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Investigation of ultrafast relaxation in terrestrial and meteoric Fe-Ni LAURA CHEN, DANIEL EAKINS, DAVID CHAPMAN, SAM STAFFORD, JOHN WINTERS, Imperial College London, DAMIAN SWIFT, BASSEM EL-DASHER, MIKE SACULLA, MUKUL KUMAR, JOEL BERNIER, Lawrence Livermore National Laboratory — The ablation and breakup of meteorites upon entry into the Earth's atmosphere is an important challenge of global relevance. However, large thermal gradients, coupled with complex stoichiometry of Fe-Ni based meteorites, lead to difficulties in accurately modeling the breakup process. Ultrafast compression experiments are being conducted to better understand the effect of microstucture and temperature on the behavior of dislocation mechanisms in Fe-rich materials. The Janus laser at the Jupiter Laser Facility (LLNL) has been employed to drive pressures up to 50 GPa into thin foil targets composed of Fe and 0-25% atomic composition of Ni. Targets have been prepared from meteorites harvested from Diablo Canyon and the Gibeon crater, as well as Fe-Ni synthesized to yield similar stoichiometry. A new target holder has been used to pre-heat/cool targets in the range of 77-600K. Line-imaging VISAR and X-ray diffraction are employed to provide measure of distinct features linked to the onset of stress relaxation as well as to examine the effects of impurities on the α - ε phase transformation. In this poster, we present preliminary data of the effect of temperature and impurity content on the peak elastic state of Fe-Ni alloys under laser-driven shock compression.

Laura Chen
Imperial College London

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