

Abstract Submitted
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Dynamic Shearing Resistance of a Simulant of an Active Material¹ PINKESH MALHOTRA, TONG JIAO, RODNEY CLIFTON, PRADEEP GUDURU, Brown University, BROWN UNIVERSITY TEAM — Pressure-Shear Plate Impact (PSPI) experiments have been conducted to provide an experimental foundation for developing constitutive models for the mechanical response of polymer-bonded sugar (PBS) simulants of polymer-bonded explosives (PBXs). Experiments have been done on HTPB, sucrose, and a HTPB/sucrose composite at a range of pressures (3-9 GPa) and shearing rates of 10^5 - 10^6 s⁻¹. It is shown that shear strength of HTPB is highly pressure sensitive, increasing from 120 MPa at 2.8 GPa to 470 MPa at 8.8 GPa. Sucrose, on the other hand, exhibits a nominally constant value of shear strength (\sim 300 MPa) in this range of pressures and shear strain rates. However, pronounced strain softening is observed in sucrose at high shear strains — even a dramatic drop in shearing resistance in some cases. Based on the experimental data, constitutive models have been developed. Finite element simulations are carried out for a quasi-linear viscoelastic model for HTPB and an elastic-thermoviscoplastic model for sucrose.

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