Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Crystallization Times of Ge2Sb2Te5 Nanostructures as a Function of Temperature FARUK DIRISAGLIK, KADIR CIL, MAREN WENNBERG, ADRIENNE KING, MUSTAFA AKBULUT, University of Connecticut, YU ZHU, CHUNG LAM, IBM T. J. Watson Research Center, ALI GOKIRMAK, HELENA SILVA, University of Connecticut — Phase-change memory is a promising non-volatile memory technology in which a small volume of a phase change material is reversibly and rapidly switched between amorphous and crystalline phases by a suitable electrical pulse. Amorphization is achieved by fast cooling after a melting pulse while crystallization is achieved through electrical breakdown of the amorphous element that leads to heating above the crystallization temperature for a sufficient period. Significant difference between the crystallization behavior of phase-change materials in bulk, thin films and in nanostructures have been observed[1,2]. We have studied the crystallization times of nanoscale Ge2Sb2Te5 line structures using 50-500 ns voltage pulses with a baseline offset in the 500 K to 625 K range under high-vacuum. The baseline voltage allows measurement of resistance before and after the pulse and crystallization time. Current and voltage were recorded with high time-resolution for amorphizing pulse and very long periods of time to observe the crystallization time. The crystallization time decreases for increasing temperature but it remains on the order of seconds even at elevated temperatures. [1] H. Wong et al., Proc IEEE 98, 2201, 2010. [2] T. Zhang et al., Scr. Mater. 58, 977, 2008.

Faruk Dirisaglik
University of Connecticut

Date submitted: 10 Nov 2011 Electronic form version 1.4