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Reversible pressure-induced phase change in eutectic GeSb
DMITRY SHAKHVOROSTOV, University of Western Ontario, London, Ontario, Canada, LIA KRUSIN-ELBAUM, GLENN J. MARTYNA, DENNIS M. NEWNS, CYRIL CABRAL, JR., IBM T.J. Watson Research Center, Yorktown Heights, NY, USA, SIMONE RAOUX, IBM Almaden Research Center, Almaden, CA, USA, ZAK E. HUGHES, MARTIN H. MÜSER, YANG SONG, University of Western Ontario, London, Ontario, Canada — In phase-change materials (PCM), typically Ge-Te-Sb based glassy semiconductors, a reversible transformation between a highly resistive (amorphous) and a highly conductive (crystalline) phase is accomplished by Joule heating that melt-quenches PCM into the amorphous state, and thermally anneals it back to the crystalline state. Here we report a room-temperature pressure driven *reversible* phase change in a binary eutectic GeSb system. From structural and Raman spectroscopy studies, we demonstrate abrupt hysteretic amorphous-to-crystalline and intra- crystalline transitions under a compressive load—unique to the Te-free system—that access with pressure the two extreme GeSb states previously obtained by thermal programming. Using *ab-initio* molecular dynamics simulations we show that the reverse process occurs under a tensile load. The role of the Peierls gap and Anderson localization in the pressure induced phase change accompanying a metal-insulator transition will be discussed.

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