

Abstract Submitted
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Extreme pressure research at the European XFEL KAREN APPEL, European XFEL, THOMAS COWAN, Helmholtz-Zentrum Dresden Rossendorf, HANNS-PETER LIERMANN, DESY, MOTOAKI NAKATSUSUMI, THOMAS TSCHENTSCHER, European XFEL — The European XFEL [1] plans to integrate a nanosecond pulse duration laser system into the high energy density experiment (HED) to enable studies of materials at extremely high pressures. Ramp-compression [2] by nanosecond shaped laser pulses will enable to extend the range of high pressure conditions accessible at hard X-ray sources up to 10 Mbar at comparatively low temperatures. A suitable optical laser system with repetition rates of 0.1 and 10 Hz was recently proposed by an international consortium. Probing of the laser generated excited states will be performed with the high energy X-ray free electron laser (FEL). In the energy range between 5 and 25 keV, it will be possible to study samples by X-ray diffraction, X-ray spectroscopy and imaging techniques. Due to the high excitation energies, diffraction patterns will have excellent quality and a wide range of elements ($Z > 22$) will be accessible by X-ray absorption spectroscopy. The high intensity and time structure will enable time-resolved studies of the samples generated during dynamic compression. In addition, the high brilliance and coherence of the FEL radiation will enable spatially resolved studies.

[1] for detailed information about European XFEL see www.xfel.eu

[2] J.-P. Davis, J. Appl. Phys. **99**, 103512(2006); R. Smith et al., Phys. Rev. Lett. **102**, 075503(2009); A. Higginbotham et al., Phys. Rev. B **85**, 024112(2012)

Karen Appel
European XFEL

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