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Ultra High-Pressure Equation of State and Melting of $MgSiO_3$

DYLAN SPAULDING, RAYMOND JEANLOZ, UC Berkeley, Dept of Earth and Planetary Science — New laser-driven shock experiments, using both single-crystal and glass starting materials, extend equation of state measurements on $MgSiO_3$ to 4.5 Mbar and 15,000 K. Simultaneous collection of temporally and spatially resolved velocimetry, pyrometry and reflectivity data document shock-induced melting at pressures above 275GPa, with an apparent increase in optical reflectivity (>20%) and density (several percent). These observations indicate transformation to a metallic state upon melting, implying that the distinction between silicate and metallic constituents are blurred at Earth's core-mantle boundary. This was particularly the case at the high temperatures and pressures present after the late-stage giant impact that formed the Moon.

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