Abstract Submitted
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Silicon nanowires under high pressure YUEJIAN WANG, Los Alamos National Lab — Silicon nanowires (Si NWs), one-dimensional single crystalline, have recently drawn extensive attention, thanks to their robust applications in electrical and optical devices as well as in the strengthening of diamond/SiC superhard composites. Here, we conducted high-pressure synchrotron diffraction experiments in a diamond anvil cell to study phase transitions and compressibility of Si NWs. Our results revealed that the onset pressure for the Si I-II transformation in Si NWs is approximately 2.0 GPa lower than previously determined values for bulk Si, a trend that is consistent with the analysis of misfit in strain energy. The bulk modulus of Si-I NWs derived from the pressure-volume measurements is 123 GPa, which is comparable to that of Si-V NWs but 25% larger than the reported values for bulk silicon. The reduced compressibility in Si NWs indicates that the unique wire-like structure in nanoscale plays vital roles in the elastic behavior of condensed matter..

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