

Dynamic Experimentation and the Need for Subsecond Thermophysical Property Measurements (LA-UR 08-07710)

Darcie Dennis-Koller^{C, S}
Los Alamos National Laboratory, Los Alamos, NM, U.S.A.

The behavior of materials under thermomechanical extremes of high pressure and stress, strain and strain-rate, and high and low temperature is at the heart of many energy problems that face our world today. Development of new materials that can withstand thermomechanical extremes begins with the understanding of physical processes involved, starting with the properties of the atoms and molecules extending from the nanoscale to the collective mesoscale. In particular, understanding of the dynamic response of materials to high strain-rate loading is lacking. At these extreme conditions, fundamental changes in the atomic bonding, structure, physical properties, and chemistry of materials present new opportunities for understanding routes for synthesis of new materials. Development of experimental techniques for achieving the measurement of thermophysical properties in the extreme environment of a dynamic experiment will lead to better equation of state (EOS) construction and predictive capabilities, as well as, opening new pathways for a better understanding of dynamic material response.