Abstract Submitted
for the SHOCK13 Meeting of
The American Physical Society

A new polymorph of germanium BIANCA HABERL, Australian National University, Australia, MALCOLM GUTHRIE, Geophysical Laboratory, Carnegie Institution of Washington, USA, BRETT C. JOHNSON, University of Melbourne, Australia, GUOYIN SHEN, HP-CAT, Geophysical Laboratory, Carnegie Institution of Washington, USA, BRAD D. MALONE, Harvard University, USA, MARVIN L. COHEN, University of California-Berkeley, USA and Lawrence Berkeley National Laboratory, USA, JIM S. WILLIAMS, JODIE E. BRADBY, Australian National University, Australia — The behavior of germanium under high pressure has been studied for many decades using diamond-anvil cells (DACs). A series of metal-metal transitions has been observed after the initial transition to the metallic β-Sn structure at $\sim$10 GPa. More recently, evidence for the semiconductor-metal transition has also been reported from point loading (indentation) experiments. Particularly pure amorphous Ge as starting material can be reliably phase transformed. These transitions are not reversible however, and meta-stable crystalline phases can be recovered upon pressure release. In this study we report experimental evidence from both point loading and in-situ DAC experiments for a new polymorph of Ge with the r8 structure, the same as observed for silicon. In the point loading case, the final phases after unloading are characterized using Raman spectroscopy in conjunction with computations employing density functional theory. In the DAC case, in-situ X-ray diffraction using synchrotron radiation was employed. This combination of two such very different methods for pressure application yields a more comprehensive picture of the phase behavior of Ge.

Bianca Haberl
Australian National University, Australia

Date submitted: 26 Feb 2013 Electronic form version 1.4