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14. ABSTRACT

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4 different papers enclosed for Task # 78

(*) Paper Rec'd After 30-day Deadline = (16 days until Deadline) No rush issued

MEMORANDUM FOR PRS (In-House Publication)

FROM: PROI (STINFO)

01 Nov 2002

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-VG-2002-258**
C.T. Liu (PRSM) et al., "Multi-Scale Strain Measurements of a Particulate Composite Material"
(viewgraphs only)

ASME Int'l Mechanical Engineering Congress & Exhibit
(New Orleans, LA, 17-22 November 2002) **(Deadline: 15 Nov 02)**

(Statement A)

a1192 A.ppt

Multi-Scale Strain Measurements of a Particulate Composite Material

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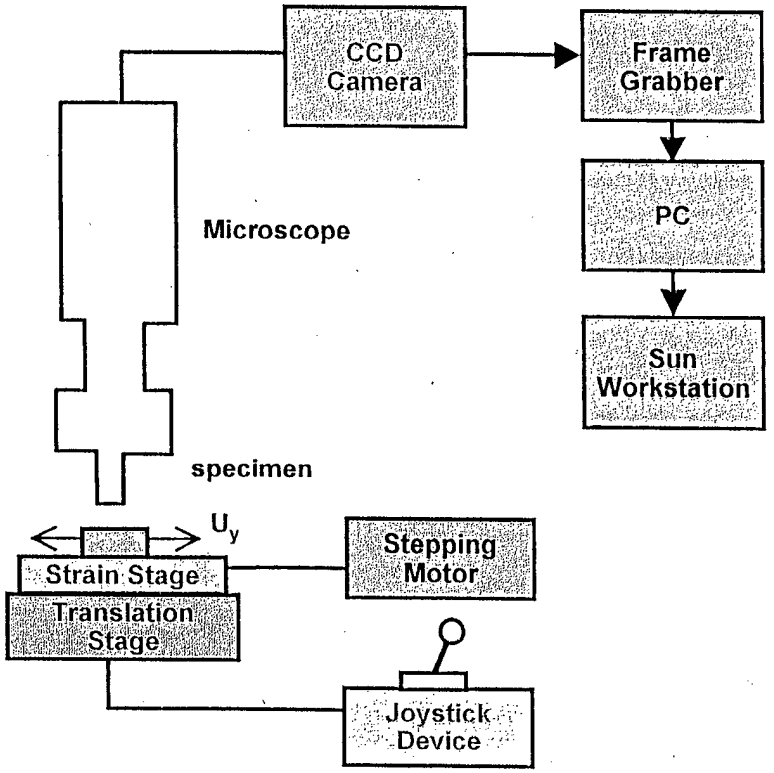
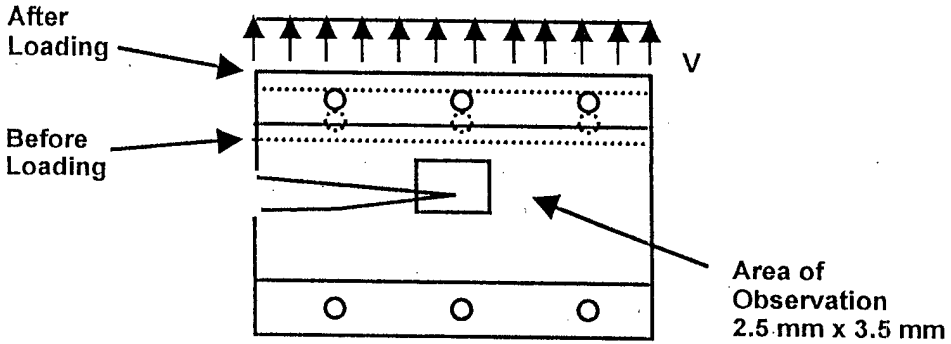
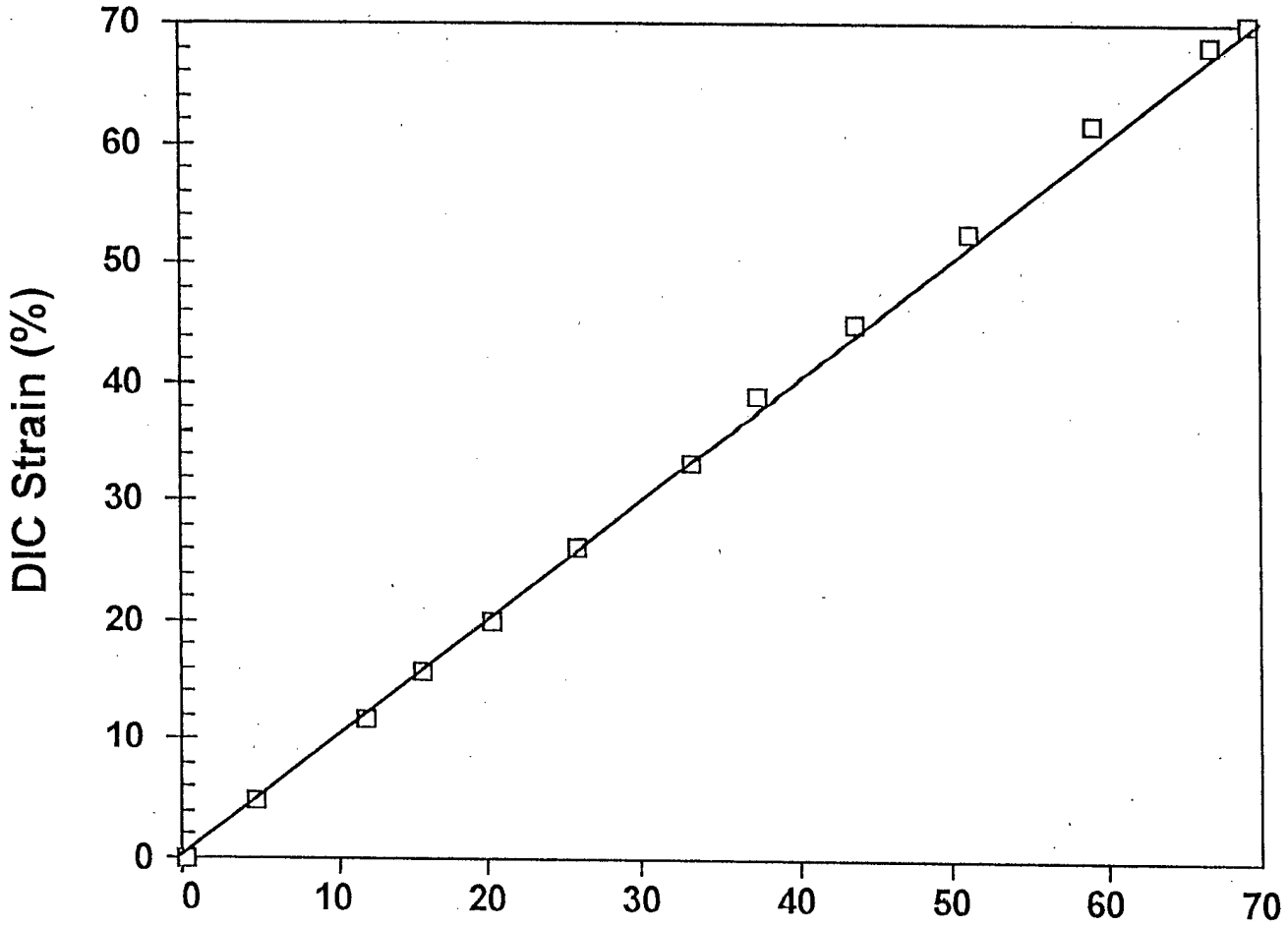
Objectives

