

Abstract Submitted
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Impact Initiation of Rods of Pressed Polytetrafluoroethylene (PTFE) and Aluminum Powders WILLIS MOCK, JR., WILLIAM H. HOLT, Naval Surface Warfare Center, Dahlgren Laboratory, Dahlgren, VA 22448-5100 — A gas gun has been used to investigate the shock initiation of rods consisting of a mixture of 74 wt % PTFE (28 μm particle size) and 26 wt % aluminum (5 μm particle size) powders. The 7.6 mm diameter by 51 mm long rods were fabricated from material that had been pressed and sintered to a full density of 2.27 gm/cm³. The rods were sabot-launched into 4340 steel anvils at impact velocities ranging from 104 to 777 m/s. This corresponds to calculated impact stresses of 3.3 to 48 kbar. The experiments were carried out in a 50-100 mtorr vacuum. A framing camera was used to observe the time sequence of events. These include changes in rod shape, fracture, and the initiation and evolution of the reaction phenomena. Observation of first visible light after impact was taken as the initiation time. Initiation of the reaction occurred at discrete locations in the rod material. At low velocity, no initiation occurred. Above an initiation threshold, the initiation time dropped abruptly from 56 μs just above threshold to 4 μs at the highest impact velocity. Two experiments were performed for pure PTFE material for comparison with the PTFE/Al rods. The pure PTFE showed more extensive radial flow without obvious brittle fracture. For the 784 m/s impact experiment, small points of light were observed on the edge of the mushroomed portion of the rod about 20 μs after impact, suggesting the onset of chemical reaction.

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