

SILICON SHEET
N85-32441
SILICON SHEET SURFACE STUDIES

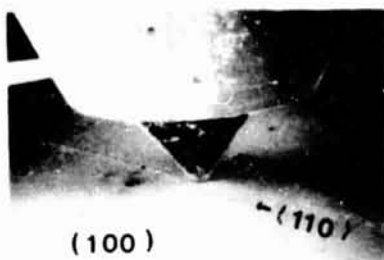
UNIVERSITY OF ILLINOIS AT CHICAGO

S. Danyluk

**Relative Magnitudes of Residual Stresses
in Web and Mobil Silicon Sheet**

TECHNOLOGY	REPORT DATE October 2, 1984
APPROACH Residual stresses in sheet silicon by interferometry. Simulation of abrasion of silicon by diamond by scratching and indentation tests. CONTRACTOR	STATUS Developed an interferometry technique for measuring residual stresses in short, thin silicon sheet. Measured the residual stresses in WEB and Mobil sheet. Correlated experimental wear rate with a wear model. Determined the residual stresses due to scratching. Showed that dislocations are associated with scratching and indentations performed at room temperature.
GOALS Develop non-destructive residual stress measurement technique. Determine wear mechanism in silicon.	

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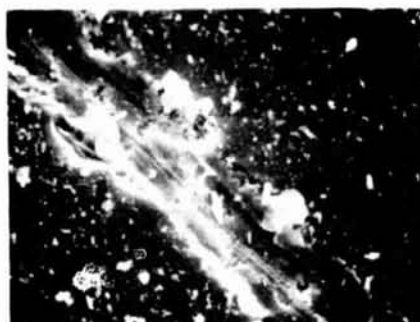
(100)

-(110)

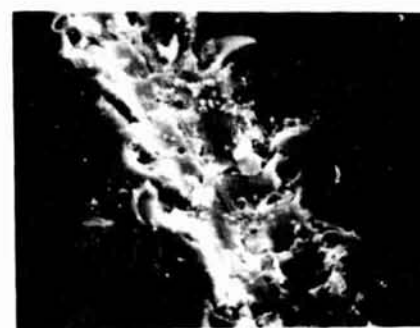
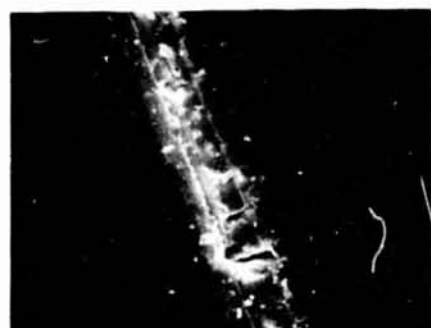
1 Scratch

10 Scratches

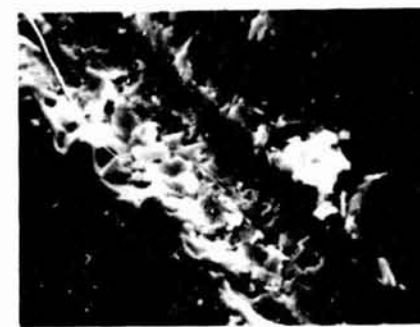
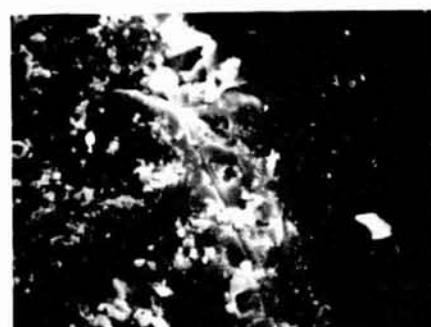
Air



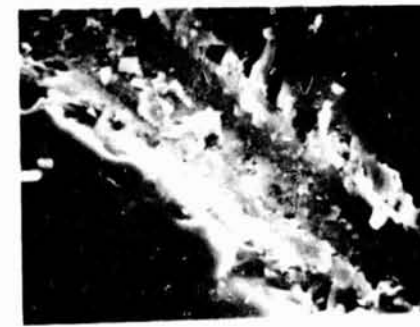
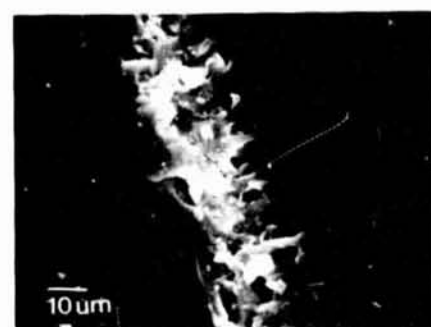
DI H₂O

