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Hematite phase diagram under laser shock compression

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Iron–oxygen (Fe-O) binary systems are of the utmost importance for planetary evolution. However, their phase diagrams and physical properties at extreme pressure and temperatures are poorly known. As an example, recent static compression experiments have demonstrated the existence of new iron oxide stoichiometries at high pressure and temperature such as FeO2 [1][2], Fe4O5 [3], Fe5O6 [4]. These discoveries, with the wide variety of iron oxides phases existing at high pressure [5], highlight the complexity of iron-oxygen phase diagram in extreme condition. In this context, measurements of physical properties, phase transition processes and phase diagrams of Fe-O systems with laser shock compression techniques offer unique opportunities to extend the actual pressure and temperature ranges of such studies. Here, I will present main results from a laser shock experiment at the ID24 ESRF beamline using time-resoved X-ray absorption measurement on Fe2O3 samples. In addition, I will show a preliminary analysis of a very recent experiment performed at LULI 2000 to measure equation of state along the Fe2O3 Hugoniot and above 500GPa. I will also describe the experimental setups, as well as the target designs and fabrications used for both experiments.

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