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Microstructural Defects in Shocked Nanocrystalline Ni and Ni-W
HUSSAM JARMAKANI, UCSD, EDUARDO BRINGA, MORRIS WANG, LLNL, CHRIS SCHUH, MIT, MARC MEYERS, UCSD — This mechanisms of defect generation and multiplication in nanocrystalline Ni and Ni-W deformed at very high strain-rates between $\dot{\varepsilon} \sim 10^4\,\mathrm{sec}^{-1}$and $\dot{\varepsilon} \sim 10^7\,\mathrm{sec}^{-1}$ quasi-isentropically compression via gas-gun and laser methods are investigated experimentally, experimentally, and computationally. Transmission Electron Microscopy (TEM) was used to probe the recovered microstructure for defects (dislocations, stacking faults, twins, etc). As the grain size is decreased and stacking-fault energy is increased, the propensity for twinning is decreased and the critical twinning pressure is increased. An analytical model was developed that determines the critical twinning pressure as a function of grain size and stacking-fault energy. Molecular dynamics (MD) simulations using LAMMPS were performed on nc Ni, and results of the defect substructure are compared with that of TEM. This research effort is funded by grant no. LLNL-B560780.

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