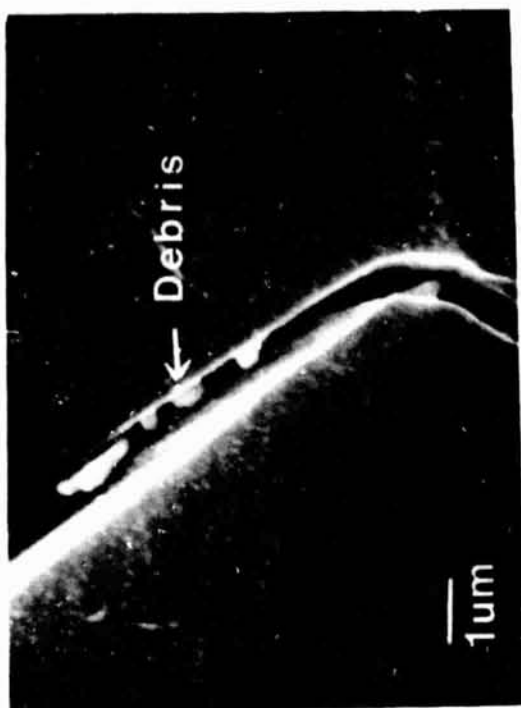
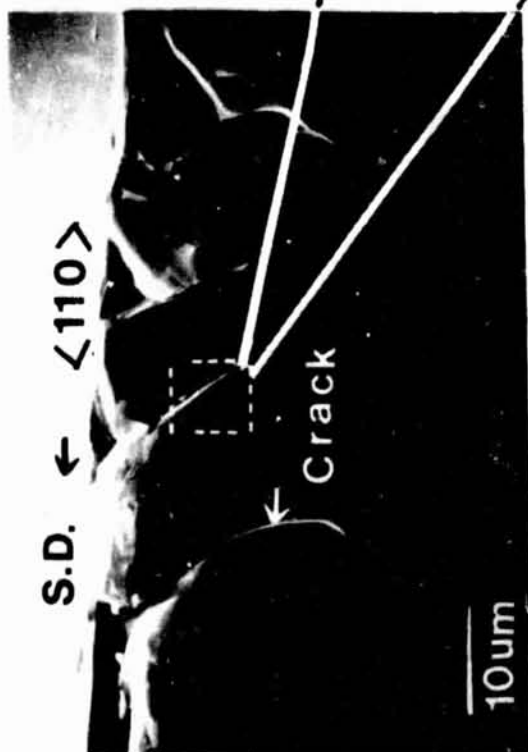


