

23021162

MEMORANDUM FOR PRS (In-House Publication)

FROM: PROI (STINFO)

24 July 2001

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-VG-2001-168**
C.T. Liu and J. Gonzalez (Clinical Micro Sensors), "Hybrid Experimental-Numerical J-Integral Analysis and Crack Growth Resistance of a Particulate Composite Material (Keynote Lecture)"

International Conf. on Computational Science and Engineering
(Puerto Vallarta, Mexico, 20-24 August 2001) (Deadline: 14 Aug 2001)

(Statement A)

1. This request has been reviewed by the Foreign Disclosure Office for: a.) appropriateness of distribution statement, b.) military/national critical technology, c.) export controls or distribution restrictions, d.) appropriateness for release to a foreign nation, and e.) technical sensitivity and/or economic sensitivity.

Comments: _____

Signature _____ Date _____

2. This request has been reviewed by the Public Affairs Office for: a.) appropriateness for public release and/or b) possible higher headquarters review.

Comments: _____

Signature _____ Date _____

3. This request has been reviewed by the STINFO for: a.) changes if approved as amended, b) appropriateness of references, if applicable; and c.) format and completion of meeting clearance form if required

Comments: _____

Signature _____ Date _____

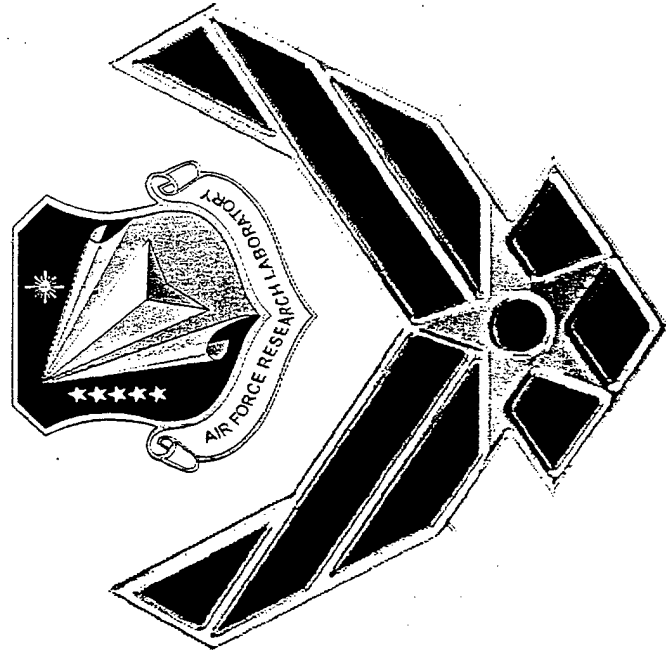
4. This request has been reviewed by PR for: a.) technical accuracy, b.) appropriateness for audience, c.) appropriateness of distribution statement, d.) technical sensitivity and economic sensitivity, e.) military/national critical technology, and f.) data rights and patentability

Comments: _____

APPROVED/APPROVED AS AMENDED/DISAPPROVED

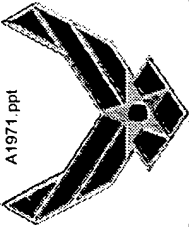
PHILIP A. KESSEL Date
Technical Advisor
Space and Missile Propulsion Division

HYBRID EXPERIMENTAL- NUMERICAL J-INTEGRAL ANALYSIS AND CRACK GROWTH RESISTANCE OF A PARTICULATE COMPOSITE MATERIAL



C.T Liu
AFRL/PRSM
10 E. Saturn Blvd
Edwards AFB, CA 93524-7680

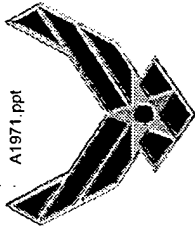
Javier Gonzalez
Clinical Micro Sensors
757 South Raymond Ave.
Pasadena, CA 91105



