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Phase conversion in silicon and carbon nanomaterials at extreme pressure MATTHEW CRANE, BENNETT SMITH, EVAN ABRAMSON, PETER PAUZAUSKIE, University of Washington — The high pressures and temperatures accessible in laser-heated diamond anvil cells (LH-DAC) have produced fundamental insights by identifying metastable states with extraordinary properties. However, the actual conditions necessary to access a metastable state depend on the kinetics of phase transformation. The explosion of research in nanomaterials has generated interest in exploring how phase transformations occur in materials with high radii of curvature, and how we can leverage these effects. We present work investigating phase transformations in Si- and C-based nanomaterials with high radii of curvature. We have loaded a LH-DAC with Si nanowires (NWs) and examined the phase at a range of pressures to discover a recoverable phase transition to a wurtzite crystal structure. For C materials, we have synthesized a pyrolyzed carbon aerogel, an amorphous carbon sol gel with size features of ˜10 nm and incredibly low density and thermal conductivity (˜10^{-2} W/m-K). We investigate spatial resolution of heating under pressure and the effect of temperature on resulting material electronic structure. Finally, we model heating with Mie theory to provide insights into the phase transformations of nanomaterials.

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