- Investigate the Effect of Microstructure on the Strain Distributions Near a Crack Tip
- Conduct Numerical Modeling Analysis to Determine the Displacement and Strain Fields

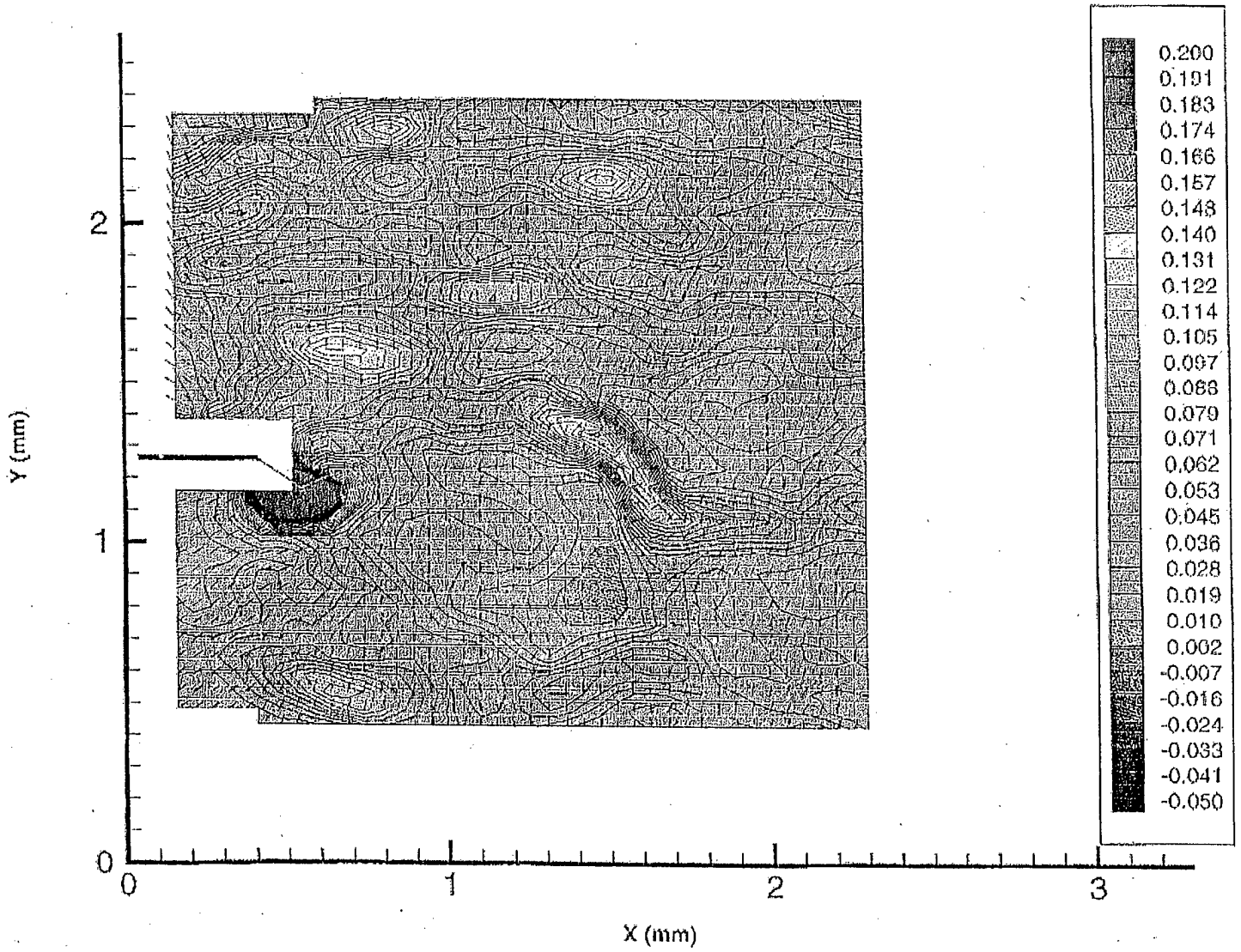

CCD Camera
Frame Grabber
PC
Sun Workstation
Microscope
specimen
U_y
Strain Stage
Translation Stage
Stepping Motor
Joystick Device


