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Direct measurements of dynamic granular compaction using synchrotron phase-contrast X-ray radiography MICHAEL E. RUTHERFORD, DAVID J. CHAPMAN, Institute of Shock Physics, Imperial College London, JAMES G. DERRICK, Earth Science and Engineering, Imperial College London, JACK R.W. PATTEN, Institute of Shock Physics, Imperial College London, ALEXANDER RACK, European Synchrotron Radiation Facility, PHIL A. BLAND, Curtin University of Technology, GARETH S. COLLINS, Earth Science and Engineering, Imperial College London, DANIEL E. EAKINS, Institute of Shock Physics, Imperial College London — The true nature of dynamic granular compaction is challenging to resolve with surface-based diagnostics. Direct measurements of mesoscale shock phenomena such as grain fracture, stress-bridging and local phase transition growth are required to understand how key initial parameters (e.g. grain morphology or size) may be tuned to influence the distribution of shock states developed in a shocked powder. Bimodal, porous samples analogous to precursor chondritic meteorite (chondrite) material were shock-compressed via plate-impact. The shock compaction process was diagnosed with single-bunch (150 ps, 71 m), transmission phase-contrast X-ray radiography at the European Synchrotron Radiation Facility. The cutting-edge radiographic method permitted spatially-resolved measurements of wave velocities and wave thickness across the powder bed in real-time. Focus is given to the direct experimental measurement and evolution of shock state distributions within the powder samples, and how these distributions were dependent on the guest particle size.

Michael E. Rutherford
Institute of Shock Physics, Imperial College London

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