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Structural Phase Stability in Group IV Metals Under Static High Pressure NENAD VELISAVLJEVIC, GARY CHESNUT, DANA DATTELBAUM, Los Alamos National Laboratory, YOGESH VOHRA, ANDREW STEMSHORN, Department of Physics, University of Alabama at Birmingham — In group IV metals (Ti, Zr, and Hf) room temperature compression leads to a martensitic transformation from a ductile α to a brittle ω phase. $\alpha - \omega$ phase boundary decreases to lower pressure at high temperature and can limit the use of group IV metals in industrial applications. There is a large discrepancy in the transition pressure reported in literature, with some of the variation attributed to experimental conditions (i.e. hydrostatic vs. non-hydrostatic). Shear deformation in non-hydrostatic experiments drives $\alpha \rightarrow \omega$ transition and decreases transition pressure. Impurities can also aid or suppress $\alpha \rightarrow \omega$ transition. By performing x-ray diffraction experiments on samples in a diamond anvil cell we show that interstitial impurities, such as C, N, and O can obstruct $\alpha \rightarrow \omega$ transition and stabilize α phase to higher pressure. We also show that reduction in grain size can also influence $\alpha - \omega$ phase boundary and help stabilize α phase to higher pressure under non-hydrostatic conditions.

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