After Loading
Before Loading
V
Area of Observation
2.5 mm x 3.5 mm

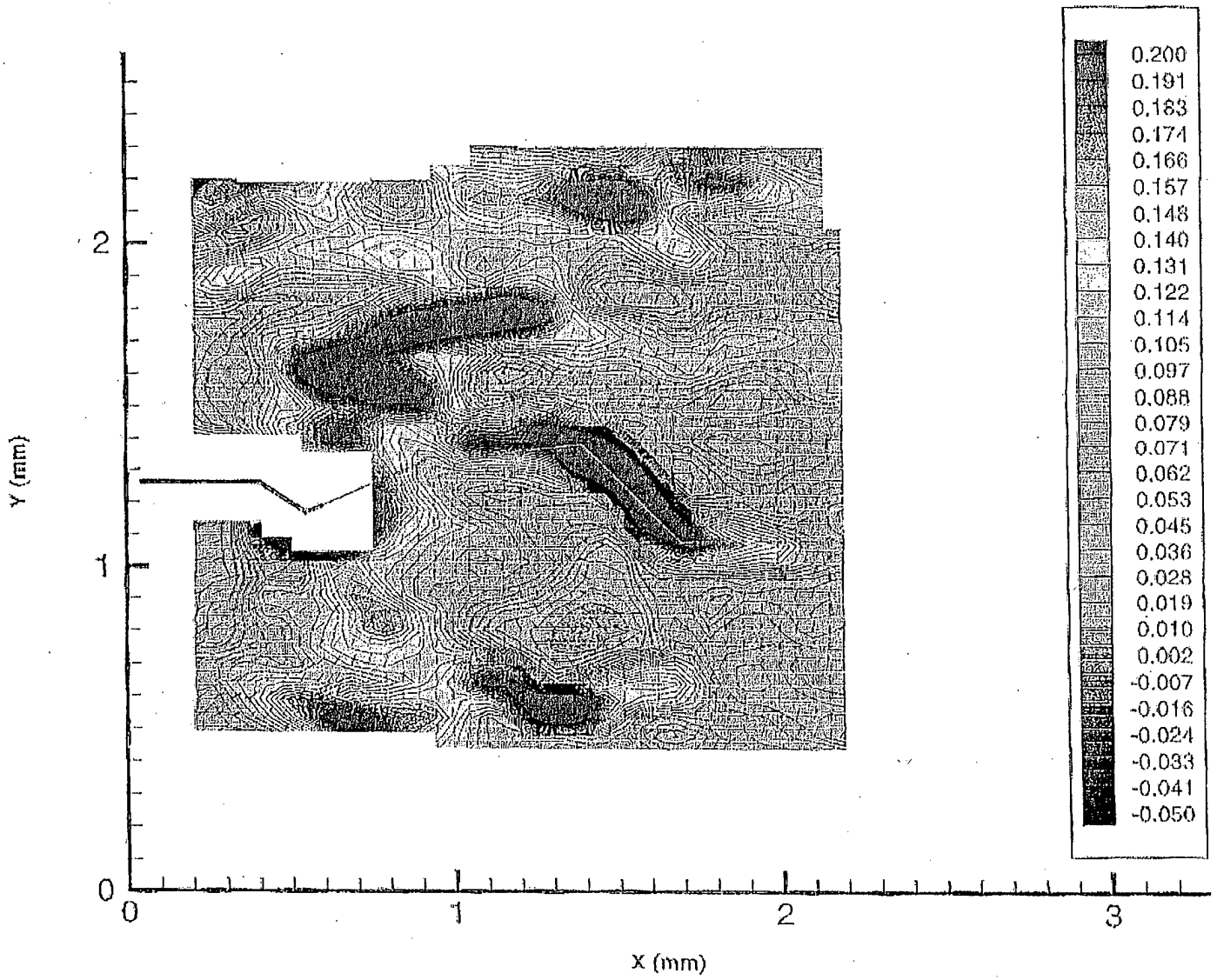
Calibration