Acetone



Ethanol





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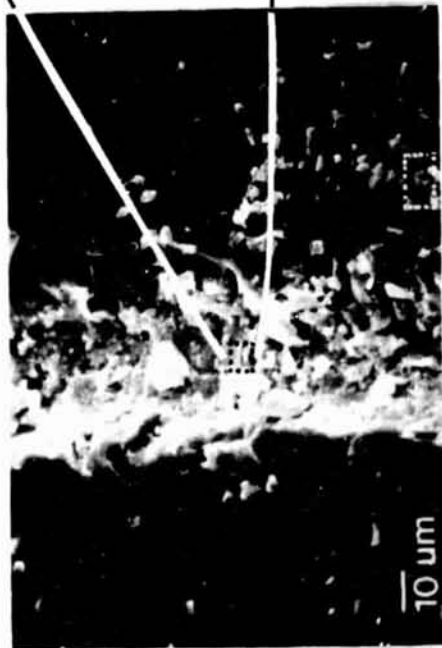
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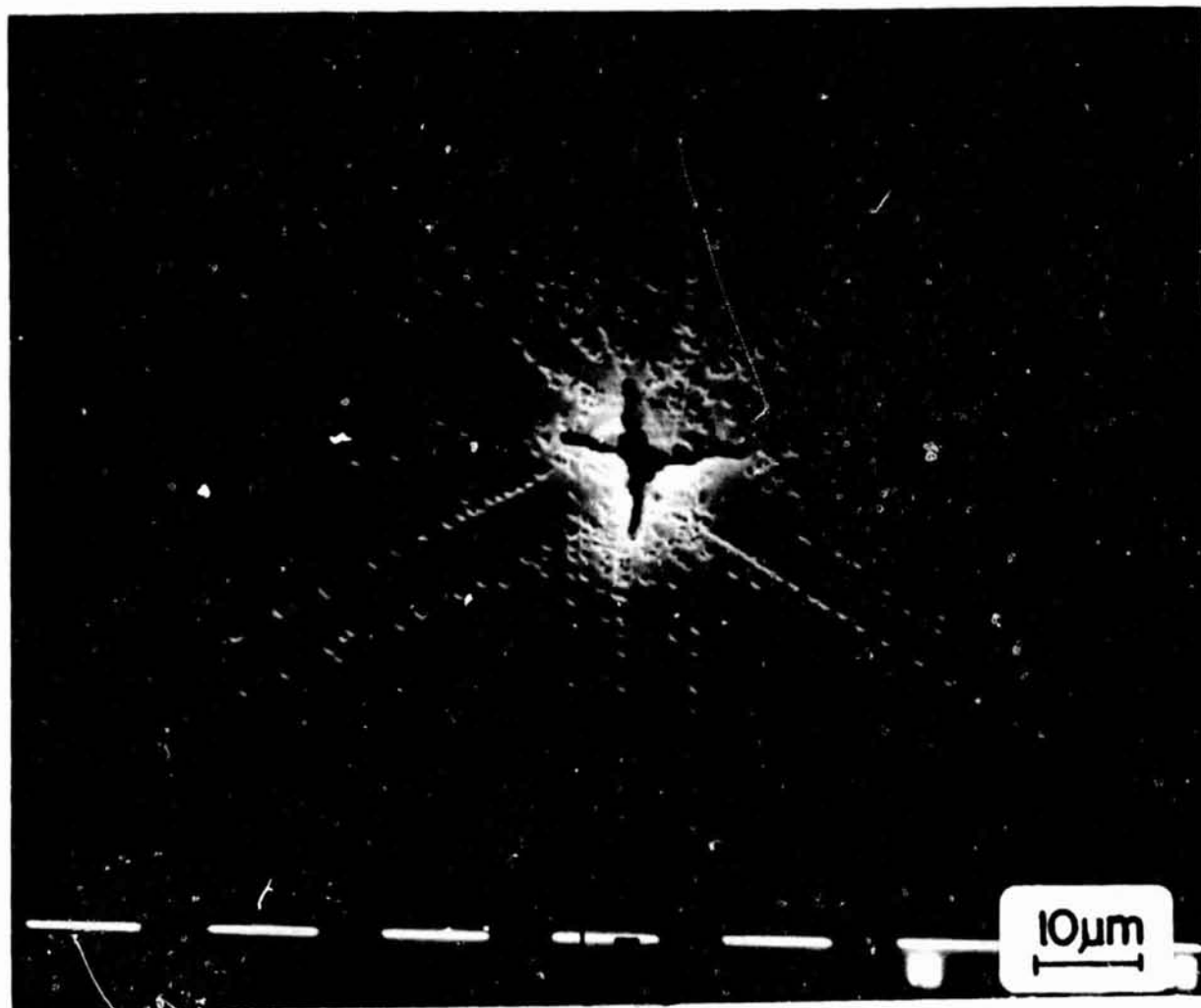
Plastic Deformation



