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Mechanistic Aspects of Shock-induced Reactions in Ni+Al Powder Mixtures DAN EAKINS, NARESH THADHANI, Georgia Institute of Technology — A combination of parallel-plate impact experiments utilizing stress measurements and meso-scale numerical simulations are used to investigate the effect of particle morphology on the mechanical and chemical response of Ni+Al powder mixtures. The instrumented gas-gun impact experiments were performed at pressures up to 6 GPa. Based on measured shock velocity increases and shock compressibility changes consistent with the Ballotechnic model, the flake-based powder mixture was found to exhibit shock-induced reaction. The particle-level mechanistic details of deformation, mass-flow, and mixing, were explored through discrete particle continuum simulations, validated against the experimental results. The micron-scale spherical and flake mixtures were found to display widely varying configurational changes at several length scales, which give insight into why the flake-Ni morphology is more susceptible to shock-induced reactions under the imposed conditions.

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