Structure and electronic properties of layered Ge-Sb-Te based alloys

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Currently, with the increasing demands for modern storage media, such as flash memory (flash-memory) and hard disks based on magnetic recording, there is a failure of these types of storage media. This is mainly due to the insufficient number of write and erase cycles, the speed of writing and reading information, low radiation resistance, etc. [1-3]. In this regard, the expected receiver of a new generation of information carriers are non-volatile phase memory elements (PCM - Phase Change Memory) based on chalcogenide glassy semiconductors (CGS) [4].

Chalcogenide glassy semiconductors have unique properties. One of these properties is the ultrafast reverse phase transition of their structure from an amorphous to a crystalline state under the action of an electric or light pulse, which differ significantly in electrical and optical properties. It is known that chalcogenide semiconductors of the Ge-Sb-Te system of compositions $Ge_1Sb_2Te_4$, $Ge_2Sb_2Te_5$, $Ge_3Sb_2Te_6$ in the crystalline state have a layered structure with a van der Waals force of interaction between layers, which allows them to be exfoliate into two-dimensional crystals with a controlled number of layers [5,6].

In this work, an integrated approach was applied to study the structure and electronic properties of layered systems based on the Ge-Sb-Te compound.