Crack

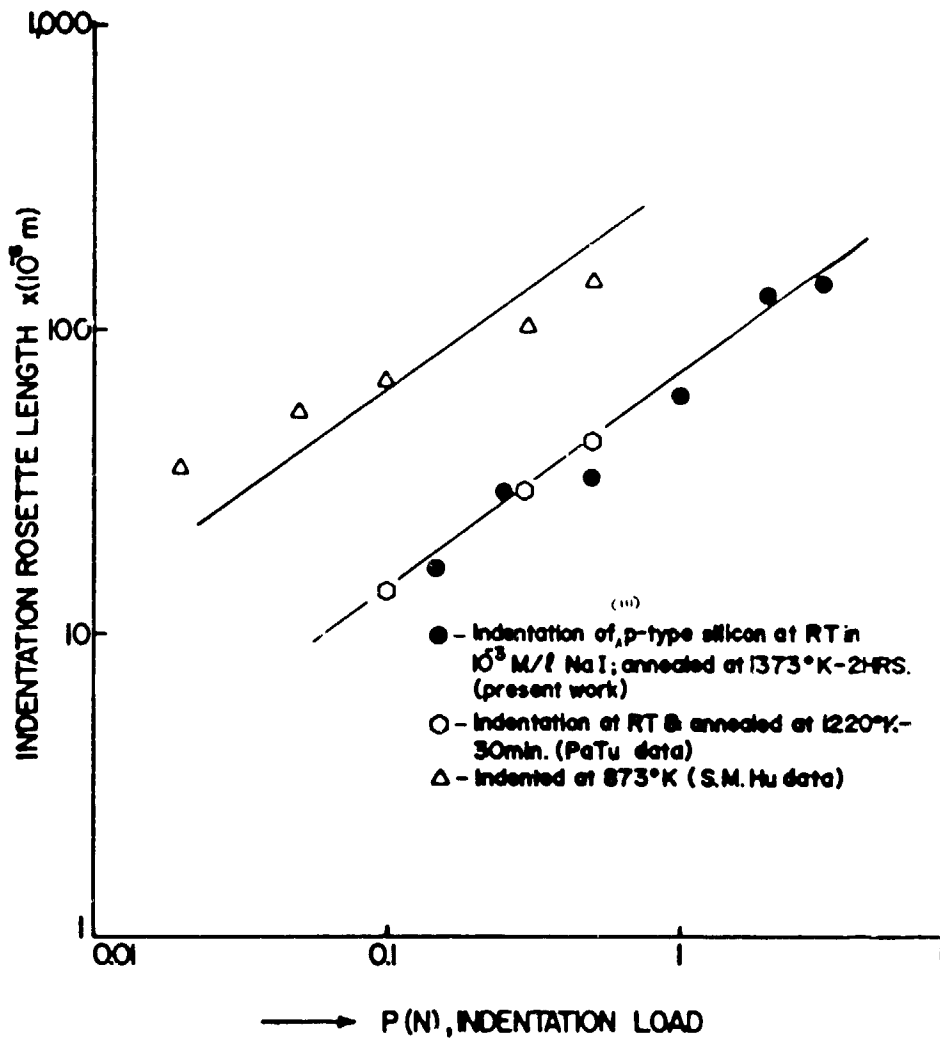
Debris

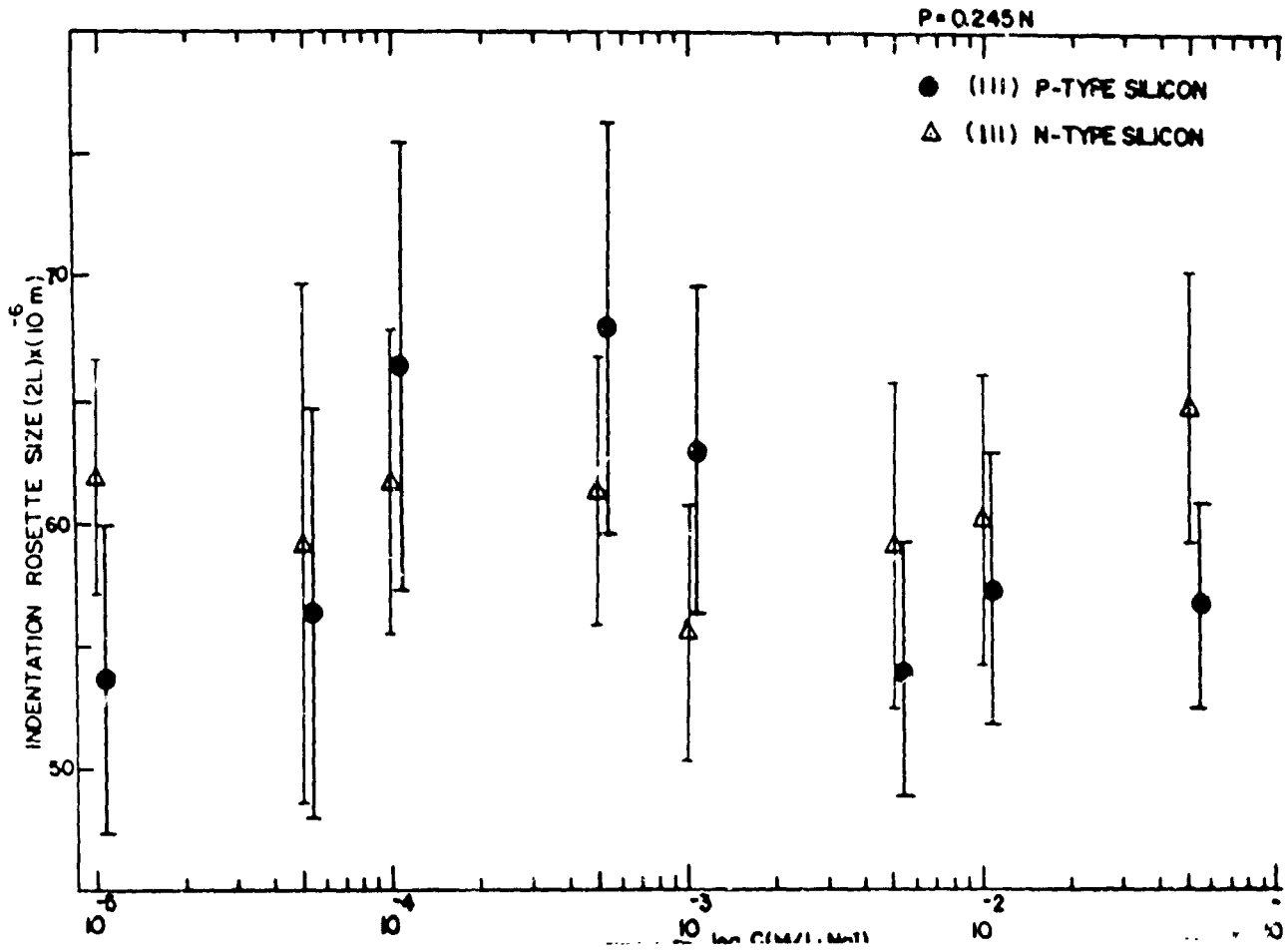




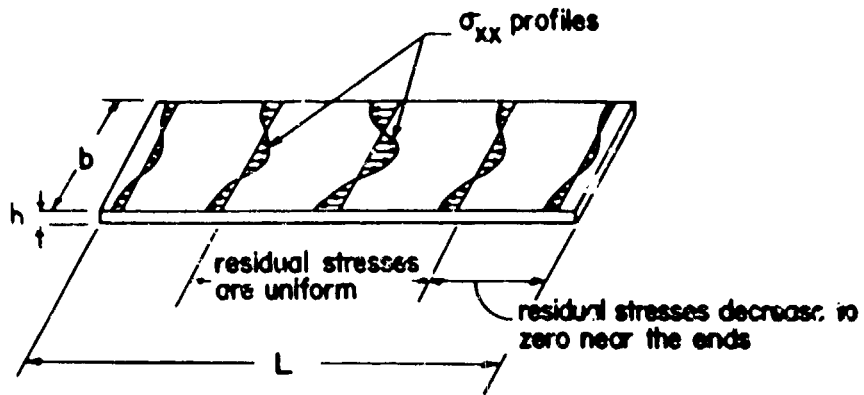
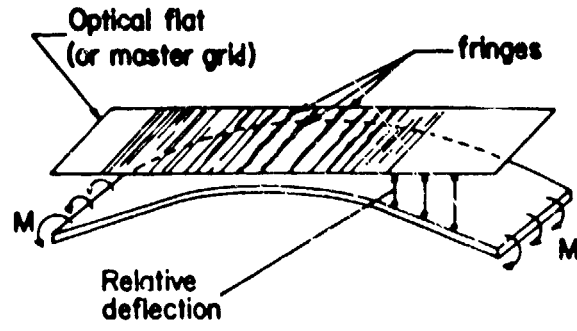
SEM MICROGRAPH OF (111) P-TYPE SILICON INDENTED
UNDER A LOAD OF 0.49N IN 10^{-3} M/L NaI;
ANNEALED AT 1373 K-2HRS AND ETCHED IN DILUTE
SIRTL SOLUTION.

