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International Conference on Mechanical Behavior of Materials  

(Statement A)
Investigating the Crack Growth Behavior in a Particulate Composite Material under Multi-Axial Loading Conditions.

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Objectives

- Investigate the Effect of Loading Conditions on the Crack Growth Behavior in a Particulate Composite Material under Confining Pressure

- Loading Conditions:
  - Constant Strain Rate: 5.8 cm/cm/min
  - Constant Strain: 12%, 15%, and 18%.
  - Confining Pressures: Ambient and 6897 Kpa
Specimen Geometry

0.254 cm
0.635 cm
0.254 cm

3.8 cm
3.8 cm
3.8 cm

1.02 cm
1.27 cm

7.62 cm

5.08 cm
5.08 cm

0.635 cm

crack
Engineering Stress Vs. Strain
(Ambient Pressure)

Eng. Stress - KPa

Strain - cm/cm

NO CRACK
SURFACE CRACK

1305 1088 870 653 435 218 0
-218 0 0.1 0.2 0.3 0.4 0.5
Engineering Stress Vs. Strain
(6897 Kpa Presure)
Normal Strain Distribution Ahead of the Crack Tip at the Onset of Crack Growth

- Test 9, Pressure = 6896 KPa
- Test 11, Ambient Pressure

Diagram: Normal Strain vs. Deformed x Coordinate (Pixel)
Half Crack Length Vs. Time
(Constant Strain Rate Condition)

- Pressure
  ▲ - 6897 Kpa
  ◆ - Ambient

18% Strain
Crack Growth Rate Vs. Time
(Constant Strain Rate Condition)

Pressure
- ▲  6897 Kpa
- ◆  Ambient
Half Crack Length c Vs. Time

Time (sec)

Strain

- 15%
- 15%
- 15%
- 15%
- 18%
- 18%
- 18%
- 12%
- 12%

Half Crack Length c (cm)
Crack Growth Rate Vs. Time

Strain

- 15%
- 18%
Conclusions

- Under constant strain rate condition, the crack growth rate under ambient pressure is significantly higher than that under 6897 Kpa confining pressure.

- Under constant strain condition, in general, the crack growth rate decreases as the applied strain level is decreased.

- Under constant strain condition, the crack stops growth after it propagates a short distance.

- At the onset of crack growth, confining pressure has no significant effect on the size of the high strain region.