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Study of the strength of molybdenum under high pressure using electromagnetically applied compression-shear ramp loading[1] JOW DING, Washington State University, C. SCOTT ALEXANDER, Sandia National Laboratories, JAMES ASAY, Consultant — MAPS (Magnetically Applied Pressure Shear) is a new technique that has the potential to study material strength under megabar pressures. By applying a mixed-mode pressure-shear loading and measuring the resultant material responses, the technique provides explicit and direct information on material strength under high pressure. In order to apply sufficient shear traction to the test sample, the driver must have substantial strength. Molybdenum was selected for this reason along with its good electrical conductivity. In this work, the mechanical behavior of molybdenum under MAPS loading was studied. To understand the experimental data, a viscoplasticity model with tension-compression asymmetry was also developed. Through a combination of experimental characterization, model development, and numerical simulation, many unique insights were gained on the inelastic behavior of molybdenum such as the effects of strength on the interplay between longitudinal and shear stresses, potential interaction between the magnetic field and molybdenum strength, and the possible tension-compression asymmetry of the inelastic material response.

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