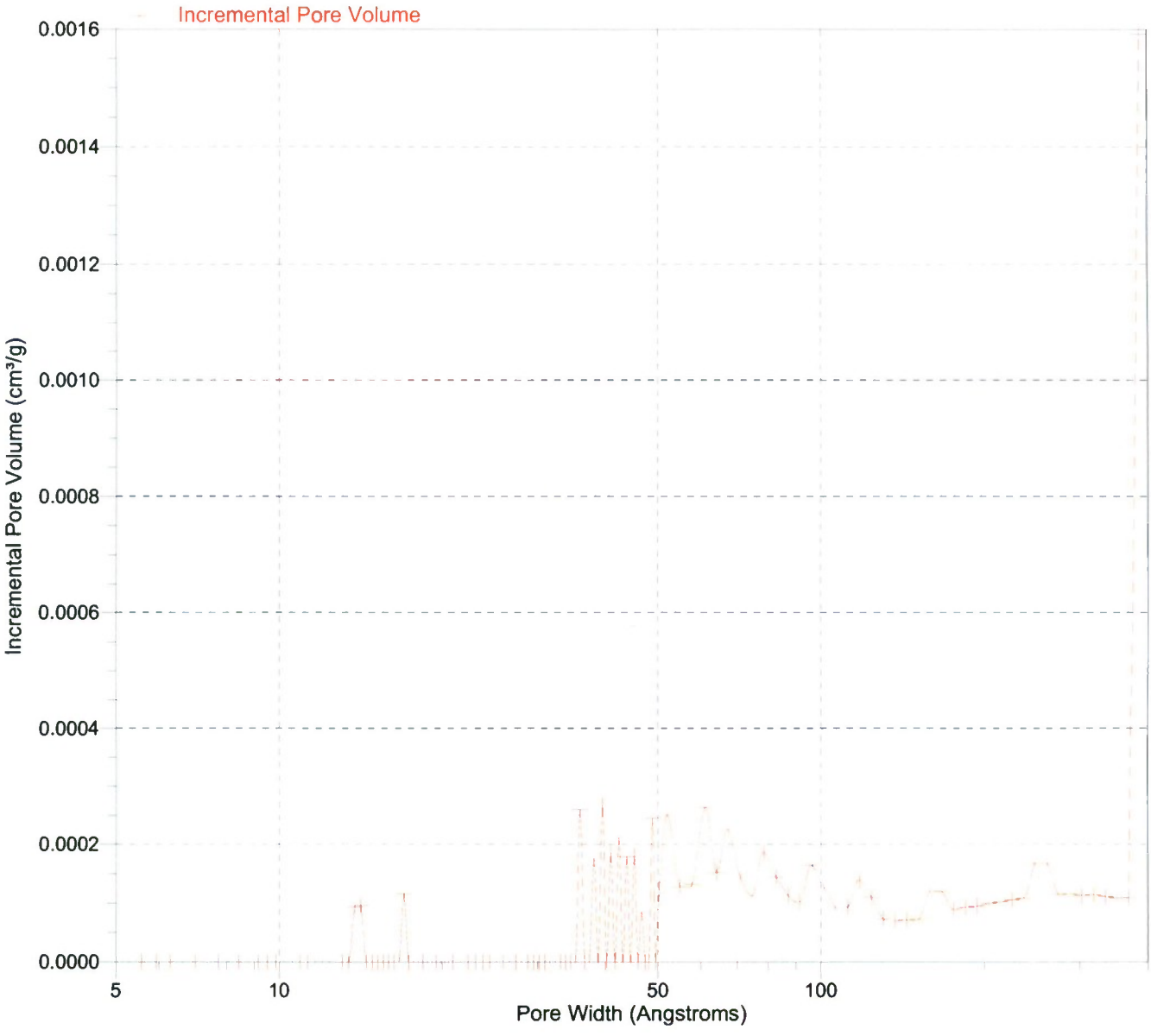
Started:	10/26/2007 3:36:45PM	Analysis Adsorptive:	N2
Completed:	10/27/2007 2:12:52AM	Analysis Bath Temp.:	77.300 K
Report Time:	10/30/2007 9:27:03AM	Thermal Correction:	No
Sample Mass:	0.5005 g	Warm Free Space:	27.7500 cm³ Entered
Cold Free Space:	85.5700 cm³	Equilibration Interval:	20 s
Low Pressure Dose:	0.200 cm³/g STP	Automatic Degas:	No



Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4318.SMP

Started:	10/26/2007 3:36:45PM	Analysis Adsorptive:	N2
Completed:	10/27/2007 2:12:52AM	Analysis Bath Temp.:	77.300 K
Report Time:	10/30/2007 9:27:03AM	Thermal Correction:	No
Sample Mass:	0.5005 g	Warm Free Space:	27.7500 cm³ Entered
Cold Free Space:	85.5700 cm³	Equilibration Interval:	20 s
Low Pressure Dose:	0.200 cm³/g STP	Automatic Degas:	No

Incremental Pore Volume vs. Pore Width

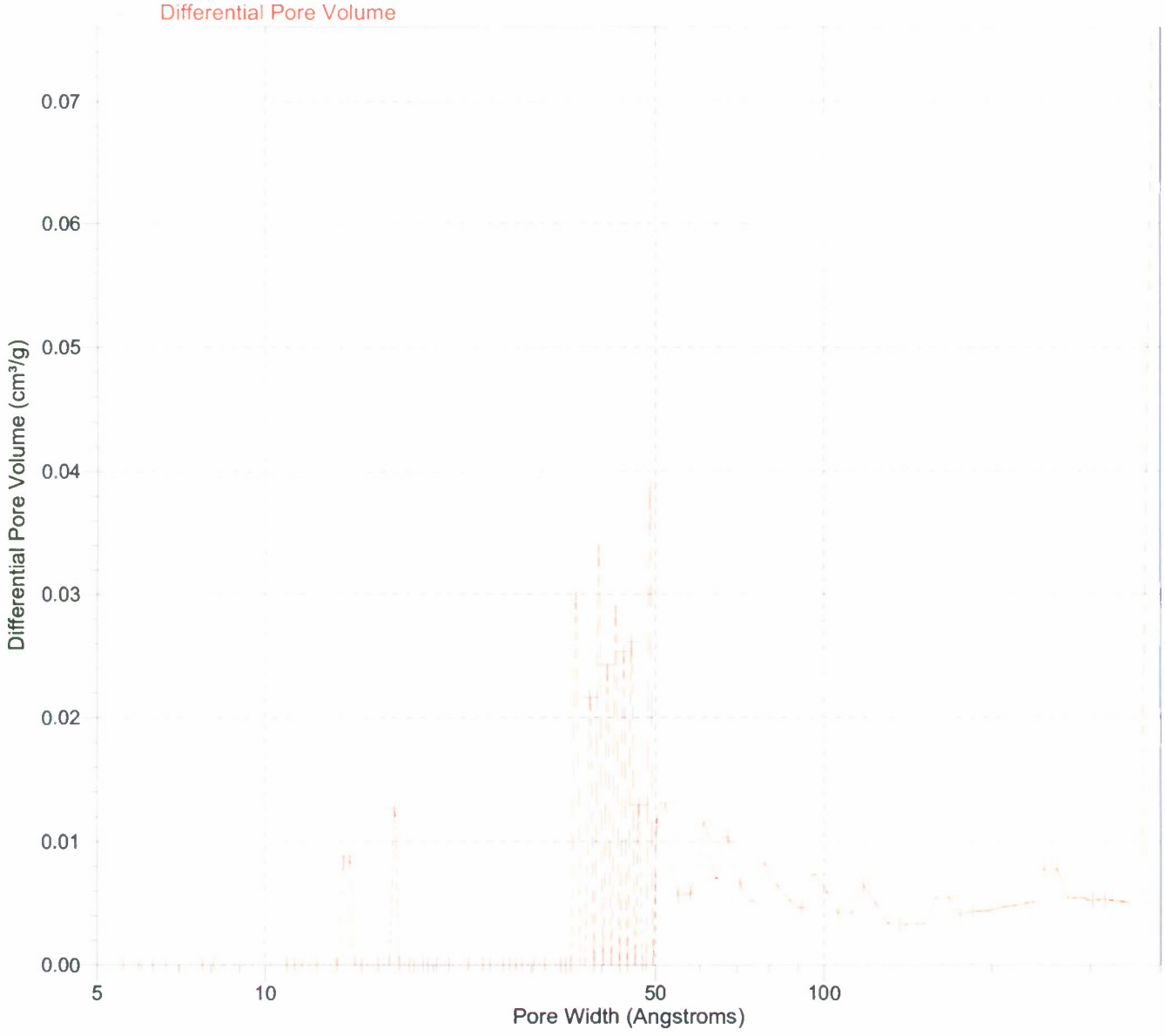


Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4318.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:03AM
Sample Mass: 0.5005 g
Cold Free Space: 85.5700 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 27.7500 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

