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Role of interfacial bonding in the design and realization of Magnetically Applied Pressure Shear (MAPS) experiments[1] JOW DING, Washington State University, C. SCOTT ALEXANDER, Sandia National Laboratories
— MAPS (Magnetically Applied Pressure Shear) is a new technique that can be used to explore the material behavior under dynamic compression-shear loadings at strain rates and pressures that are much higher than those that can be achieved by gas-gun driven pressure shear experiments. A significant challenge for MAPS is the transmission of large shear stress through material interfaces. In this study, numerical simulations were used to gain insights on the behavior of the interface between molybdenum, which is the driver, and zirconia, the anvil, in MAPS experiments. Molybdenum was stressed into the plastic regime and zirconia stayed elastic but appeared to have incurred some spall damage at the later stage of the experiments. By including damage for the anvil and interfacial sliding in the simulations, both the longitudinal and transverse velocity data were able to be reasonably simulated. The results indicate that the interfacial slip appears to usually occur at the beginning stage of the shear loading when the pressure is relatively low. After the pressure reaches a certain level, the shear stress could be fully transmitted. Some other possible experiment designs to minimize the role of interface in MAPS are discussed.

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