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## Local atomic arrangement in Ge-Sb-Te phase-change thin films

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Phase change materials (PCM), such as Te-based  $\text{Ge}_2\text{Sb}_2\text{Te}_5$  (GST), are known from optical memory applications and can be also used in non-volatile next generation random access memory. The relevant phases of GST are an amorphous phase, a metastable cubic rock salt like structure and a stable hexagonal layered structure. However, the atomic arrangements in the GST lattices are not well-understood and still under discussion. Insights into the local atomic arrangement of layered Ge-Sb-Te compounds are of particular importance from a fundamental point of view as well as for optical and electronic applications such as data storage, thermoelectric and ferroelectric. In this work, the local atomic arrangement in metastable GST and in Ge-Sb-Te thin films consisting of GST,  $\text{Ge}_1\text{Sb}_2\text{Te}_4$  and  $\text{Ge}_3\text{Sb}_2\text{Te}_6$  layered crystal structures are studied by using a combination of atomic-resolution aberration-corrected (Cs-corrected) high-angle annular dark-filed scanning transmission electron microscopy (HAADF-STEM) and detailed theoretical image simulation approaches. By comprehensive analyses of experimental and simulated HAADF-STEM image intensities, a structural model for metastable  $\text{Ge}_2\text{Sb}_2\text{Te}_5$  is proposed. In addition, the proper stacking sequences in the Ge-Sb-Te phases are determined. The obtained data are discussed with respect to existing experimental and theoretical structure models reported for bulk Ge-Sb-Te materials.

### Biography

Andriy Lotnyk has completed his PhD in 2007 from the University of Halle working at the Max Planck Institute of Macrostructure Physics (Halle) and Post-doctoral studies from the same Institute. He has been a permanent staff member at the Faculty of Engineering, CAU of Kiel in 2009-2011. Presently, he is a group leader of the group "Structure Determination and Electron Microscopy" at the Leibniz Institute of Surface Modification (IOM). He was awarded Otto Hahn Medal from the Max Planck Society in 2008. He has authored and co-authored more than 50 scientific publications in peer reviewed journals and about the same number of conference papers.

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