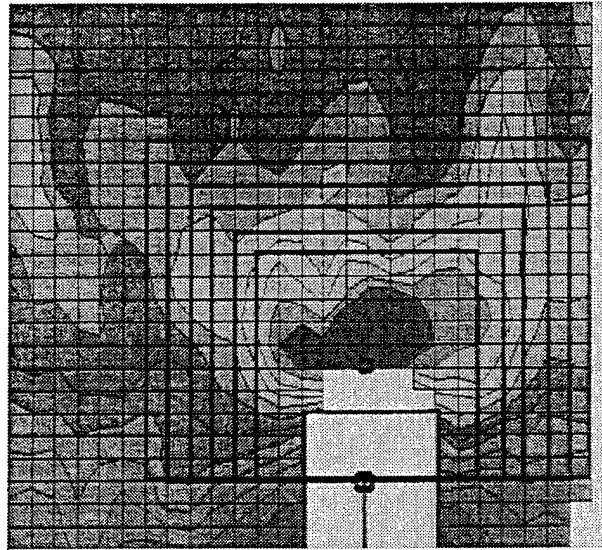
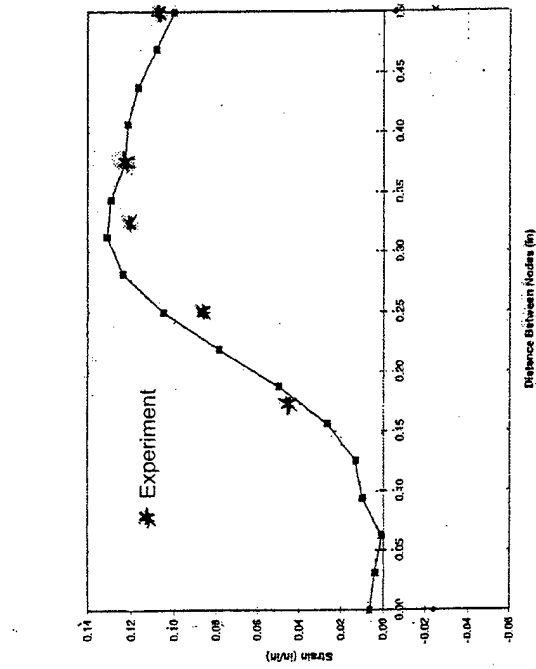
Objectives



- Investigate the Inhomogeneous Nature of the Microstructure.
- Determine J-Integral Using a Hybrid Experimental-Numerical Technique.
- Investigate Crack Growth Behavior.

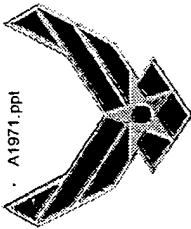


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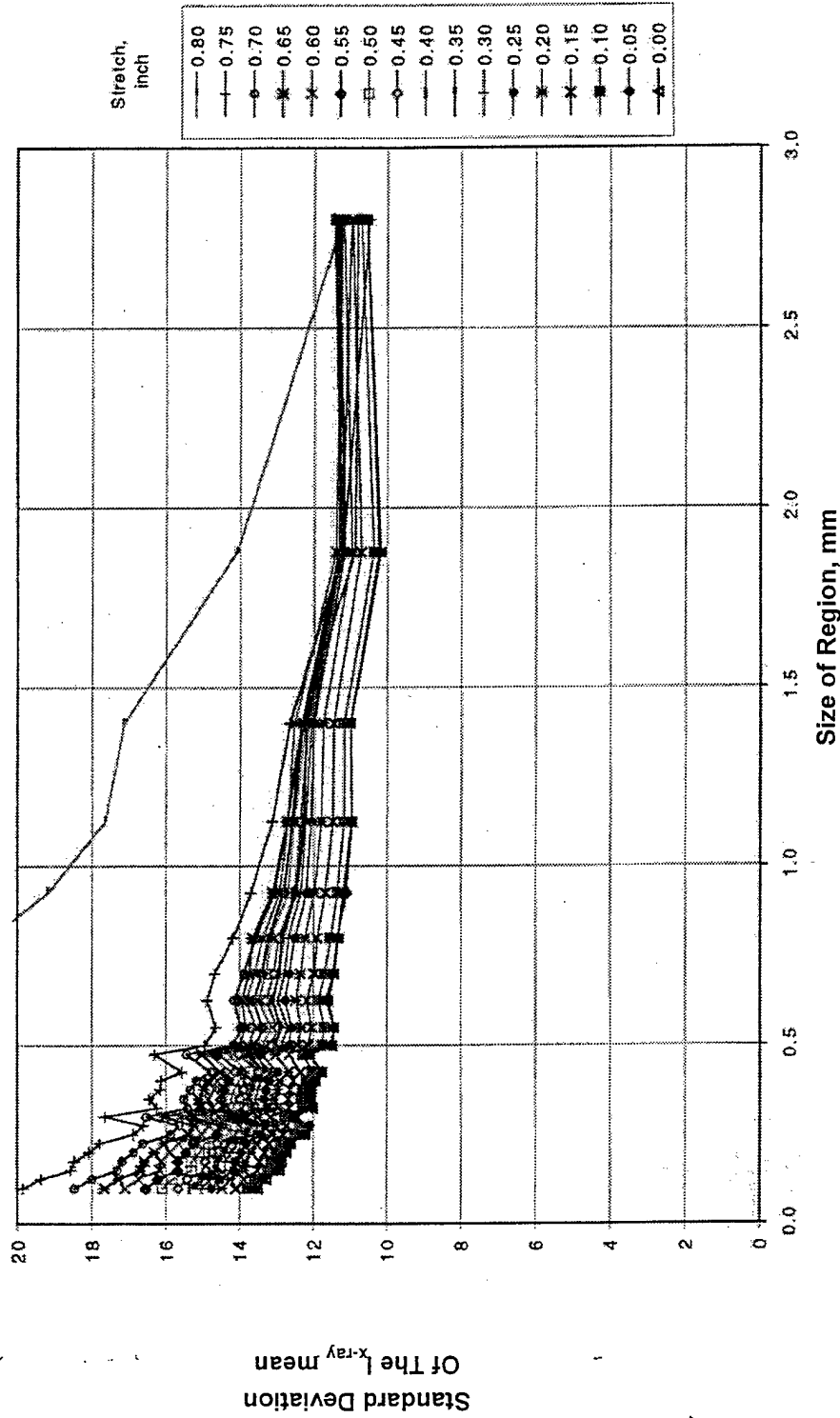
Normal Strain Along an Integration Path

