Laser shock compression of iron and iron alloys studies for planetary science

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Abstract

An accurate knowledge of the properties of iron and iron alloys at high pressures and temperatures is crucial for geophysics and planetary science. In particular, detailed information on melting curves and solid phases are required to anchor the Earth's thermal profile at the Inner Core Boundary (ICB) and to assess the solid or liquid nature of exoplanets cores. In that context, XFEL sources coupled with high-energy lasers are affording unique opportunities to measure microscopic structural properties at extreme condtions. Here we present recent studies devoted to investigate the solid-solid and solid-liquid transition in laser-shocked iron and iron alloys using both X-ray diffraction and X-ray Absorption Near-Edge Spectroscopy (XANES). Experiment were performed at the MEC end-station of the LCLS facility at SLAC (USA) as well as the EH5 end station of SACLA – Spring-8 facility (Japan).

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