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Kinetics of Phase Transitions in Simple Materials using *dynamic*-DAC[1]

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The pressure-induced phase transition is often limited by diffusion and occurs at the intermediate time-scale (μs to ms) of shock wave and static DAC high pressure experiments, which can be obtained precisely and in controlled ways using *dynamic*-DAC. Coupling it with time-resolved optical spectroscopy and time-resolved synchrotron x-ray diffraction, we have recently studied high-pressure kinetics of phase transitions in an array of materials including Bi, Ga, Fe, H_2O, and methane hydrates. In this presentation, we will first describe the experimental methods and then present the results of (i) solidification of H_2O and Ga, (ii) phase transitions in Bi and Fe, and methane hydrates, and (iii) solid-state reactions in methane hydrates. As such, we will demonstrate the significance of obtaining the time-resolved structural information to understand the phase meta/stability, transition mechanisms, and diffusion-controlled crystal growth and interfacial reactions in solids.

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