REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
20-01-2004	Technical Viewgraph Presentation	

4. TITLE AND SUBTITLE

Investigating the Effect of Interfacial Strength on Deformation and Failure Mechanisms in Bond Systems

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

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5d. PROJECT NUMBER
2302

5e. TASK NUMBER
0378

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Air Force Research Laboratory (AFMC)
AFRL/PRSM
10 E. Saturn Blvd.
Edwards AFB CA 93524-7680

8. PERFORMING ORGANIZATION REPORT NUMBER

AFRL-PR-ED-VG-2004-009

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Air Force Research Laboratory (AFMC)
AFRL/PRS
5 Pollux Drive
Edwards AFB CA 93524-7048

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S NUMBER(S)
AFRL-PR-ED-VG-2004-009

12. DISTRIBUTION / AVAILABILITY STATEMENT

Approved for public release; distribution unlimited.

13. SUPPLEMENTARY NOTES

For presentation at the 27th Adhesion Society Annual Meeting in Wilmington, NC, 16-18 February 2004.

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
					Leilani Richardson
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			**19b. TELEPHONE NUMBER** *(include area code)*
Unclassified	**Unclassified**	**Unclassified**	A	14	(661) 275-5015

Investigating the Effect of Interfacial Strength on Deformation and Failure Mechanisms in Bond Systems

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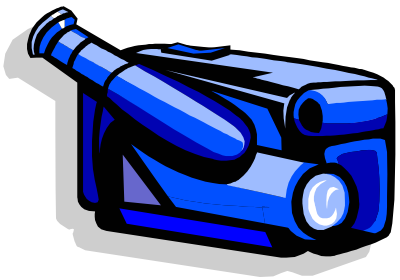
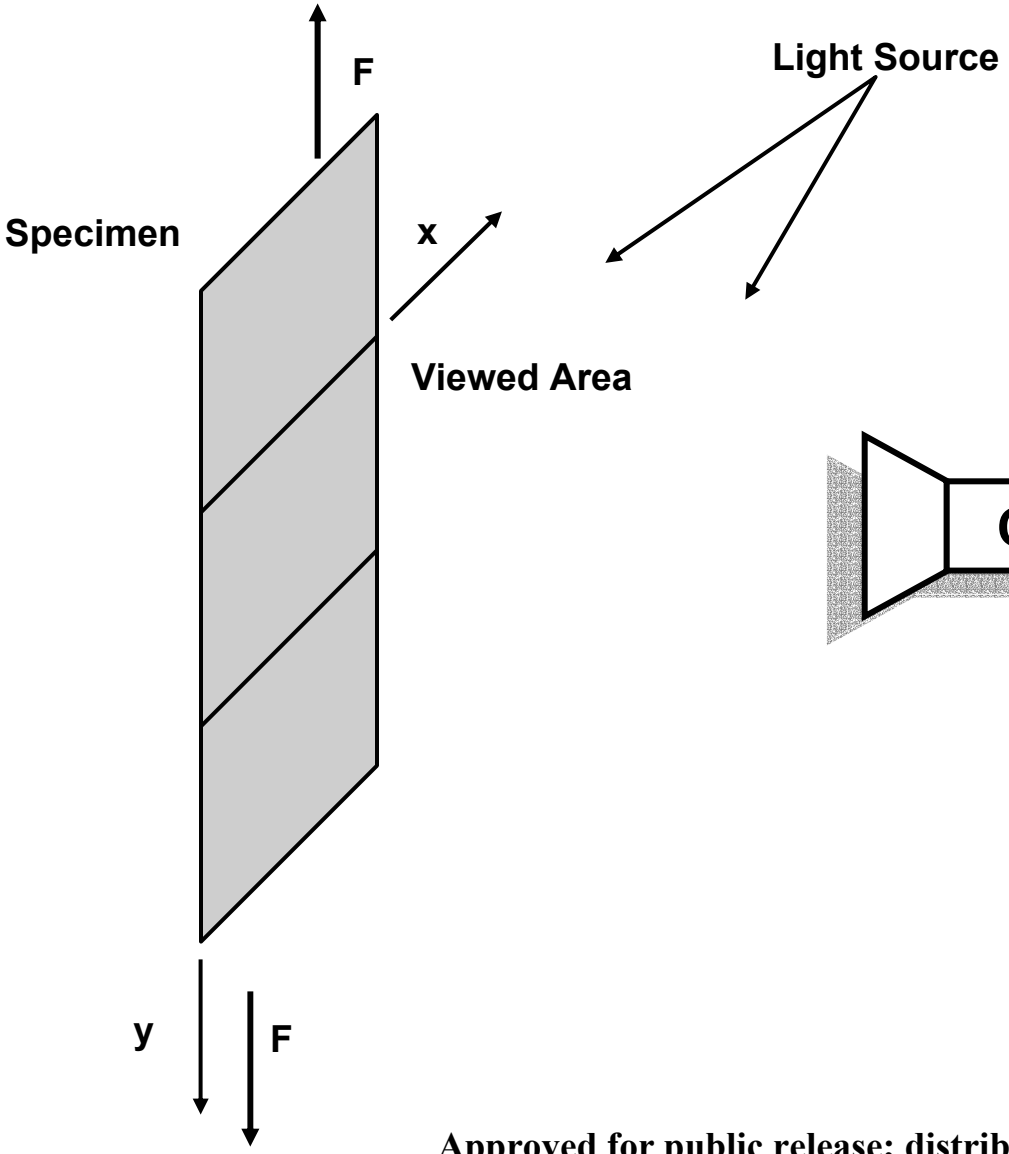
Objectives:

