Abstract Submitted
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Shock Induced Phase Changes in Forsterite and Iron Silicide[1] M. NEWMAN, P. ASIMOW, California Institute of Technology, R.G. KRAUS, R. SMITH, F. COPPARI, J.H. EGGERT, Lawrence Livermore National Laboratory, J. WICKS, S. TRACY, T. DUFFY, Princeton University — The equation of state of magnesium silicates and iron alloys at the pressures and temperatures near the melt curve is important for understanding the thermal evolution and interior structure of rocky planets. Here, we present a series of laser driven shock experiments on single crystal Mg_2SiO_4 and textured polycrystalline iron silicide (Fe-15Si), conducted at LLE. In situ x-ray diffraction measurements were used to probe the melting transition and investigate the potential decomposition of forsterite into solid MgO and silica rich liquid and Fe-15Si in to silicon rich B2 and iron rich hcp structures. This work examines kinetic effects of chemical decomposition due to the short time scale of laser-shock experiments. Preliminary results demonstrate solid-solid and solid-liquid phase transitions on both the forsterite and Fe-15Si Hugoniots. For Fe-15Si, we observe a texture preserving martensitic transformation of D03 Fe-15Si into an hcp structure and melting at 318 GPa. For forsterite, we observe diffraction consistent with B1 MgO and melting at 215 GPa.

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