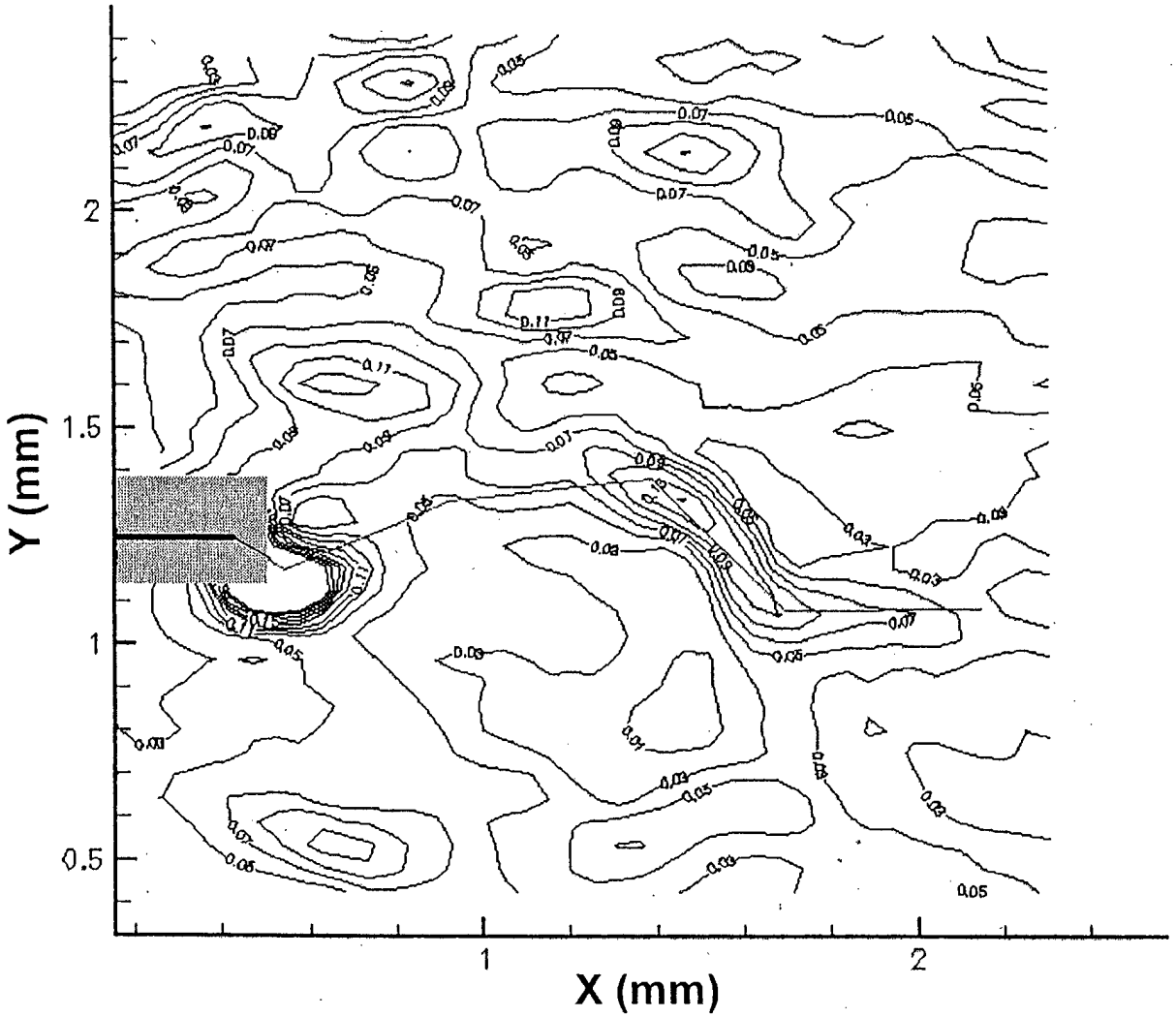
Maximum Principal Strain Distribution of 6.0% Far Field Strain During Loading