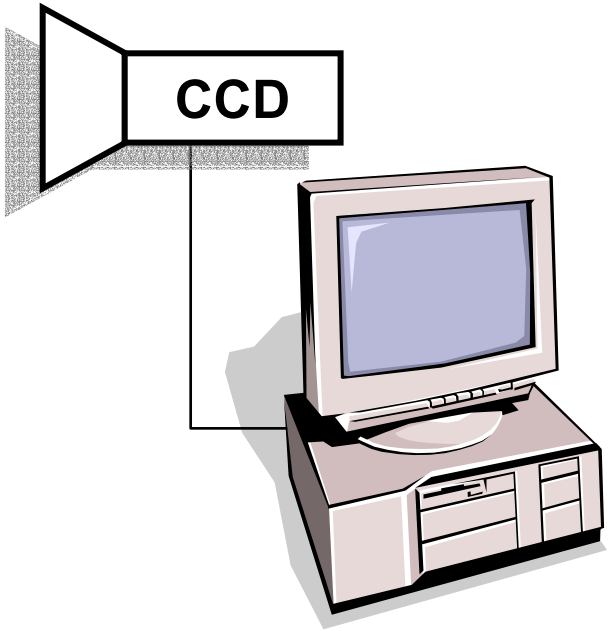
- **Investigate the Effects of Interfacial Strength on Deformation and Failure Mechanisms in Bi-Material Bonded Specimens under a 0.01 in/min Constant Displacement Rate Condition.**
- **Determine the Strain Rate Distribution in the Bi-Material Bonded Specimens.**

