Role of antimony in structure and properties of the layered GeTe-Sb_2Te_3 memory alloys

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In many papers aiming at elucidation of the phase-change mechanism, the binary GeTe material is used as the model composition. At the same time, GeTe and Ge-Sb-Te have fundamentally different properties: alloying with Sb_2Te_3 leads to qualitative changes in both optical and electrical properties, e.g. the dielectric constant ε_1 is negative (-10) at E = 0 eV for crystalline GeTe while is is positive (ca. +40) for GST alloys [1] and electrical conductivity exhibits very different behaviours upon annealing above crystallisation temperature in the binary GeTe material and in GST alloys [2] clearly demonstrating an important role of antimony.

In this talk, we demonstrate the important role of antimony in cross-linking the GeTe layers and consequently determining the local structure of the crystalline phase of and the related properties.

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[2] T. Siegrist, P. Jost, H. Volker, M. Woda, P. Merkelbach, C. Schlockermann, and M. Wuttig. Disorder-induced localization in crystalline phase-change materials. Nat Mater, 10 (2011) 202