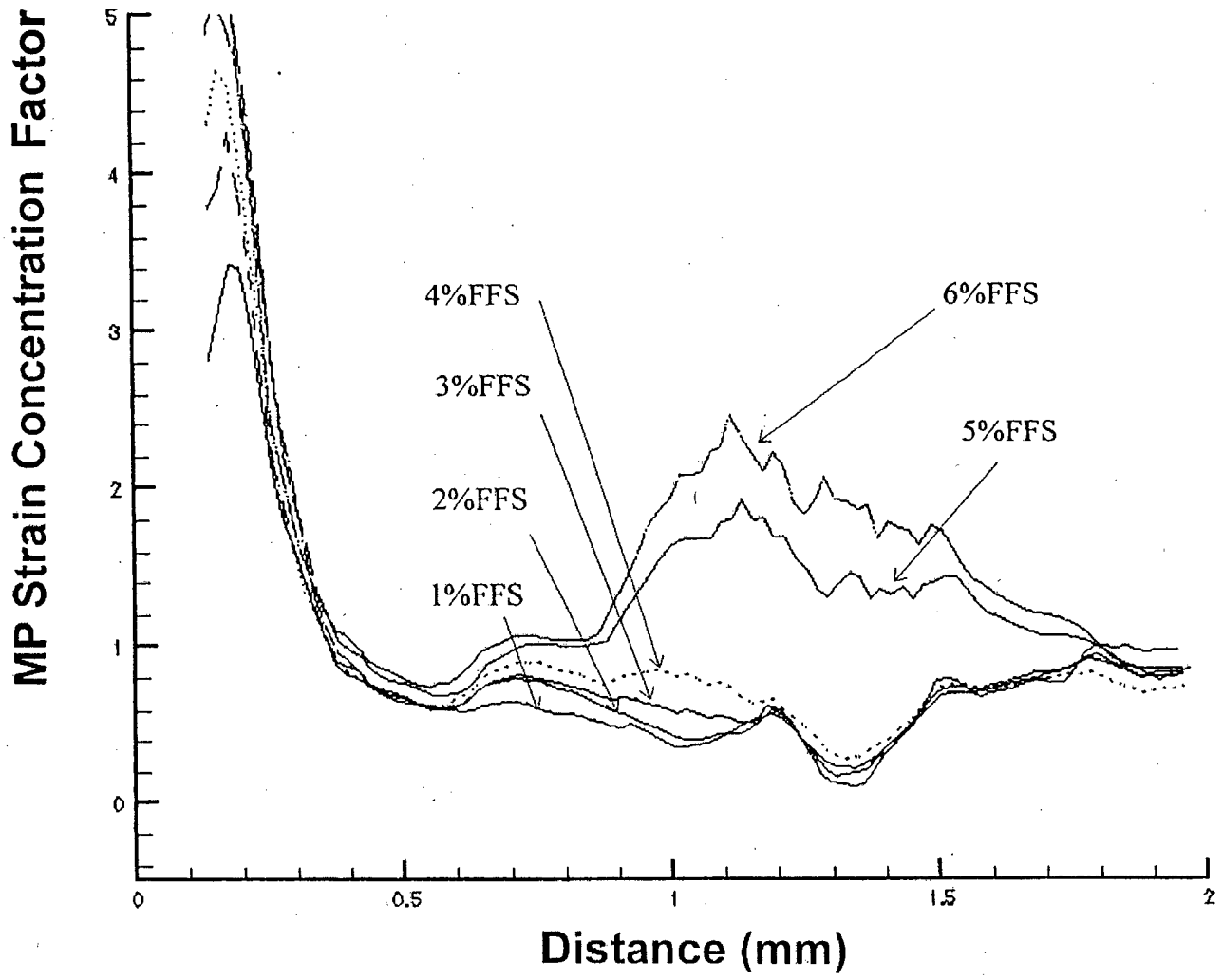
Maximum Principal Strain Distribution of 10.0% Far Field Strain During Loading



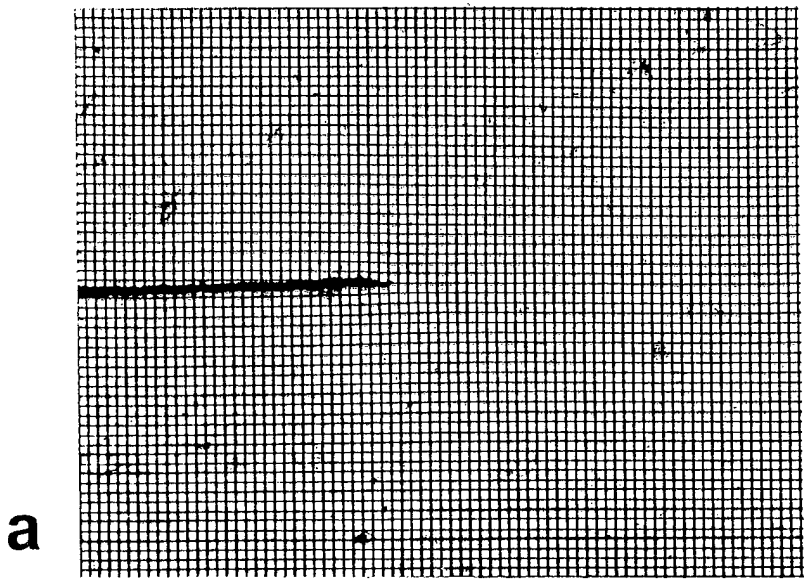
Maximum Principal Strain at 6% Far Field Strain