Experimental Set Up

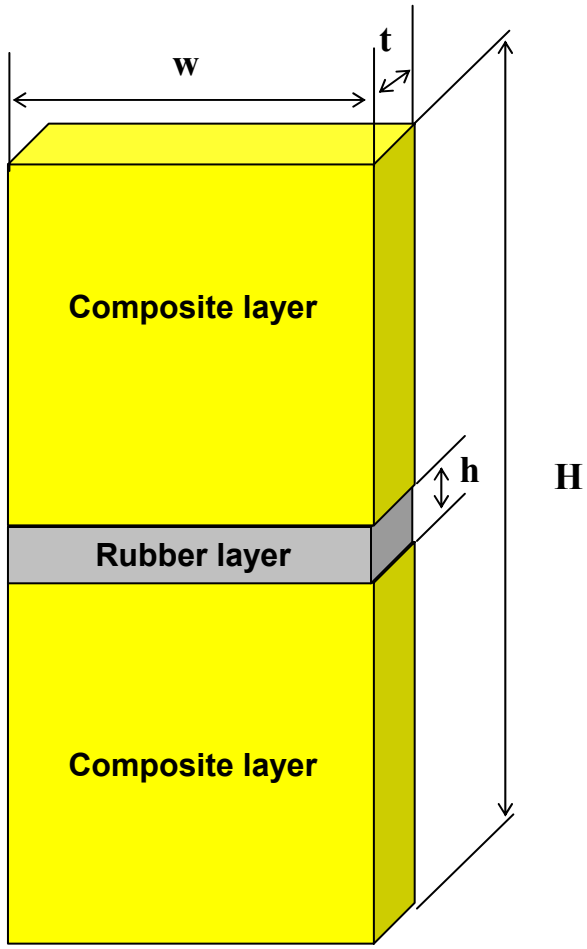


Video Camera





Specimen Geometry