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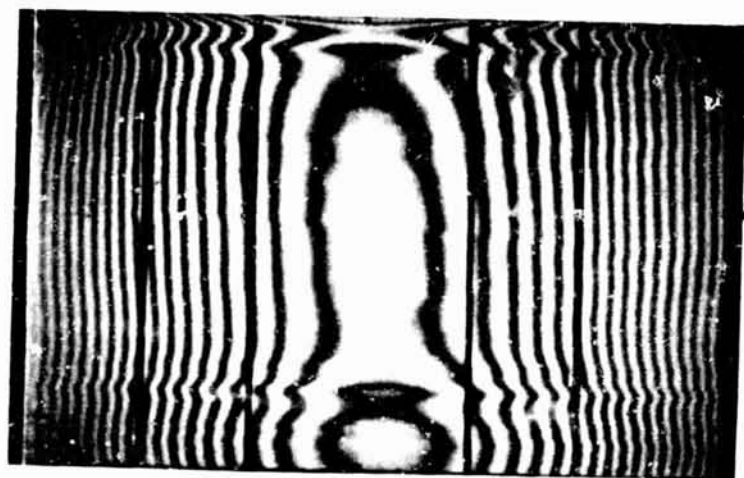
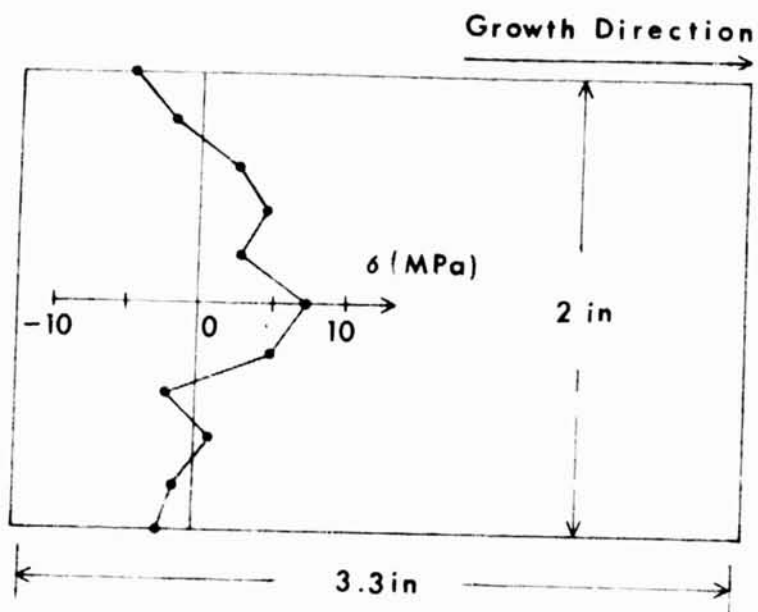


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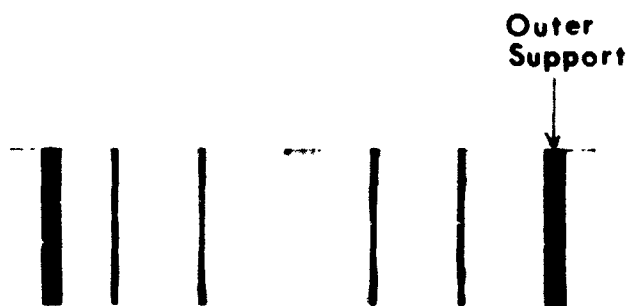
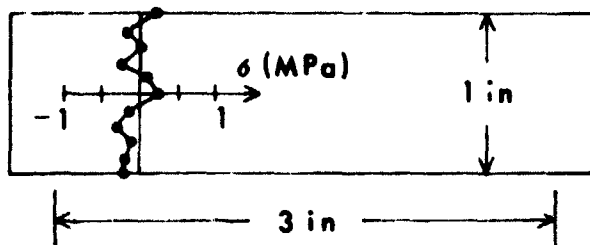
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Outer
Support

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	Sample No.	Magnitude of Maximum Residual Stress (MPa)	Growth Speed (cm/min)
WEB	J515-2.3a	2.5	
	J460-2.5a	0.4	
Mobil	47R1-1	9.0	2.00
	-2	5.0	2.00
	-3	7.3	1.75
	-4	6.5	2.25

Problems and Concerns

1. Do the residual stress measurements correlate with strain gauge measurements or dislocation distributions?
2. Is the fluid chemistry changed as a result of microcrack or dislocation generation?
3. Does the abrasion mechanism change when abrasion speeds are high? What is the contact temperature.