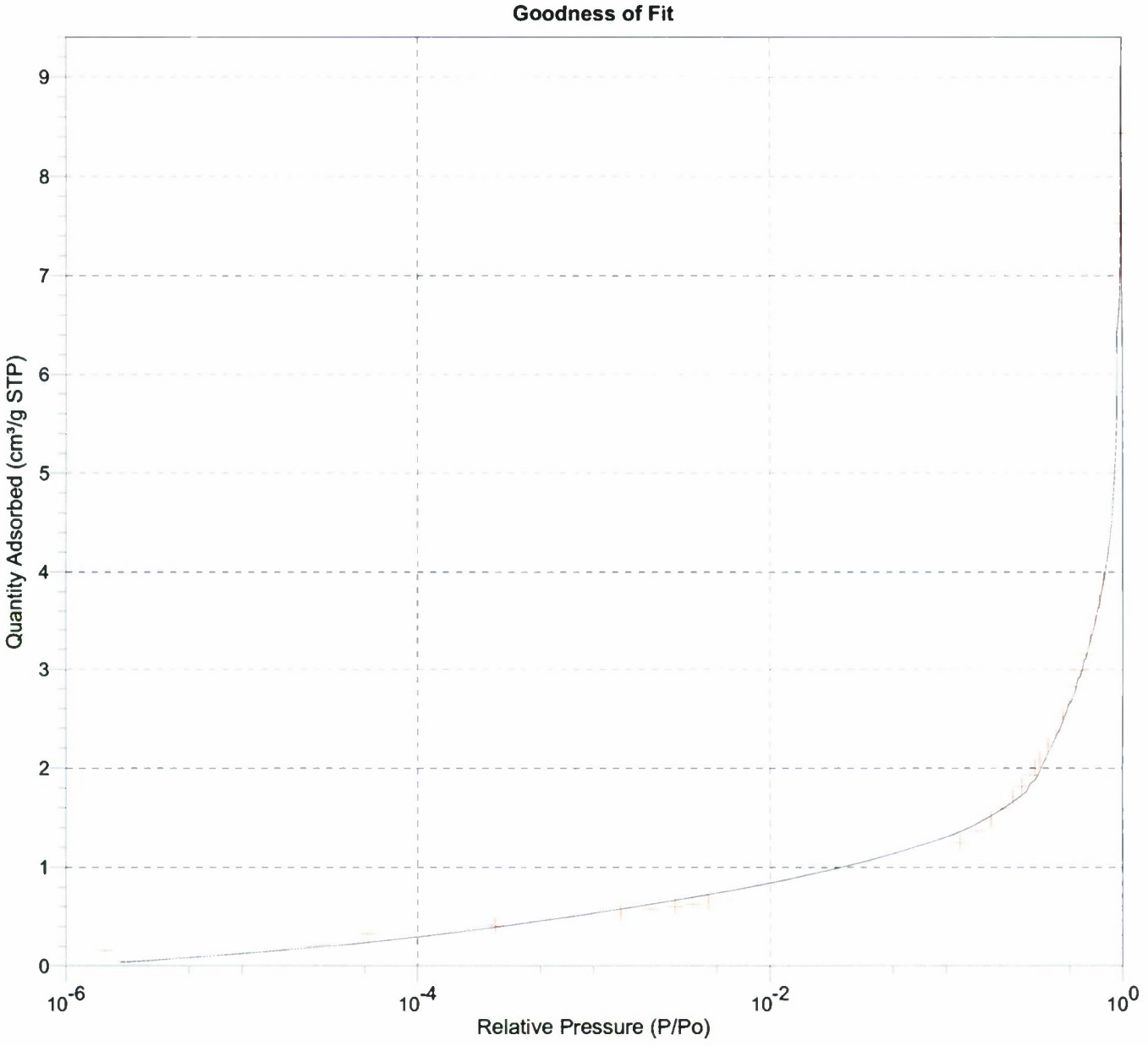
Differential Pore Volume vs. Pore Width



Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4318.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:03AM
Sample Mass: 0.5005 g
Cold Free Space: 85.5700 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 27.7500 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No



