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Embedded Binary Eutectic Alloy Nanostructures as Phase Change Materials[1] D.C. CHRZAN, S.J. SHIN, J. GUZMAN, C.W. YUAN, C.Y. LIAO, C.N. BOSWELL-KOLLER, P.R. STONE, O.D. DUBON, A.M. MINOR, U. C. Berkeley and LBNL, M. WATANABE, Lehigh University, J.W. BEEMAN, K.M. YU, J.W. AGER, III, LBNL, E.E. HALLER, U. C. Berkeley and LBNL — Phase change materials are essential components of both optical data storage and emerging static random access memory technologies. We suggest a new approach to development of phase change memory materials: embedded binary eutectic-alloy nanostructures. The approach exploits the unique properties binary eutectic-alloys that emerge when they are embedded within nanoscale voids. The equilibrium, as-grown, morphology of GeSn nanostructures within SiO_2 is a phase separated, bi-crystalline, bi-lobed state. The rapid cooling following pulsed laser melting stabilizes an amorphous, homogeneously mixed state. Subsequent annealing recrystallizes the bi-lobed state. Further, the composition of the alloy can be used to tune the re-crystallization temperature over the range of temperatures between 150C and 500C. Thus these nanostructures display the requisite crystalline-amorphous-crystalline transition, and enable tuning of the relevant transformation temperatures.

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