

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Enhanced Strength via crack friction and Pressure¹ DONALD WIEGAND, ARDEC Picatinny USA, KEVIN ELLIS, CLAIRE LEPPARD, AWE Aldermaston — The effect of pressure on the mechanical response of particulate polymer composites is being studied. Between about 0.1 and 7 MPa for one composite the results indicate that slow crack growth is the dominant failure mode. With continuously creasing strain at low pressures the stress initially increases to a maximum, the compressive strength, then decreases indicating work softening and then becomes approximately constant at a plateau value. Both the compressive strength and the plateau stress increases linearly with pressure but the plateau stress increases with a steeper slope such that at higher pressures work softening is not observed. The results are analyzed in terms of shear cracks with friction between the crack surfaces. The model predicts a threshold stress for crack growth which increases linearly with pressure and further predicts that the compressive strength increases linearly with pressure as observed and with the same slope as the threshold stress. These results clearly indicate that the pressure dependence of the compressive strength is due to the pressure dependence of the threshold stress for crack growth. The changes in the plateau region can also be attributed to frictional effects.

¹Supported by AWE Aldermaston.

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Date submitted: 11 Nov 2010

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