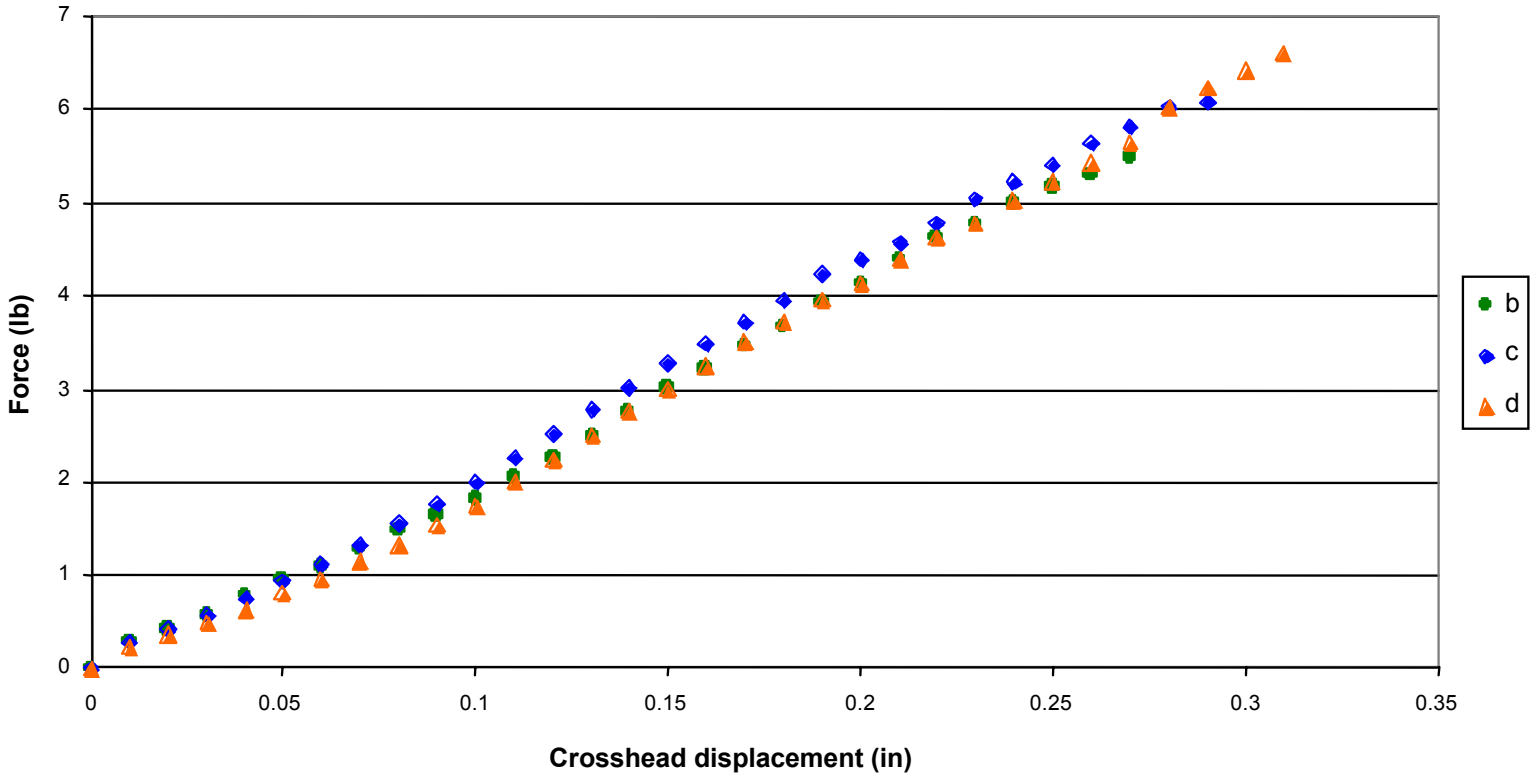
w = 0.5 in.

t = 0.2 in.

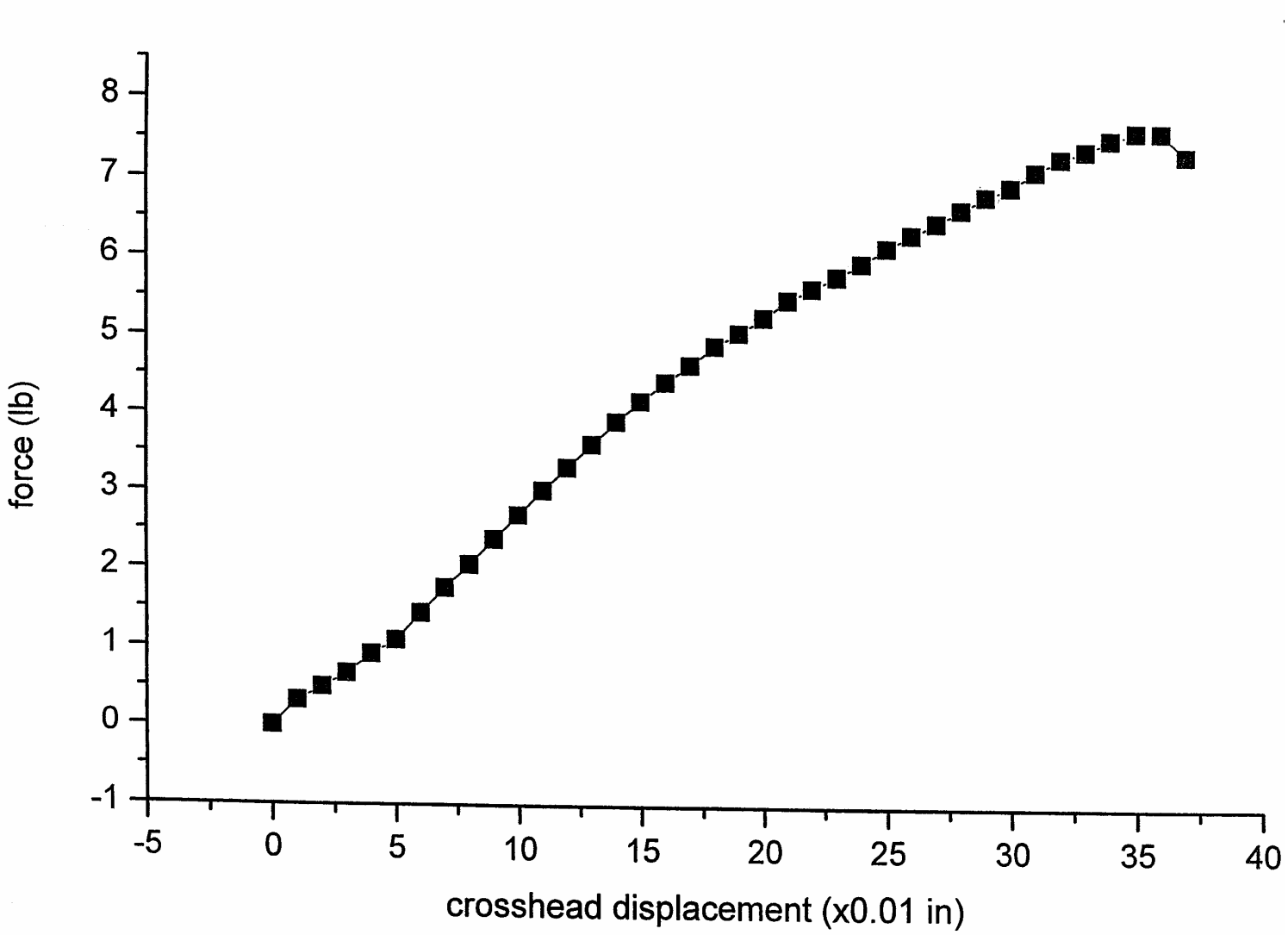
h = 0.1 in.

