Abstract Submitted
for the SHOCK11 Meeting of
The American Physical Society

Determining the Liquid-Vapor Curve of Silica with Mbar Shock and Release Experiments R.G. KRAUS, S.T. STEWART, Harvard University, D.C. SWIFT, LLNL, C.A. BOLME, LANL, R.F. SMITH, S. HAMEL, B. HAMMEL, LLNL, D.K. SPAULDING, U.C. Berkeley, D.G. HICKS, J.H. EGGERT, G.W. COLLINS, LLNL — The liquid-vapor curve of most materials is an elusive part of the phase diagram because static techniques cannot reach the high temperatures and pressures near the critical point. Dynamic shock and release experiments are currently the best method for probing states up to and over the critical point. Shock-induced vaporization is an important process in the geosciences, e.g., it is key to testing the giant impact hypothesis for the formation of the Moon. We use shock and release experiments to probe the liquid-vapor curve of SiO_2, the dominant phase in Earth's crust. At Janus, 1-3 Mbar planar supported shock waves were driven through alpha-quartz by direct laser ablation. The temperature of the fluid released to the liquid-vapor curve is measured using a streaked optical pyrometer, and the average density of the mixed phases is derived from stagnation against aluminized LiF windows after uniaxial expansion across different gap distances. The results of our temperature and density measurements compare favorably with a recent model for the vapor curve of silica; however, our calculated entropy on the Hugoniot is significantly higher than in previous work. Hence, we revise the criteria for vaporization of silica during planetary impact events.

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Date submitted: 18 Feb 2011 Electronic form version 1.4