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Microstructure-based hypervelocity impact simulations of additively manufactured composite shielding MANNY GONZALES, Materials and Manufacturing Directorate, Air Force Research Laboratory, WPAFB, Ohio 45433, LAUREN POOLE, MATTHEW FRENCH, WILLIAM YARBERRY, ZACHARY CORDERO, Materials Science and NanoEngineering, Rice University, Houston, TX 77005 — It is desirable for lightweight armor to defeat projectile impact events through dispersion and dissipation mechanisms intrinsic to its design. Microstructural control afforded by additive manufacturing techniques can provide a topologically-dispersive armor material in a dimensionally-compact form. The dispersive response of a dual-phase interpenetrating metallic composite manufactured through a two-step processing approach is evaluated in this work via microstructure-based hydrocode simulations to assess its ability to dissipate shock compression and disperse shock waves. Real microstructures obtained via x-ray computed tomography are used to simulate hypervelocity impact experiments at a range of impact velocities in both 2D and 3D. The wave dispersion, rear spall, and dissipation in an interpenetrating composite are compared with experimental results and simulations of simpler lamellar configurations. The geometric origins of the dispersive properties of this composite are also discussed.

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