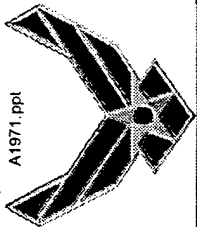
Strain Distributions and Integration Paths



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Standard Deviation of X-Ray Intensity Versus Size of Region as a Function of Applied Deformation



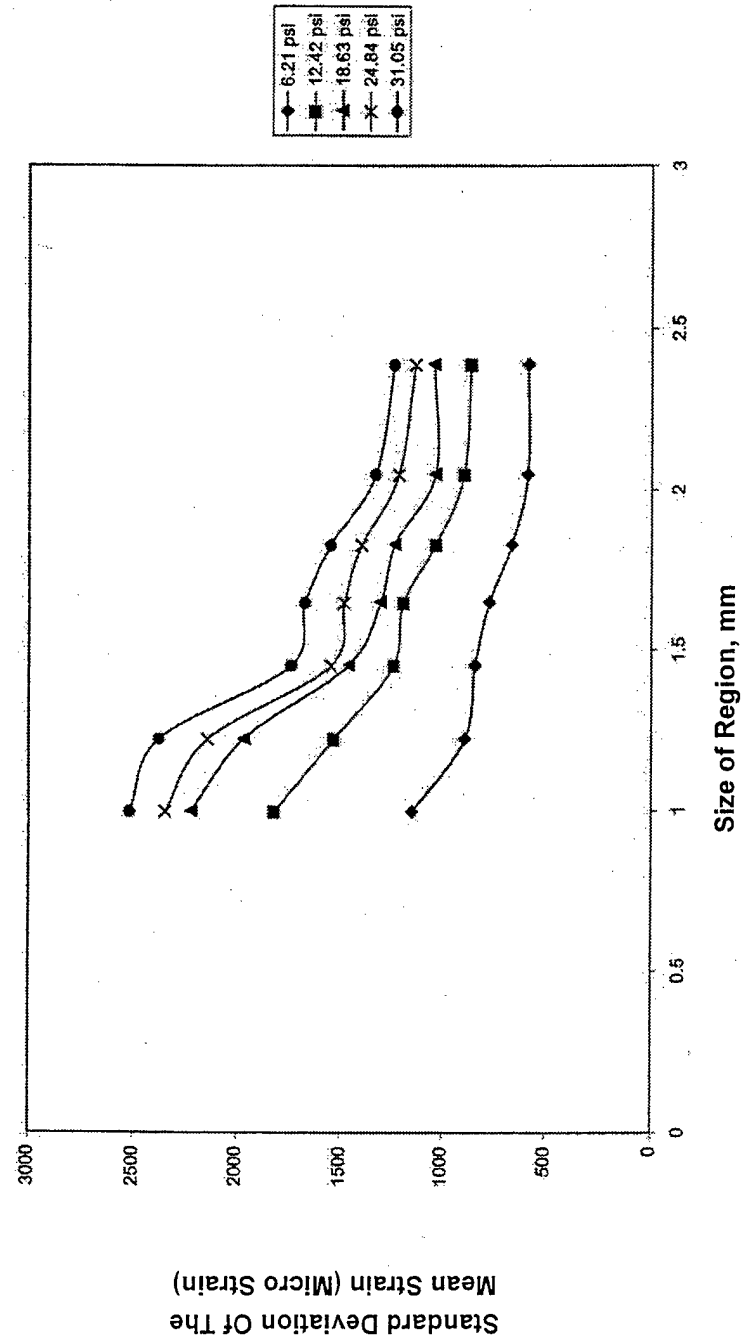


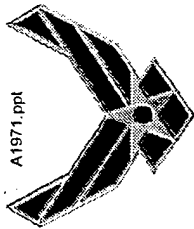
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Standard Deviation of Strain Versus Size of Region as a Function of Applied Stress



