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Thermomechanical Response of HMX Polycrystals to Simulated Impact Loading D. BARRETT HARDIN, Georgia Institute of Technology, The George W. Woodruff School of Mechanical Engineering, JULIAN J. RIMOLI, Georgia Institute of Technology, The Daniel Guggenheim School of Aerospace Engineering, MIN ZHOU, Georgia Institute of Technology, The George W. Woodruff School of Mechanical Engineering — A framework for analyzing the thermo-mechanical response of ensembles of HMX crystals to impact loading is presented. The effects of material microstructure and anisotropy on heating and stress evolution are investigated. The model accounts for anisotropic elasticity, crystalline plasticity, and thermal conduction. Simulations carried out concern the response of fully dense HMX polycrystalline ensembles under loading at impact velocities from 50 - 400 m/s. Herein, the effect of the inherent anisotropies on the energy and stress localization in an HMX based PBX is quantified. The results show that when local stress and temperature states are critical, such as energetic composites, modeling the crystalline anisotropy of the constituents is essential to capturing the whole range of states experienced by the material.

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