SHOCK15-2015-000646

Abstract for an Invited Paper
for the SHOCK15 Meeting of
the American Physical Society

**Real-time Visualization of Dynamic Particle Contact Failures**

WAYNE CHEN, Purdue University

Granular materials have been widely used for shock isolation and ballistic protection. Particles constituting granular materials come under dynamic compressive loading during projectile penetration, materials processing, transportation, and construction. The resulting integrity of the spherical particles plays a significant role in both the subsequent processing and the energy absorption capabilities of the material. In this study, failure mechanisms in two contacting brittle particles under dynamic compressive loading are investigated using high speed X-ray phase contrast imaging. Controlled dynamic compression is applied using a modified Kolsky bar apparatus. Particles investigated in study are composed of five different materials: soda-lime glass (SLG), polycrystalline silicon, polycrystalline silicon dioxide (silica), barium titanate glass (BTG), and yttria stabilized zirconia (YSZ). For both SLG and silica particles, one of the particles pulverize, thus breaking into many small pieces, when compressed. For Silicon and BTG particles, a finite number of cracks are observed in one of the particles causing it to fracture. For YSZ particles, a single meridonial crack develops in one of the particles, breaking it into two parts.