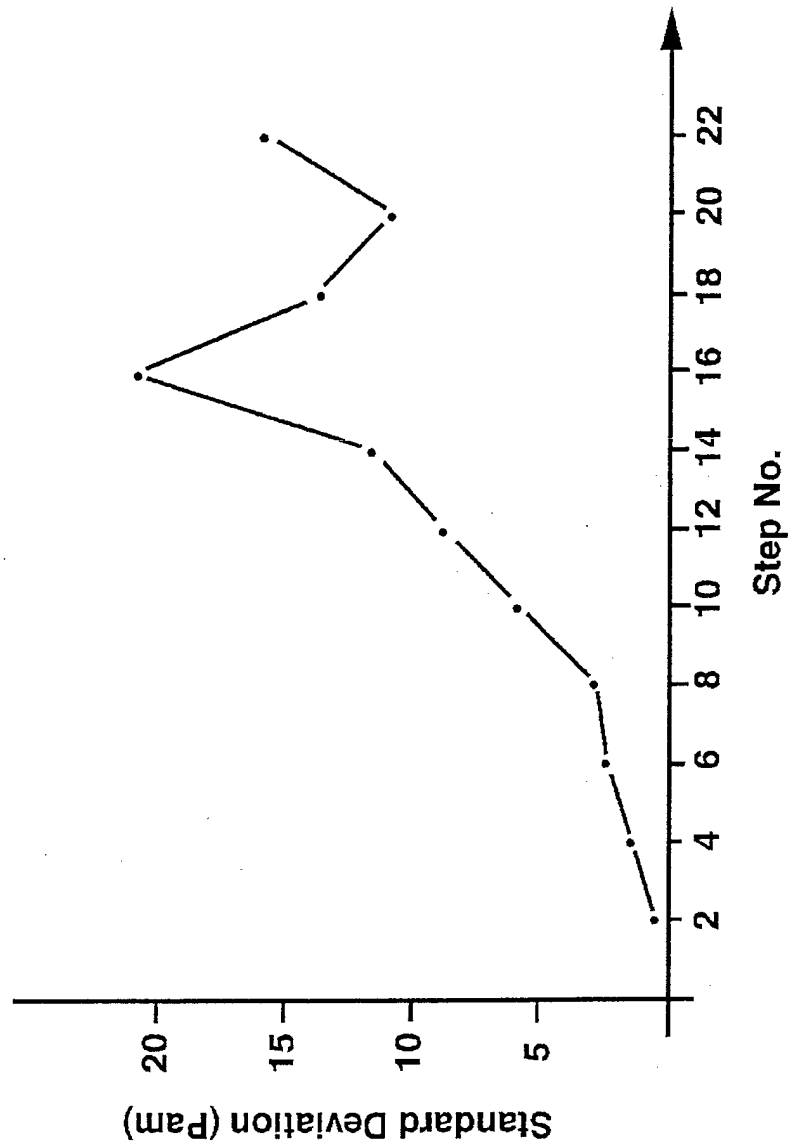
STD vs. Size of Region

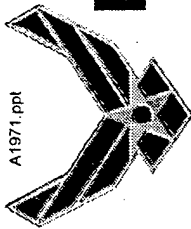




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