Novel crystal imperfection: transrotational nanostructure and its role for local amorphous – crystalline transitions and phase change materials

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We report about new kind of crystal imperfection revealed by means of transmission electron microscopy bend-contour technique in thin films after amorphous-crystalline transformations.

As was first discovered for Se, Te [1] and later on proved for different films prepared by various methods [2] amorphous-crystalline transformation in thin films can be associated with rather general unusual phenomenon: strong (up to 100-300 degrees per micrometer) regular dislocation independent lattice bending round an axis (or axes) lying in the film plane of the growing crystal. Microcrystals and nanostructures with ***internal lattice bending*** (new term – "***transrotation***" [3]) during this period have been eventually recognized/studied in a variety of thin film systems including well-known chalcogen/chalcogenide-based compositions (e.g. [4-5]) known for easy switching "amorphous-crystalline" or/and "crystalline-amorphous" also for optical memory (i.e. rewritable formats of CD and DVD disks) and prospective for new phase change materials. We suppose that ***transrotational*** crystalline structures nowadays deserve much more attention and discussions since corresponding microstructure parameters (either ignored or underestimated) can strongly influence the phase switching (e.g. the time and energy needed for writing/rewriting in chalcogenide films for phase change information storage).

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