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Role of Heterogeneities on the Shock Compression Response of Mock-Additively Manufactured Energetic Materials (AMEMs)[1] ANDREW BODDORFF, GREG KENNEDY, HANNAH WOODS, Georgia Institute of Technology, DIDIER MONTAIGNE, Eglin AFRL, BLAIR BRETTMANN, NARESH THADHANI, Georgia Institute of Technology — The role of process-inherent heterogeneities on the shock compression response of AMEMs comprised of high solids loaded composites with simulant particles (e.g. melamine, silicon dioxide) in a UV-curable binder matrix is investigated. Additive manufacturing introduces heterogeneities at the macro-scale, such as periodic and aperiodic voids and hierarchical layers, as well as particle aggregation and micro-voids on the meso-scale. These heterogeneities affect the shock compression response and influence the sensitivity of energetic materials. In the present work, AMEMs fabricated using direct write extrusion are investigated to study the role of AM process-inherent heterogeneities on their shock compression response. Samples obtained from sections cut from AM fabricated blocks are shock-compressed using gas gun plate-impact experiments with Photon Doppler Velocimetry used to measure shock and particle velocities, and 1-D photonic crystal multilayer optomechanical sensors to measure spectral shifts associated with shock pressure. The measured PDV particle velocity profiles and pressure distributions obtained from spectral changes are correlated to deduce the role of heterogeneities. The results obtained to date will be presented.

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