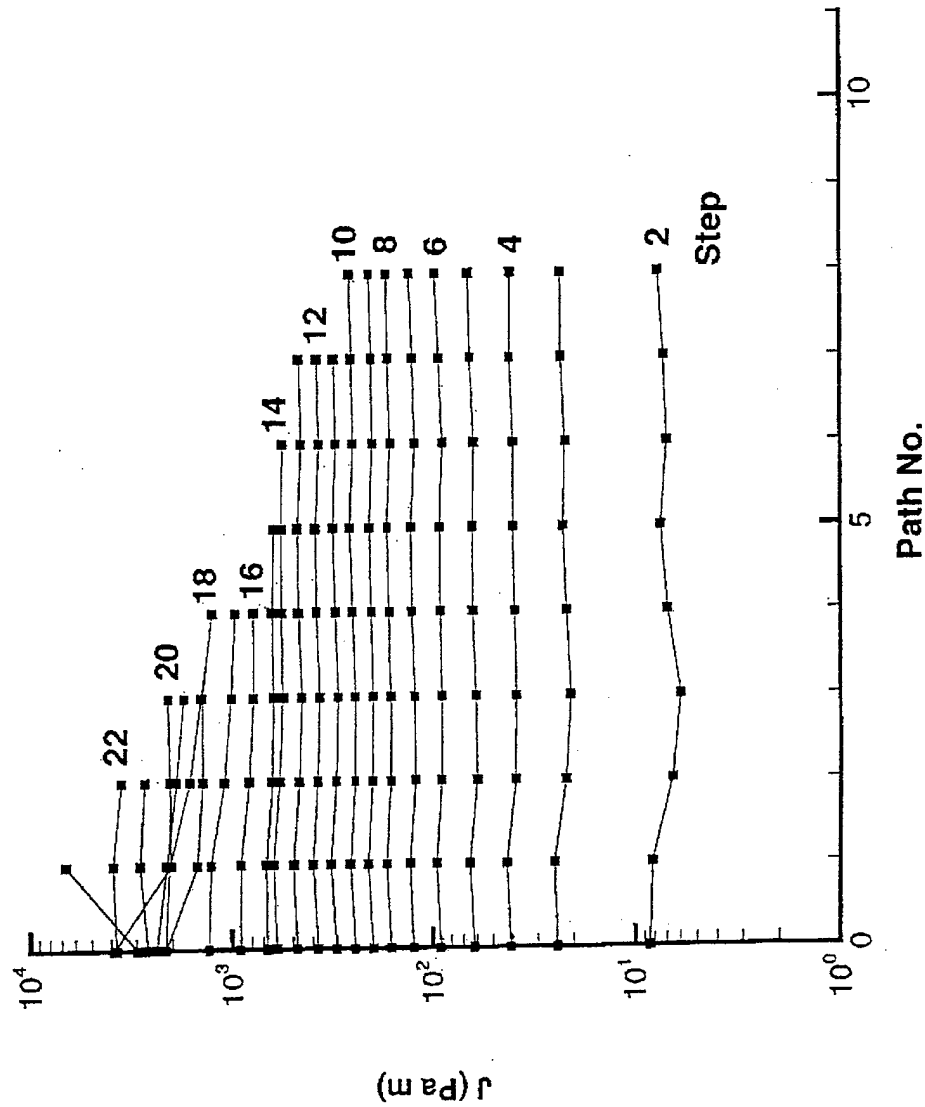
Standard Deviation of J-Integral Versus Step Number (Applied Strain)

