Dynamic compression of Tantalum up to 120 GPa and associated spallation process using an XFEL probe

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In this talk, we present a pump-probe experiment performed at the XFEL SACLA (Japan). An optical laser with an intensity ~ 2.5×10^{12} W/cm^2 generates a shock wave in a 5 µm thick polycrystalline Ta target., A 7 fs quasi-monochromatic 10 keV XFEL pulse is used to diffract at the rear side of the target, with respect to the pump laser, and give us access to the crystal lattice spacing *d* after compression. With this diagnostic, we were able to follow the all dynamics of Ta under compression (elastic and plastic wave) and observed new diffraction peaks which can be associated to a phase transition or twinning of the lattice. Following the compression of Ta, we investigate its spallation (stretching of the lattice) under extreme tensile stress [1]. These data are then *directly* compared to large scale atomic simulations and help to constraint the interatomic potential of Ta in order to reproduce experimental results.

References

[1] B. Albertazzi et al., Science Advances (In press)