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Sound Velocities in Shock-Synthesized Stishovite to 72 GPa[1]
ELEANOR J. BERRYMAN, Princeton University, J. MICHAEL WINEY, YOGENDRA M. GUPTA, Washington State University, THOMAS S. DUFFY, Princeton University — Stishovite (rutile-type SiO_2) is expected to occur in the Earth's lower mantle and is an archetype for lower-mantle silicates. Constraints on the stishovite sound speed at relevant pressure and temperature conditions are necessary for understanding its thermoelastic behavior at deep Earth conditions and for interpreting seismic data. In situ X-ray diffraction measurements have shown that stishovite forms in fused silica shock-compressed above 34 GPa [Tracy, et al., PRL (2018)]. Here, we report shock-wave profiles and sound-speed measurements in fused silica shock-compressed to 44 - 72 GPa. Plate-impact experiments were conducted using a two-stage light-gas gun in both transmission (Al or Cu impacting fused silica) and front-surface-impact (fused silica impacting LiF) geometry. Laser interferometry was used to measure particle velocity profiles. The shock and particle velocities determined from the transmission-shock wave profiles are consistent with previous experiments. Longitudinal sound speeds were determined from the release wave velocities in the front-surface-impact experiments. The results will be compared to previous experimental and theoretical sound velocities for stishovite and evidence for melting on the fused silica Hugoniot will be assessed.

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