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Comminution of Ceramic Materials Under High-Shear Dynamic Compaction[1] MICHAEL HOMEL, Lawrence Livermore Natl Lab, JASON LOISEAU, ANDREW HIGGINS, Dept of Mechanical Engineering, McGill University, ERIC HERBOLD, Lawrence Livermore Natl Lab, JAMIE HOGAN, Dept of Mechanical Engineering, University of Alberta — The post-failure "granular flow" response of high-strength lightweight ceramics has important implications on the materials' effectiveness for ballistic protection. We study the dynamic compaction and shear flow of ceramic fragments and powders using computational and experimental analysis of a collapsing thick-walled cylinder geometry. Using newly developed tools for mesoscale simulation of brittle materials, we study the effect of fracture, comminution, shear-enhanced dilatation, and frictional contact on the continuum compaction response. Simulations are directly validated through particle Doppler velocimetry measurements at the inner surface of the cylindrical powder bed. We characterize the size distribution and morphologies of the initial and compacted material fragments to both validate the computational model and to elucidate the dominant failure processes.

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