H = 4 in.

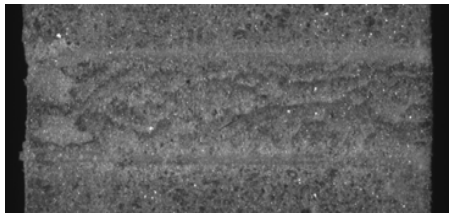
Force Versus Displacement Curves
(specimen with strong interfacial strength)



Force Versus Displacement Curves
(specimen with weak interfacial strength)



Mechanism of Debonding
(specimen with strong interfacial strength)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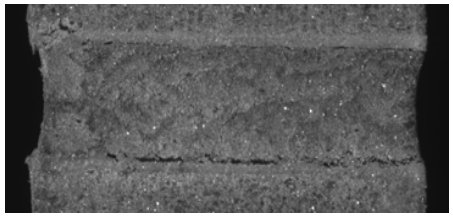
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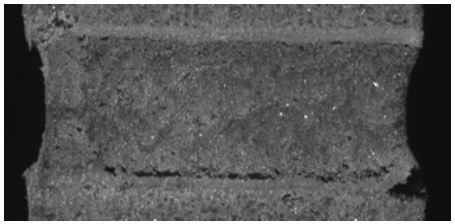
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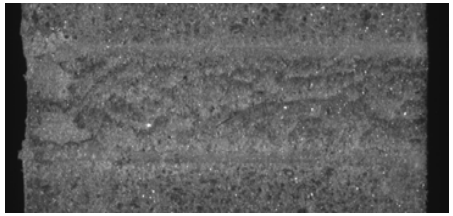
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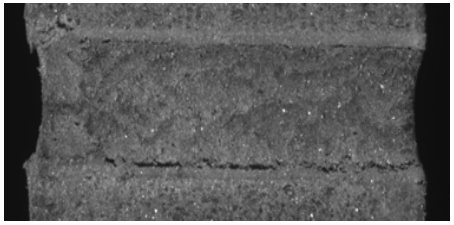
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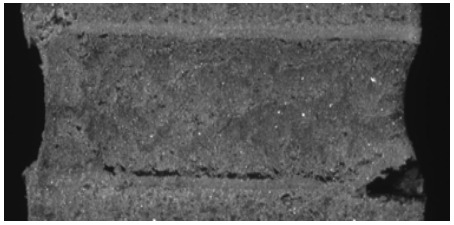
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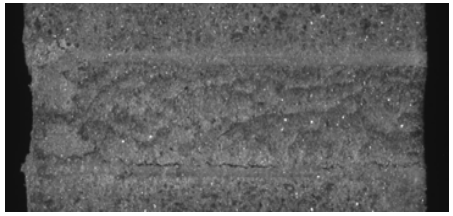
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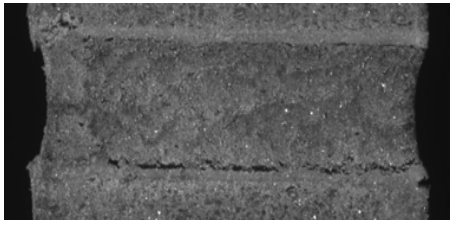
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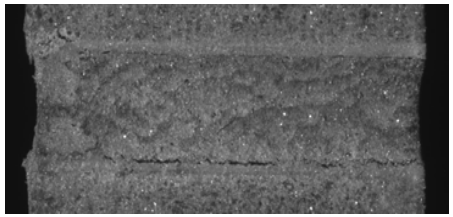
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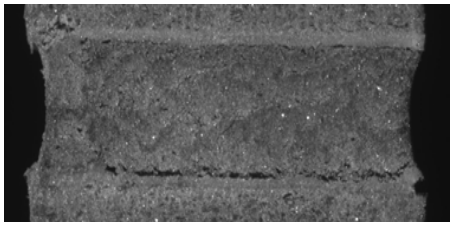
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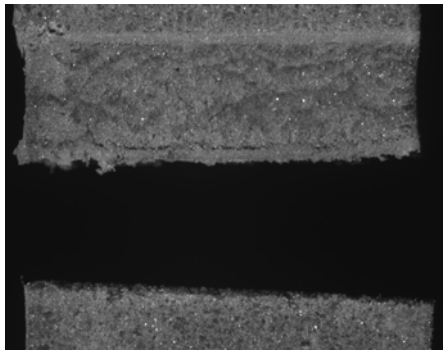
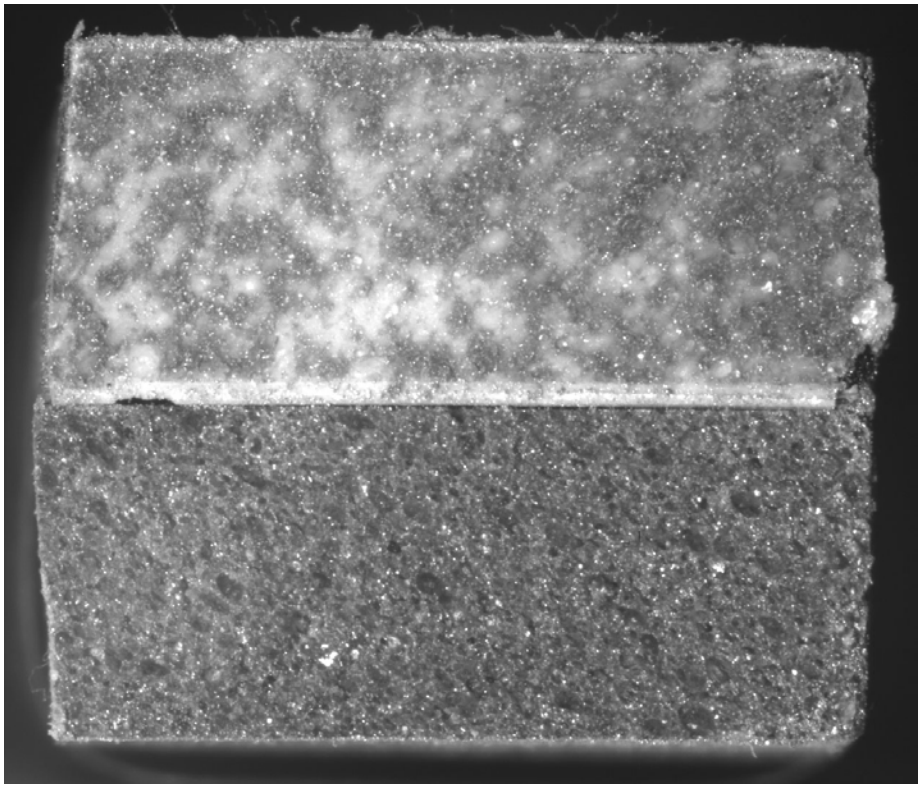
Fracture Surfaces
(specimen with strong interfacial strength)

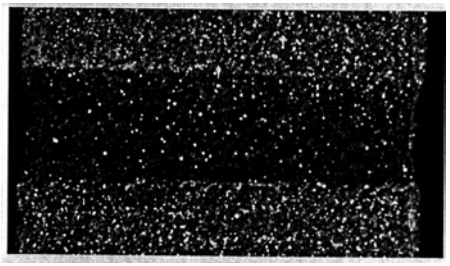




Fracture Surfaces
(specimen with weak interfacial strength)

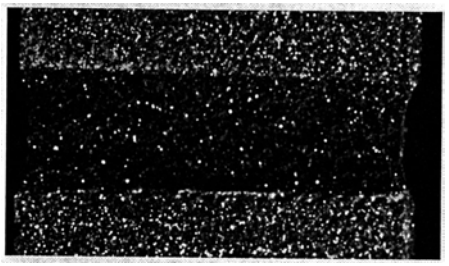
0 min

24 min



18 min

25 min



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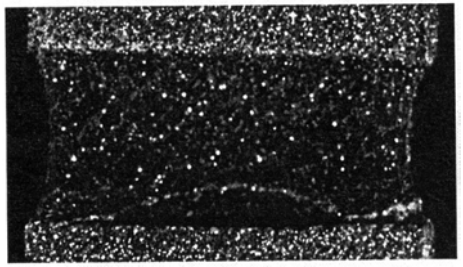