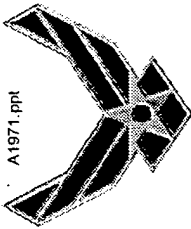




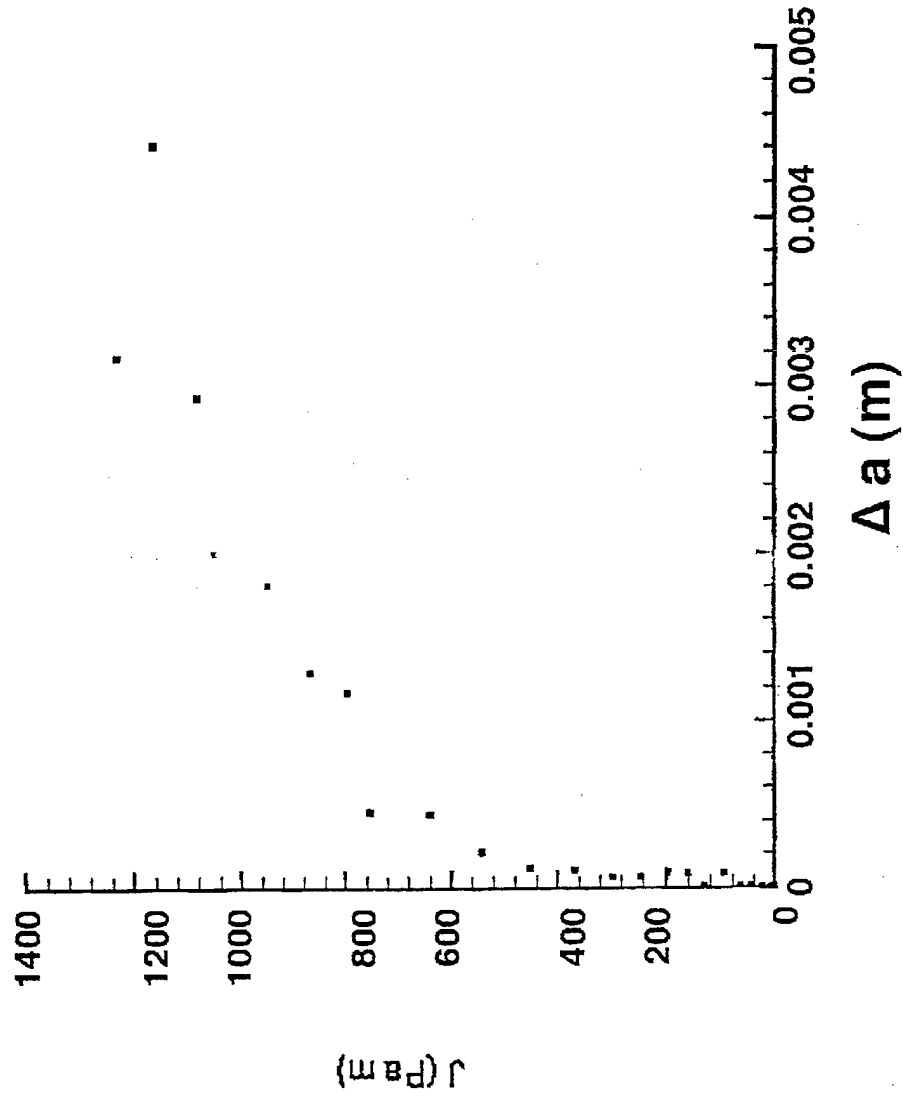
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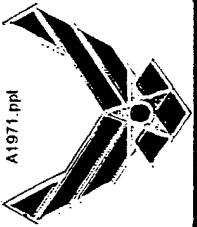
J-Integral Versus Path Number as a Function of Step Number (Applied Strain)