micromeritics®

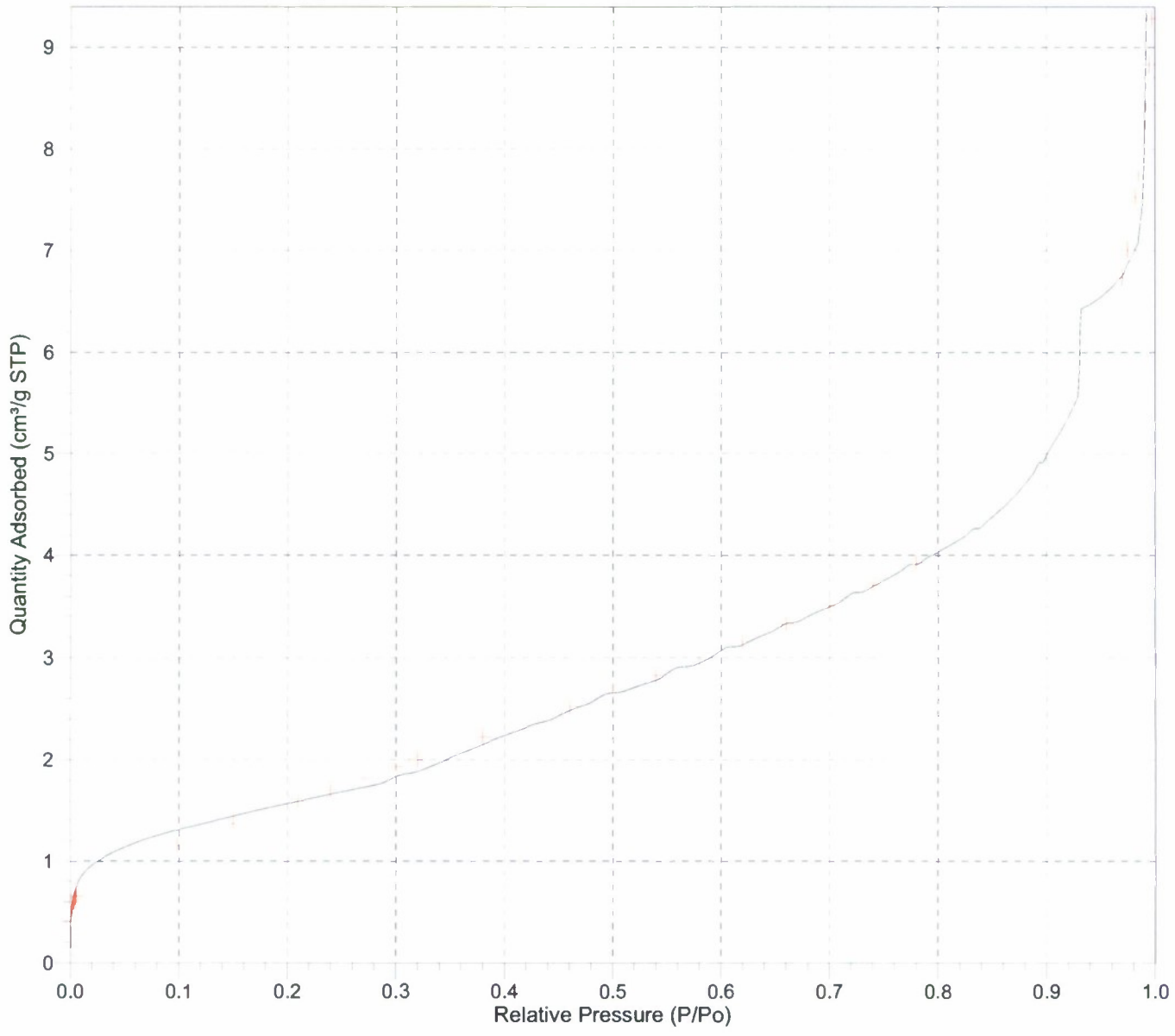
Surface Area Reports

Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\10OCT\07-4318.SMP

Started: 10/26/2007 3:36:45PM
Completed: 10/27/2007 2:12:52AM
Report Time: 10/30/2007 9:27:03AM
Sample Mass: 0.5005 g
Cold Free Space: 85.5700 cm³
Low Pressure Dose: 0.200 cm³/g STP