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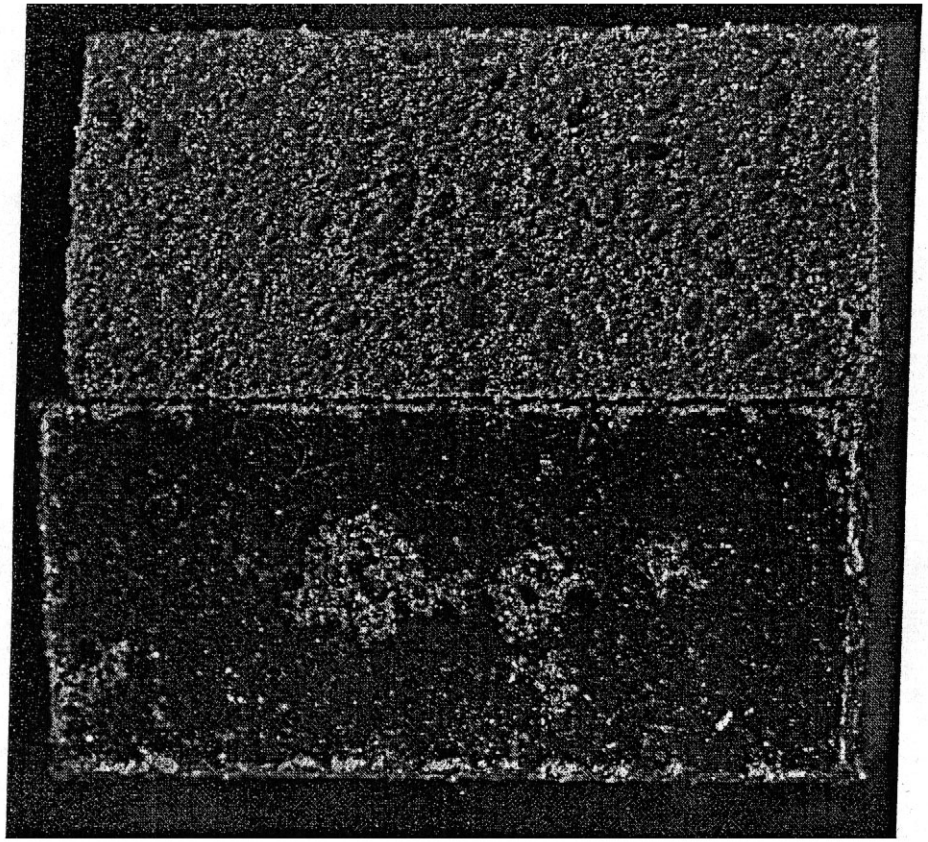
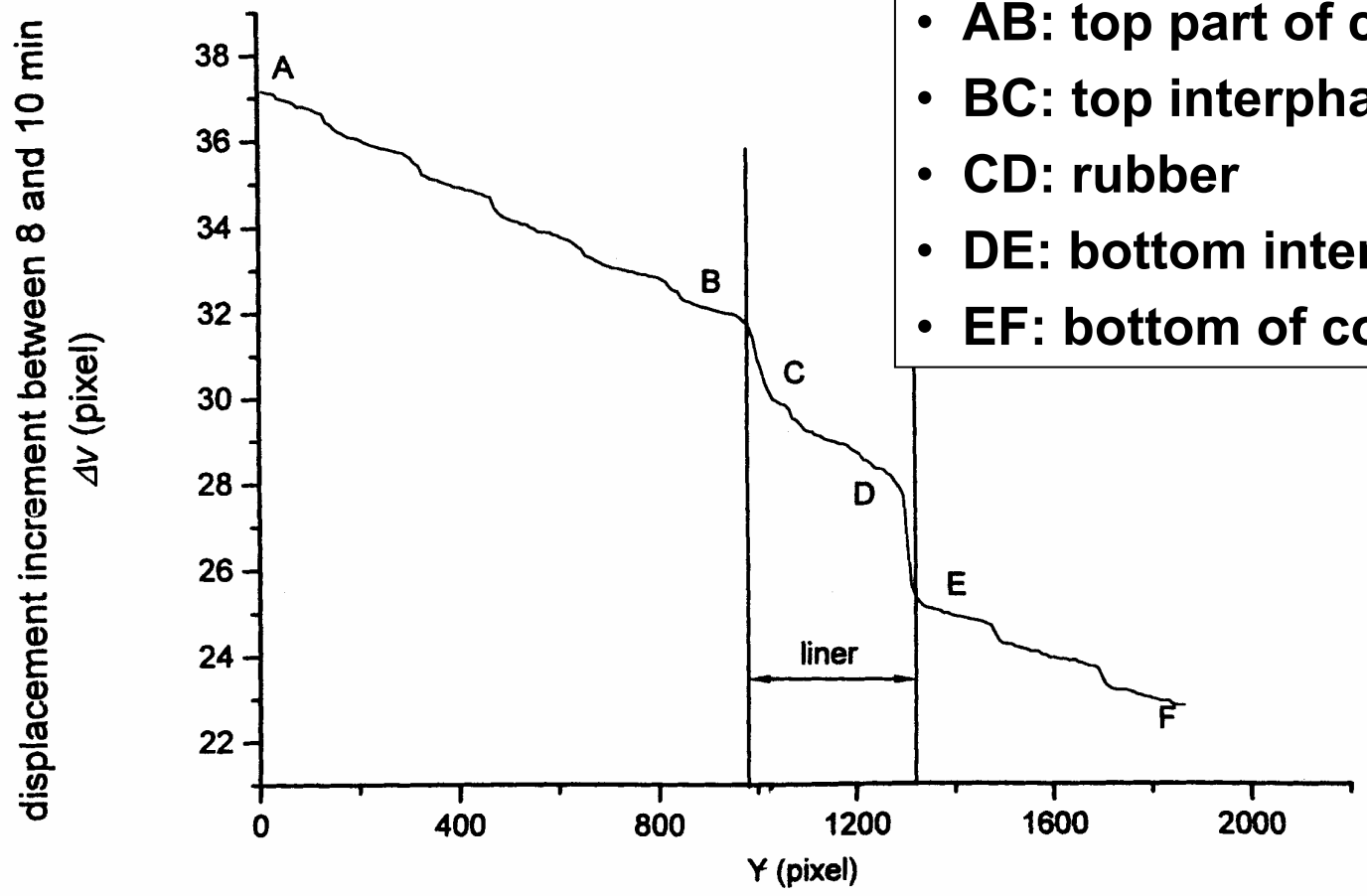
Fracture Surfaces
(specimen with weak interfacial strength)



