

Off-Hugoniot measurements of iron and hydrogen above 500 GPa

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Recent development of techniques to compress samples to many Mbar off the principal Hugoniot enables the preparation and investigation of materials in states like those in planetary interiors. Iron, for example, melts on the Hugoniot at 250 GPa, but remains solid in the Earth's inner core (350 GPa). High pressure solid iron has been prepared by ramp-compression up to 470 GPa, and the phase and pressure-density EOS were measured using a newly developed powder x-ray diffraction diagnostic. In separate experiments, a sequence of reverberating shocks was used to compress deuterium samples up to 570 GPa near the Jupiter adiabat. Simultaneous pressure, temperature, and conductivity measurements were acquired, and demonstrated a substantial increase to metal-like conductivity in the compressed deuterium samples.

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