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Optical properties of silica under shock loading R.S. MCWILLIAMS, R. JEANLOZ, University of California-Berkeley, D.G. HICKS, P.M. CELLIERS, J.H. EGGERT, G.W. COLLINS, Lawrence Livermore National Laboratory — The high-pressure behavior of Silica (SiO2) has been explored extensively with shock-compression and is of great importance in condensed matter physics and planetary science. A number of interesting phenomena, such as shock-induced shear banding and superheating, were first observed in silica and subsequently observed in a variety of dielectrics including planetary silicates and alkali halides. Thus silica can serve as an excellent system in which to understand the high-pressure and -temperature behavior of dielectrics. We have investigated the optical opacity, reflectivity, and index of refraction of alpha-quartz and fused silica to shock compressions of $\sim$2 Mbar and temperatures of $\sim$1 eV with laser driven shock waves. With increasing pressure, we observe a sharp increase in the opacity of these initially transparent solids, followed by a more gradual rise of reflectivity at higher pressure. These results may be crucial for interpreting thermal emission measurements from shocks in these materials, as well as providing new detail on the nature of silica and other dielectrics at extreme conditions. This work was performed under the auspices of the US DOE by LLNL under Contract No.\W-7405-ENG-48.

R.S. McWilliams
UC Berkeley

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