Broken Interface of Specimen V

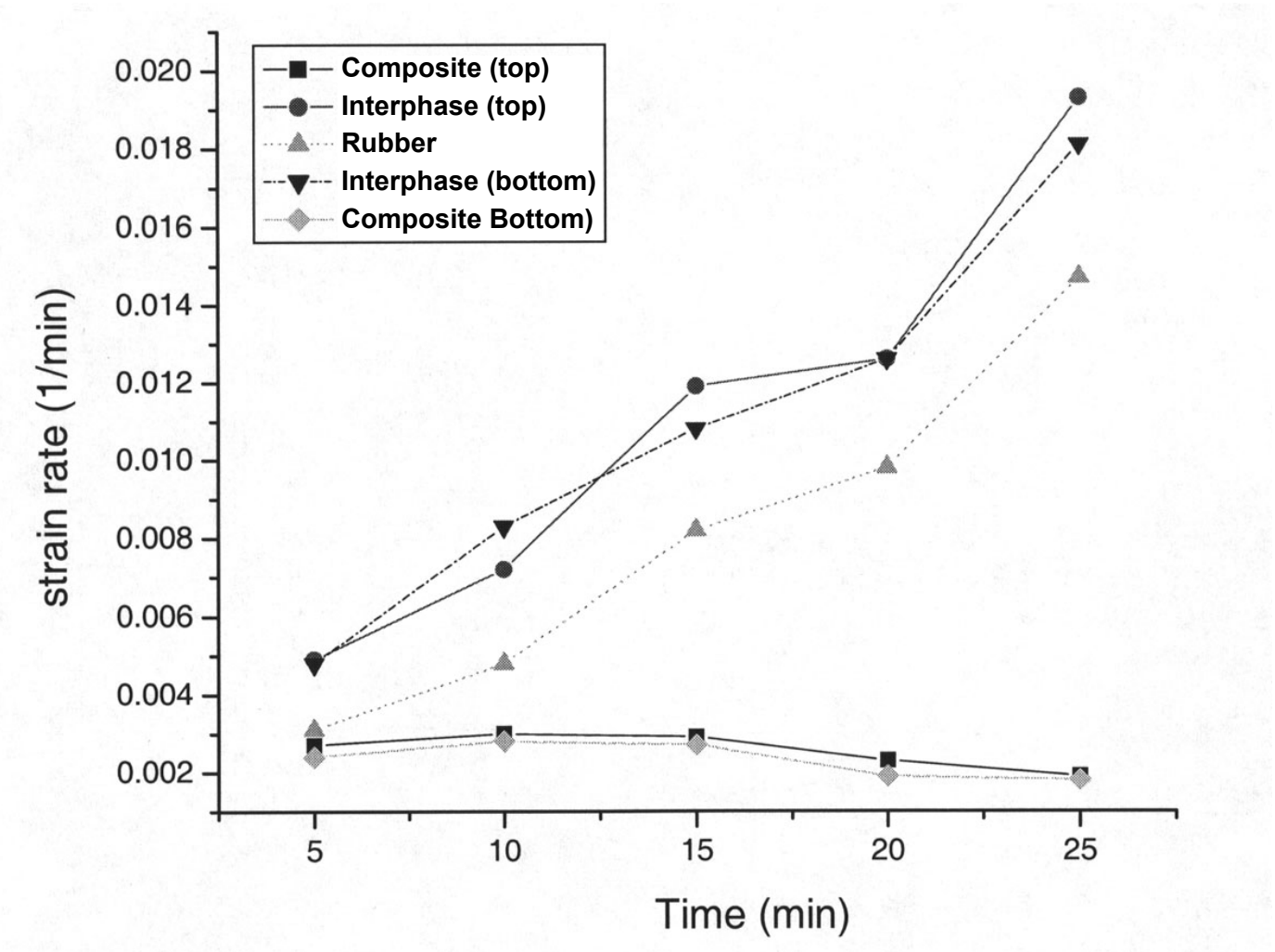
Displacement Increments Distribution along y Direction



