8th Asia-Pacific Conference on Plasma Physics, 3-8 Nov, 2024 at Malacca

Dynamic high-pressure research using intense photon beams

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High-energy density and high-pressured matters/materials have been studied using "intense photon beams," i.e., high-power optical lasers. In recent years, revolutionary experiments combining them with another type of intense photon beam, X-ray free electron laser, have also been conducted. We have developed a research platform for high-energy density science at SACLA, a Japanese XFEL facility [1-4]. Here, we present some recent XFEL experiments and the results obtained from the platform: 1) Super-high resolution imaging experiments on large and high-strain rate deformation in shock-compressed diamond associated with laser fusion research [5]; 2) Femtosecond X-ray diffraction observation experiments on material phase transition under laser-driven ultra-high pressures and temperatures [6,7].

References
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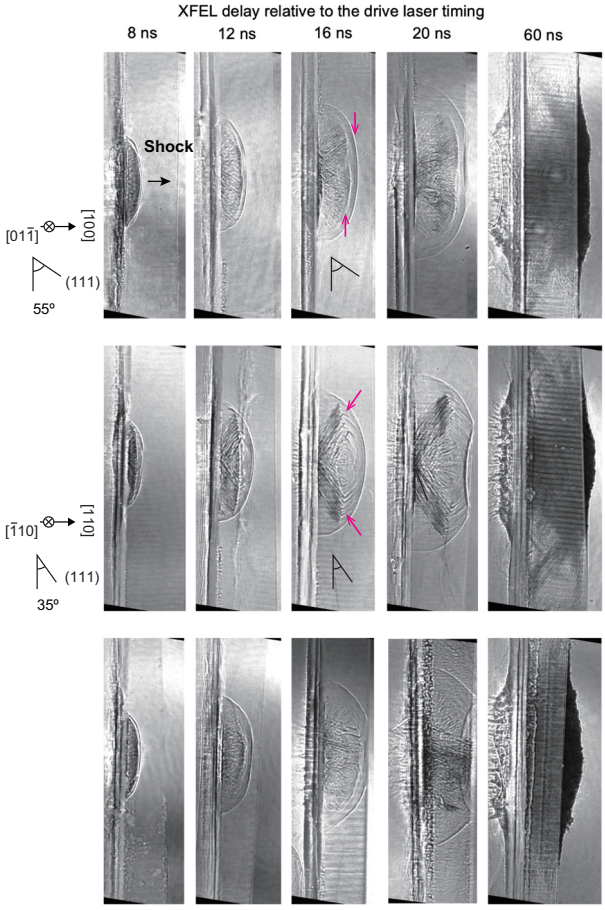

Fig. 1: XFEL radiographs of shock-compressed single crystalline diamond with different sample orientations and times. Shock propagation direction is parallel to [100] (top), [110] (middle), and [111] (bottom).