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Ultrafast x-ray studies on the dynamics of structural transitions in amorphous and crystalline SiO2 ARIANNA GLEASON, Stanford University, CINDY BOLME, Los Alamos National Lab, WENDY MAO, Stanford University, WENGE YANG, Advanced Photon Source, Argonne National Lab, HAE JA LEE, BOB NAGLER, ERIC GALTIER, DESPINA MILATHIANAKI, SLAC, LCLS, RICHARD SANDBERG, Los Alamos National Lab — Silica (SiO2) and its phase transitions at high pressure and temperature are of paramount importance to geophysics as it is the dominant chemical constituent of the Earth's mantle. Knowledge of its properties and behavior under pressure is essential to interpretation of seismic studies, high velocity cratering impact events, and to understanding the dynamics and evolution of the terrestrial planetary interiors. Here we present unprecedented experimental results on the phase transition kinetics of amorphous and crystalline SiO2 with sub-nanosecond resolution. These novel experiments, performed at LCLS, SLAC are the first ever measurements of a non-metal showing transitions from amorphous SiO_2 and single crystal -quartz to polycrystalline coesite and/or stishovite. X-ray diffraction patterns were collected with varied time delays and optical laser powers to achieve a wide sampling of pressure-temperature-time-phase space. Our datasets include information on time-resolved phase growth, grain size and texture development/evolution.

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