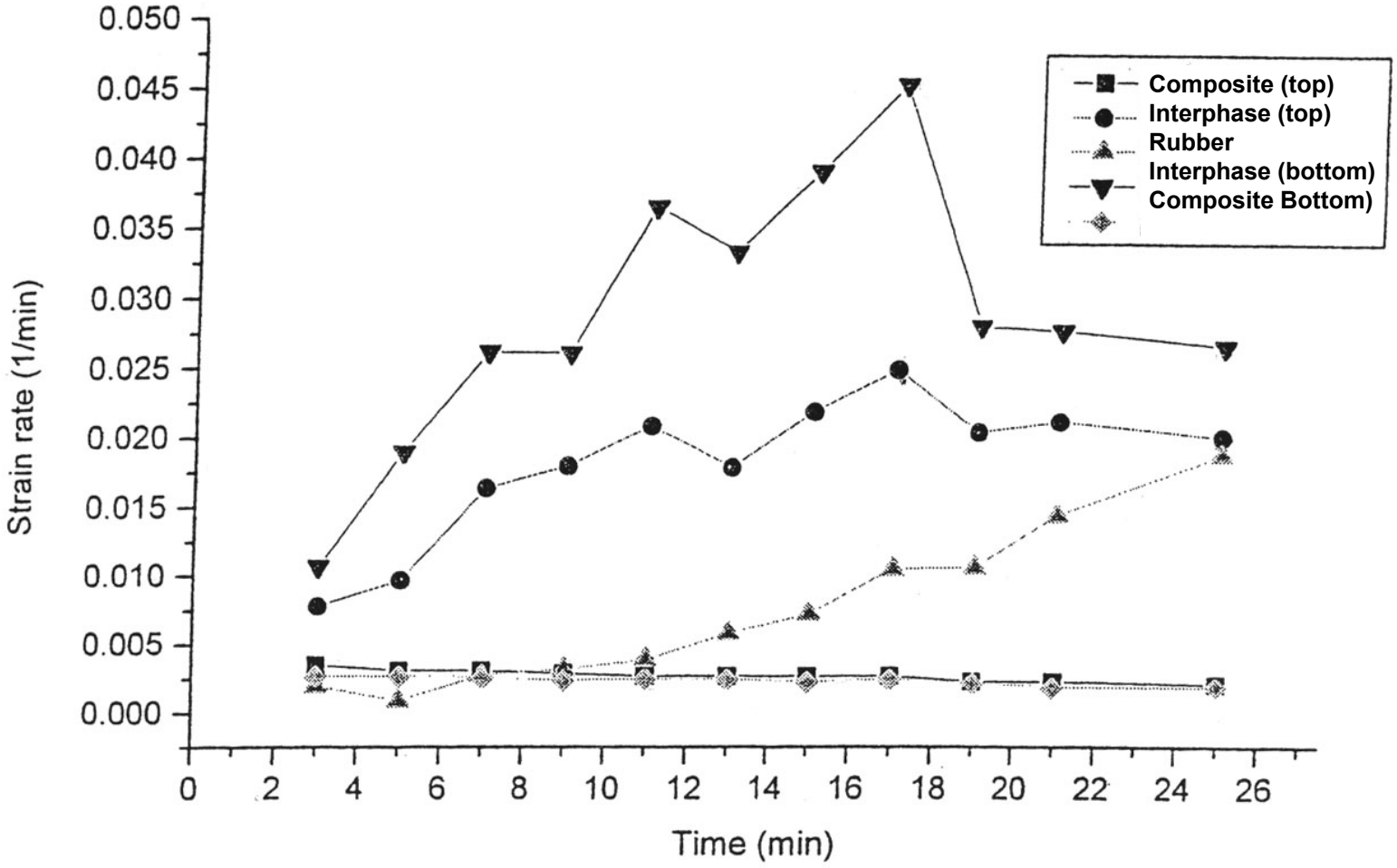
Five sections:

- AB: top part of composite
- BC: top interphase
- CD: rubber
- DE: bottom interphase
- EF: bottom of composite

Strain Rate Versus Time Curve
(specimen with strong interfacial strength)



Strain Rate Versus Time Curves
(specimen with weak interfacial strength)



Conclusions:

* For the specimen with weak interfacial strength, failure occurs in the interface.
- For the specimen with strong interfacial strength, failure occurs in the composite layer.
- There are interphase regions near the interfaces of the specimen.
- The strain rates in the rubber layer, the composite layers, and the interphase regions change with time.
- The strain rates in the interphase regions are significantly higher than that in the rubber and the composite layers.
- The strain rates in the interphase regions decrease as the interfacial strength increases.