Contribution ID: **25** Type: **not specified**

Laser-driven shock compression of Fe up to 250 GPa probed by X-ray Absorption Spectroscopy

Tuesday, 16 May 2023 11:20 (20 minutes)

Laser-driven shock compression coupled to brilliant X-rays probes opens new research opportunities in the field of matter at extreme conditions allowing to answer questions relevant for planetary science. At beamline ID24 at ESRF (Grenoble, France) a High-Power laser was coupled to time-resolved X-ray Absorption Spectroscopy (XAS)[1]. The unique advantage represented by coupling XAS together with a High-Power laser is the ability to microscopically probe a sample regardless its state. This because, XAS technique-besides being element selective- is sensitive to short-range order and to the electronic configuration. We present here the laser-driven shock compressed XAS data of iron collected at ID24 up to 250 GPa and 4000K along the Hugoniot curve and of liquid iron measured during the shock release, that means probing at later times after the shock was out of the Fe layer. We were able to locate our shocked Fe measurements on the phase diagram by anchoring the VISAR interferometer outputs to ESTHER hydrodynamic simulation code. The acquired XAS range was long enough to retrieve the first coordination shell radius and to so retrieve its volume. The laser energy upgrade foreseen in 2023, will allow to reach and microscopically probe WDM states and thus provide an experimental constrain to theoretical models.
[1] Sevelin-Radiguet, N., Torchio, R., Berruyer, G., Gonzalez, H., Pasternak, S., Perrin, F., Occelli, F., Pepin, C., Sollier, A., Kraus, D., Schuster, A., Voigt, K., Zhang, M., Amouretti, A., Boury, A., Fiquet, G., Guyot, F., Harmand, M., Borri, M., Groves, J., Helsby, W., Branly, S., Norby, J., Pascarelli, S. & Mathon, O. (2022). J. Synchrotron Rad. 29, 167-179.

Presenting Author

Sofia Balugani

Presenting Author Affiliation

European Synchrotron Radiation Facility/Ecole Polytechnique de Paris

Presenting Author Gender

Female

Country

France

Presenting Author Email Address

sofia.balugani@esrf.fr

Primary author: BALUGANI, Sofia (ESRF)

Co-authors: Dr RAVASIO, Alessandra (Ecole Polytechnique de Paris); Dr DOYLE, Hugo (First light Fusion); Dr HERNANDEZ, Jean-Alexis (European Synchrotron Radiation Facility); Dr SEVELIN-RADIGUET, Nicolas (European Synchrotron Radiation Facility); Prof. EAKINS, Daniel (Oxford University); Dr MATHON, Olivier (European Synchrotron Radiation Facility); Dr TORCHIO, Raffaella (European Synchrotron Radiation Facility)

Presenter: BALUGANI, Sofia (ESRF)

Session Classification: High Energy Density Plasmas and Powerful Light Sources

Track Classification: High Energy Density Plasmas and Powerful Light Sources