Analysis Adsorptive: N2
Analysis Bath Temp.: 77.300 K
Thermal Correction: No
Warm Free Space: 27.7500 cm³ Entered
Equilibration Interval: 20 s
Automatic Degas: No

Goodness of Fit



Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\09SEPT\07-3697.SMP

Started: 9/25/2007 4:54:40PM
Completed: 9/26/2007 2:39:27AM
Report Time: 9/26/2007 2:50:54PM
Sample Mass: 0.5005 g
Cold Free Space: 85.5676 cm³
Low Pressure Dose: None

Analysis Adsorptive: Kr
Analysis Bath Temp.: 77.140 K
Thermal Correction: Yes
Warm Free Space: 27.7499 cm³ Measured
Equilibration Interval: 10 s
Automatic Degas: No

Summary Report

Surface Area

Single point surface area at P/Po = 0.181372054: 3.3579 m²/g

BET Surface Area: 3.5984 m²/g

Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\09SEPT\07-3697.SMP

Started: 9/25/2007 4:54:40PM
Completed: 9/26/2007 2:39:27AM
Report Time: 9/26/2007 2:50:54PM
Sample Mass: 0.5005 g
Cold Free Space: 85.5676 cm³
Low Pressure Dose: None

Analysis Adsorptive: Kr
Analysis Bath Temp.: 77.140 K
Thermal Correction: Yes
Warm Free Space: 27.7499 cm³ Measured
Equilibration Interval: 10 s
Automatic Degas: No

