1. REPORT DATE (DD-MM-YYYY) | 2. REPORT TYPE | 3. DATES COVERED (From - To) 
---|---|---
| 
4. TITLE AND SUBTITLE | Technical Papers | 
---|---|---

5. AUTHOR(S) 

6. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 
Air Force Research Laboratory (AFMC) 
AFRL/PRS 
5 Pollux Drive 
Edwards AFB CA 93524-7048 

7. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) 
Air Force Research Laboratory (AFMC) 
AFRL/PRS 
5 Pollux Drive 
Edwards AFB CA 93524-7048 

8. PERFORMING ORGANIZATION REPORT 

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

10. SPONSOR/MONITOR'S ACRONYM(S) 

11. SPONSOR/MONITOR'S NUMBER(S) 

12. ABSTRACT 

13. SUPPLEMENTARY NOTES 

14. SUBJECT TERMS 

15. SECURITY CLASSIFICATION OF: 

16. LIMITATION OF ABSTRACT 

17. NUMBER OF PAGES 

18. NAME OF RESPONSIBLE PERSON 
Leilani Richardson 
(661) 275-5015 

19a. TELEPHONE NUMBER 

36 separate sheets are enclosed

Standard Form 298 (Rev. 8-98) 
Prescribed by ANSI Std. 239.18
MEMORANDUM FOR PRR (Contractor/In-House Publication)

FROM: PROI (TI) (STINFO)

C.T. Liu, "Effects of Microstructure on Damage Evolution, Strain Inhomogeneity, and Fracture in a Particulate Composite"  
Presentation slides/Invited Lecture
International Conference/Brussels, Belgium  
(Public Release)

9 June 1999
Effects of Microstructure on Damage Evolution, Strain Inhomogeneity, and Fracture in a Particulate Composite

C.T. Liu
Air Force Research Laboratory
AFRL/PRSM
10 E. Saturn Blvd.
Edwards AFB, CA 03524-7680
Objective

• Investigate the Effects of Microstructure of a Particulate Composite Material on Damage Mechanisms, Strain Fields, and Local Fracture Near the Crack Tip.
Calibration

![Graph showing the relationship between DIC strain and optically measured strain. The points lie on a straight line, indicating a linear relationship.]
Maximum Principal Strain Distribution for 4.0% Far Field Strain During Loading.
Test 1
Maximum Principal Strain Distribution for 6.0% Far Field Strain During Loading.
Test 1
Maximum Principal Strain Distribution for 8.0% Far Field Strain During Reloading. Test 1
Maximum Principal Strain Distribution for 10.0% Far Field Strain during Reloading Test 1
Iso-Intensity Contour Plots of $I_t$ Near Crack Tip

(a) $\epsilon = 3\%$

(b) $\epsilon = 6\%$

(c) $\epsilon = 9\%$

(d) $\epsilon = 12\%$
Iso-Intensity Contour Plots of $I_t$ Near Crack Tip

(e) $\varepsilon = 13.5\%$

(f) $\varepsilon = 13.5\%$

(g) $\varepsilon = 13.5\%$

(h) $\varepsilon = 13.5\%$
Normal Strain (Experimental Result)
Conclusions

1) The Heterogeneity of the Microstructure Plays a Key Role for Local Damage and Strain Distributions Near the Crack Tip.

2) The High Strain Field Is Localized Within 1 Mm of the Crack Tip.

3) Damage Saturation at the Crack Tip Precedes Crack Growth.

4) The Damage Distribution Is Roughly Commensurate With the Strain Distribution in the Specimen.