Abstract Submitted
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**Mesoscale simulations of shock-induced melting in aluminum powder**[1] BRIAN DEMASKE, MATTHEW HUDSPETH, Sandia National Laboratories, ANIRBAN MANDAL, BRIAN JENSEN, Los Alamos National Laboratories, TRACY VOGLER, Sandia National Laboratories — Mesoscale simulations of an impactor colliding with a PMMA capsule containing aluminum powder ($\rho_{00} = 1.5$ g/cc) have been performed to investigate shock-induced melting in porous metals. Impact velocities of 1-2.5 km/s are chosen to coincide with in situ X-ray diffraction experiments, which provide direct evidence of time-dependent melting behavior in the aluminum powder. Mesoscale simulations show shock heating within the powder is highly nonuniform and melting remains incomplete for even the highest impact velocities. Such incomplete melting behavior was also observed in experiments despite continuum equation of state calculations predicting equilibrium pressure-temperature states well in excess of the experimental melt line. Inclusion of explicit heat conduction within the model leads to a reduction in the high-temperature tail of the temperature distribution within the powder and a shift in the main peak towards higher temperatures. At low impact velocities, a decrease in the powder melt fraction is observed relative to the non-conductive case, whereas, at high impact velocities, an increase in the melt fraction is observed.

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