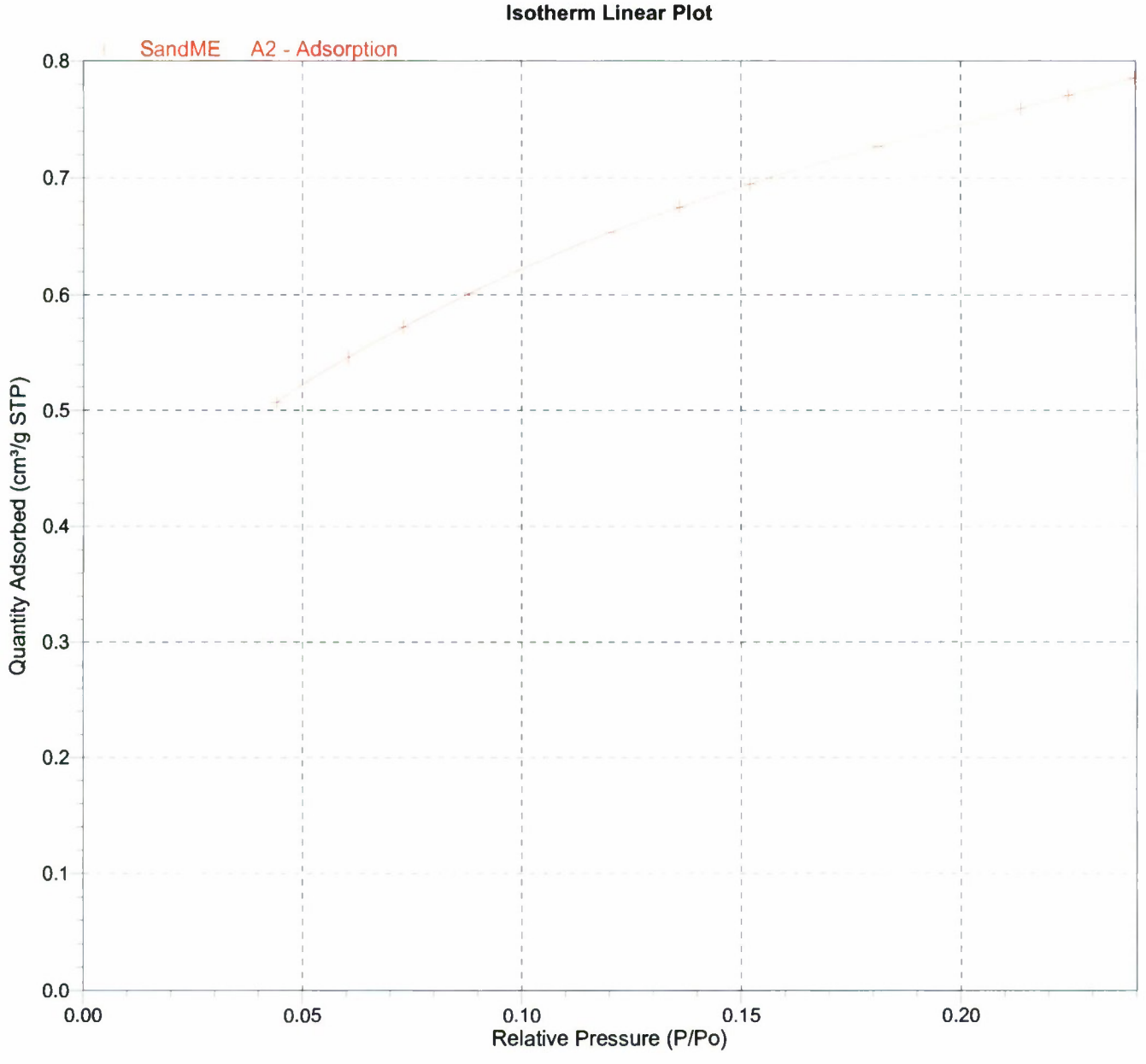
Isotherm Tabular Report

Relative Pressure (P/Po)	Absolute Pressure (mmHg)	Quantity Adsorbed (cm³/g STP)	Elapsed Time (h:min)	Saturation Pressure (mmHg)
			00:45	2.363671
0.044135126	0.104552	0.5071	07:28	
0.060531719	0.143391	0.5468	07:55	
0.073080988	0.173065	0.5725	08:08	
0.088305240	0.209153	0.6016	08:21	
0.120487753	0.285180	0.6539	08:35	
0.136132966	0.322228	0.6750	08:44	
0.152177869	0.360147	0.6951	08:58	
0.181372054	0.429191	0.7269	09:07	
0.213841328	0.505899	0.7596	09:18	
0.224775157	0.531722	0.7707	09:24	
0.239816672	0.567209	0.7855	09:30	

Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\09SEPT\07-3697.SMP

Started: 9/25/2007 4:54:40PM
Completed: 9/26/2007 2:39:27AM
Report Time: 9/26/2007 2:50:54PM
Sample Mass: 0.5005 g
Cold Free Space: 85.5676 cm³
Low Pressure Dose: None

Analysis Adsorptive: Kr
Analysis Bath Temp.: 77.140 K
Thermal Correction: Yes
Warm Free Space: 27.7499 cm³ Measured
Equilibration Interval: 10 s
Automatic Degas: No



Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\09SEPT\07-3697.SMP

Started: 9/25/2007 4:54:40PM
Completed: 9/26/2007 2:39:27AM
Report Time: 9/26/2007 2:50:54PM
Sample Mass: 0.5005 g
Cold Free Space: 85.5676 cm³
Low Pressure Dose: None

Analysis Adsorptive: Kr
Analysis Bath Temp.: 77.140 K
Thermal Correction: Yes
Warm Free Space: 27.7499 cm³ Measured
Equilibration Interval: 10 s
Automatic Degas: No

BET Surface Area Report

BET Surface Area: 3.5984 ± 0.0157 m²/g
Slope: 1.544275 ± 0.006784 g/cm³ STP
Y-Intercept: 0.023922 ± 0.000788 g/cm³ STP
C: 65.555415
Qm: 0.6377 cm³/g STP
Correlation Coefficient: 0.9999421
Molecular Cross-Sectional Area: 0.2100 nm²

Relative Pressure (P/Po)	Quantity Adsorbed (cm³/g STP)	1/[Q(Po/P - 1)]
0.044135126	0.5071	0.091047
0.060531719	0.5468	0.117837
0.073080988	0.5725	0.137725
0.088305240	0.6016	0.161011
0.120487753	0.6539	0.209494
0.136132966	0.6750	0.233469
0.152177869	0.6951	0.258236
0.181372054	0.7269	0.304799

Sample: SandME A2
Operator: AT
Submitter: SAIC
File: C:\2420\2007\09SEPT\07-3697.SMP

Started: 9/25/2007 4:54:40PM
Completed: 9/26/2007 2:39:27AM
Report Time: 9/26/2007 2:50:54PM
Sample Mass: 0.5005 g
Cold Free Space: 85.5676 cm³
Low Pressure Dose: None

Analysis Adsorptive: Kr
Analysis Bath Temp.: 77.140 K
Thermal Correction: Yes
Warm Free Space: 27.7499 cm³ Measured
Equilibration Interval: 10 s
Automatic Degas: No

BET Surface Area Plot