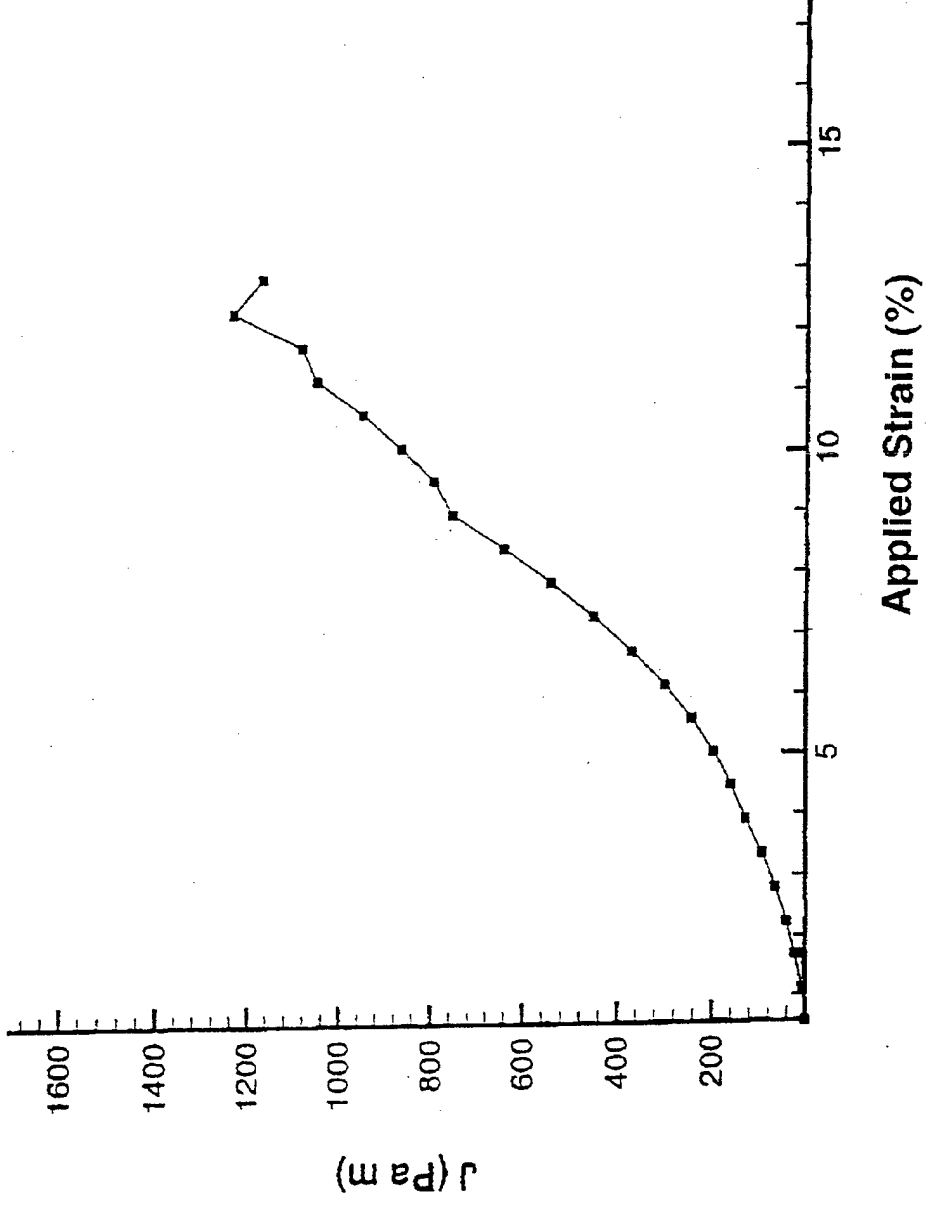


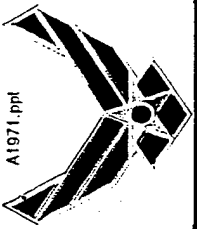
Crack Growth Resistance Curve



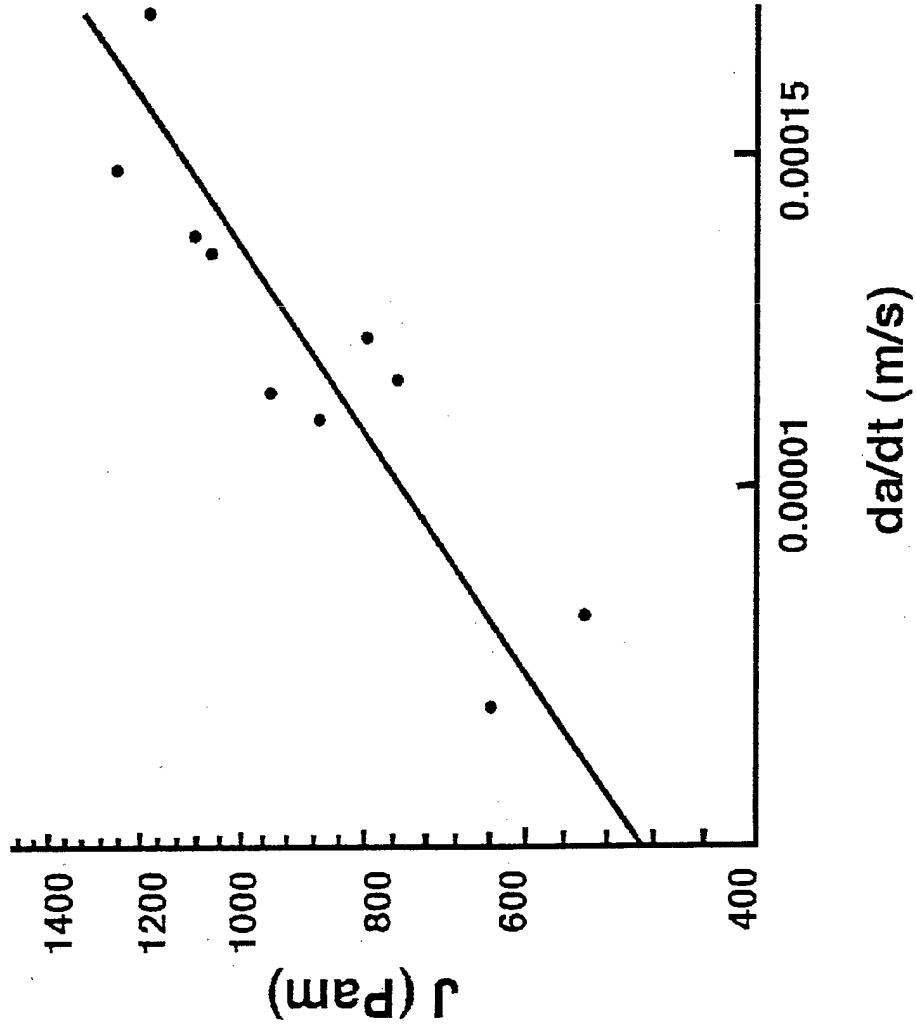


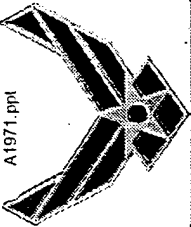
J-Integral Versus Applied Strain



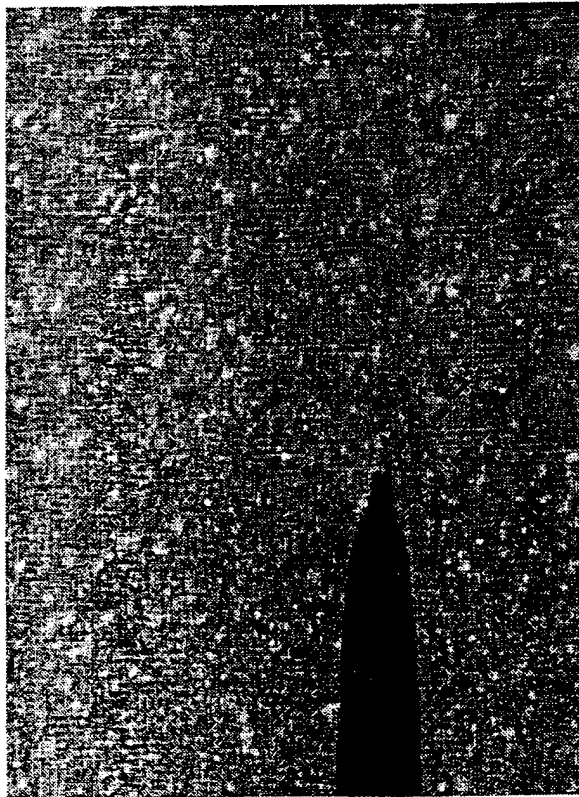


Crack Growth Rate Versus J-Integral

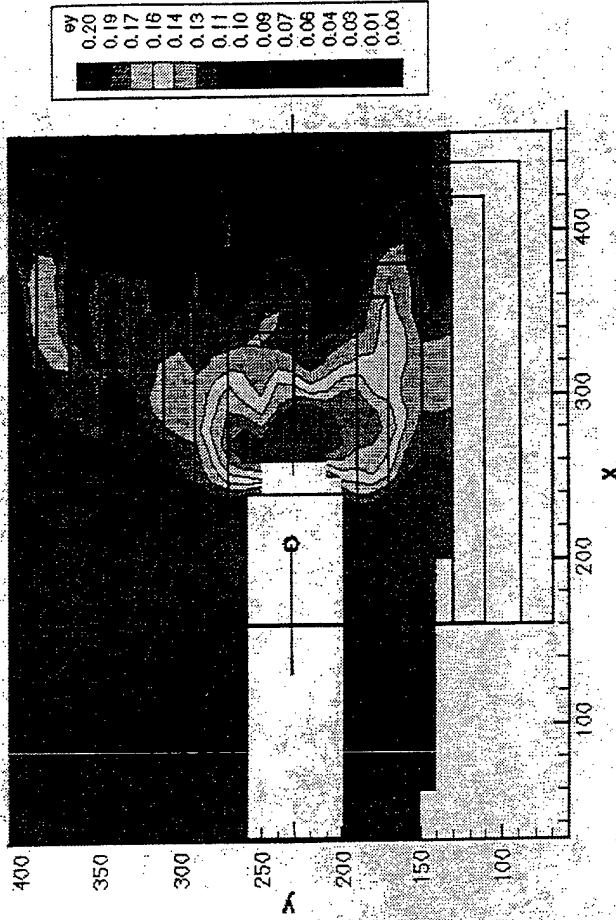




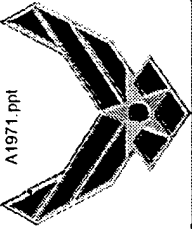
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Deformed Image



Strain Distributions and
Integration Paths



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Conclusions



- The minimum area for a valid homogeneous continuum assumption of the particulate composite material is 2 mm x 2 mm.
- On the macroscopic scale, the J-Integral is independent of the integration path.
- A power law relationship exists between the J-Integral and the crack growth rate.