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Deformation quantification during impact testing of mild steel for velocities of 1 to 3 km/s[1] JAMES D. HOGAN, ROBERT J. ROGERS, JOHN G. SPRAY, University of New Brunswick, Canada — Understanding the high rate deformation of metals during hypervelocity impact is important in mitigating damage in shielding systems. Well characterized experiments are needed to improve, validate and provide reference for numerical design of these complex systems. To better understand the high rate failure of metals, this work examines the response of mild steel plates during hypervelocity impact. An electromagnetic railgun at the French-German Research Institute of Saint-Louis, France, was used as the launch platform for impact velocities of 1 to 3 km/s. The targets were 50 mm thick. Image analysis of the highly deformed pearlite grains indicate that strains upwards of 100% occur prior to failure near the impact point. Strain values decrease and grain orientations gradually change from aligned in the shot direction to random away from the impact site. Electron back scatter diffraction is used to quantify microstructural deformation, and localized thermal and fracture effects are characterized with secondary electron microscopy.

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