Maximum Principal Strain Concentration Factor at Various Far Field Strain Values

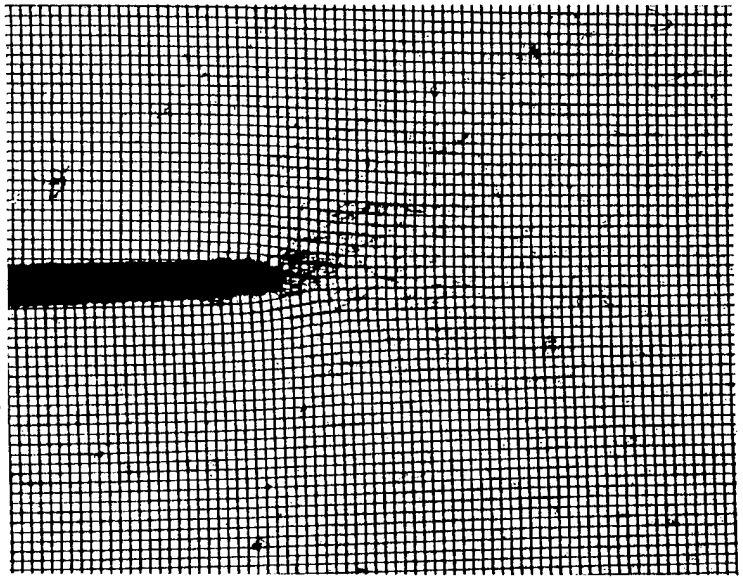


Grid Deformation During the Crack Blunting Phase



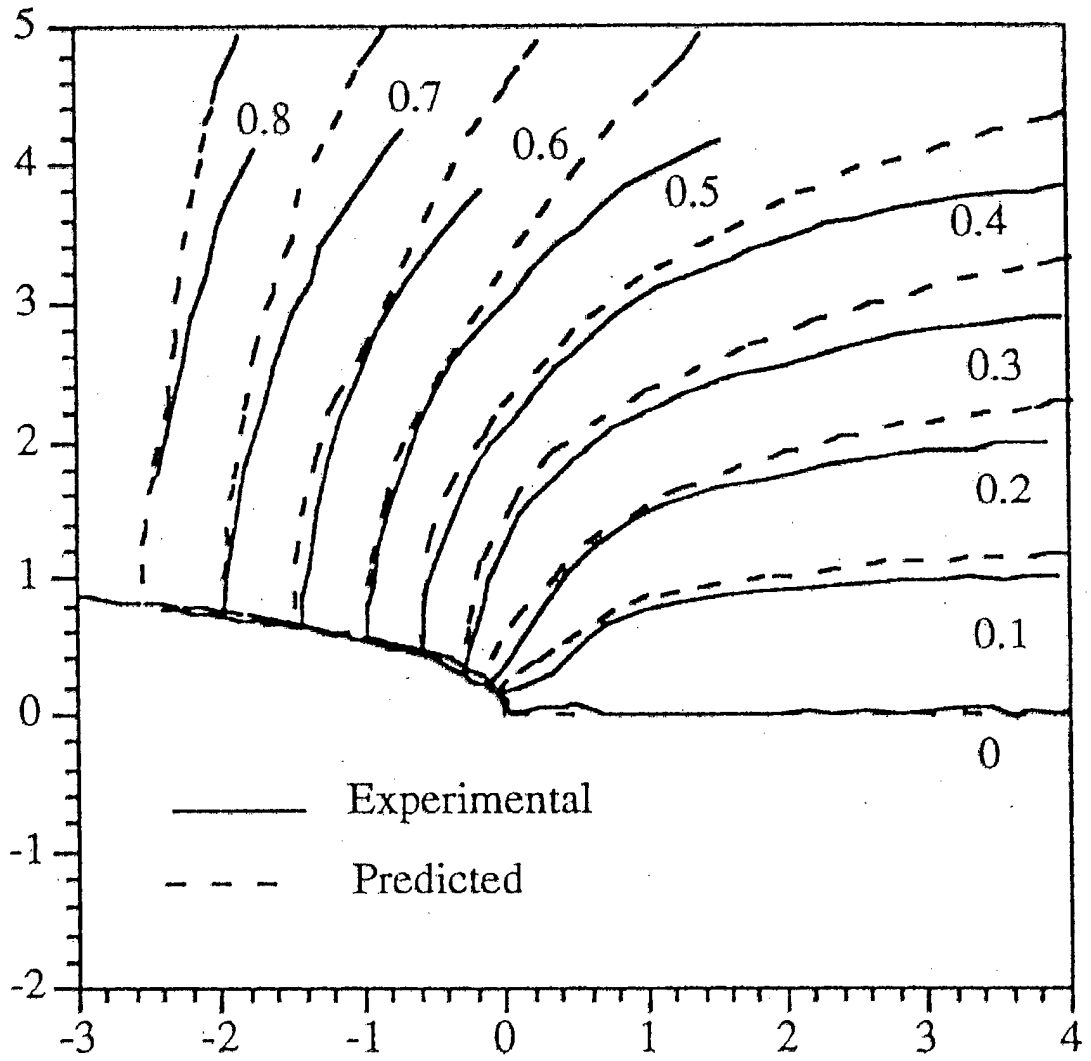
a

b

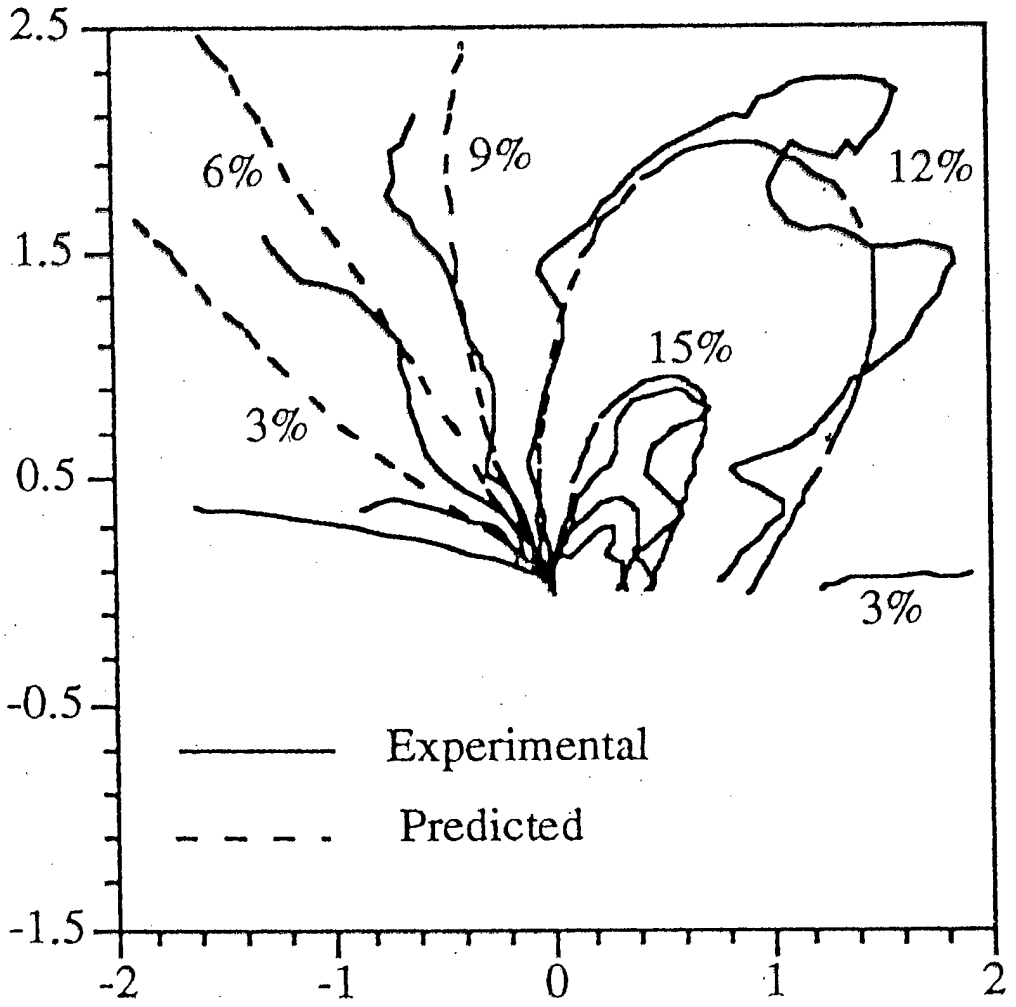


c

Contours of Constant Vertical Displacement (V) in the Crack Tip Region



Finite Element Results for a Normal Strain Contours Superimposed Upon Experimental Result



Conclusions

- The Microstructure of the Material has a Significant Effect on the Strain Fields Near the Crack Tip
- The Crack Growth Mechanism Consists of Void Generation and Coalescence with the Main Crack Tip
- The Displacement and Strain Fields Determined from Numerical Modeling Analysis Compare well with Experimental Results