SOUTH DAKOTA MINES
An engineering, science and technology university

Using Laser-Driven Shocks to Probe Material Viscosity at High Pressures

Sonya Dick, PhD Candidate,
University of Michigan Ann Arbor

Tuesday, November 7
11 AM, CM 266

Transport properties, including viscosity, play a pivotal role in modeling dynamic phenomena within the mantle of Earth and super-Earths. However, the viscosity of mantle materials at pressures exceeding 100 GPa remains poorly constrained. This seminar introduces an innovative campaign employing a coupled experimental and computational approach to infer the viscosity of silicates and oxides at mantle relevant pressures.

The methodology involves subjecting materials to a strong, laser-generated shock passing through a sinusoidal interface. The resultant evolution of the perturbed interface and the behavior of the corrugated shockwave are theorized to exhibit strong dependence on viscosity. By leveraging insights into hydrodynamic interfacial instabilities, shock dynamics, and simulations, this approach aims to refine our understanding of material viscosity at extreme conditions. Initial simulations are presented, providing a benchmark for recent experimental results. The seminar will also delve into a broader discussion of the high-energy-density physics field.

Sonya Dick is a PhD candidate in Mechanical Engineering at the University of Michigan Ann Arbor. She received a BS in Mechanical Engineering from California Polytechnic State University San Luis Obispo in 2019. Her research interests include hydrodynamic instabilities at high pressures with applications for inertial confinement fusion, astrophysical phenomena, and measuring material properties.

Department of Mechanical Engineering
Research Seminar

For more info and to view past seminars
me.sdsmt.edu > seminars