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Elastic and Thermal properties of phase change materials (PCM): Sb_2Te_3 and $\text{Ge}_1\text{Sb}_4\text{Te}_7$

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Intensive interest on Ge-Sb-Te (GST) based alloys is driven by their outstanding electrical and optical properties which makes them excellent candidates for universal nonvolatile memory applications, also known as the phase change random access memory (PCRAM). The operating principle of the PCM is based on the rapid iterative reversible transition between two structural phases after a threshold voltage. However, their thermal conductivity is critical to device performance since it determines the resistance drift during the cyclic joule heating of the sandwiched active layer. Very few studies have been reported on the elastic and thermal properties of ternary alloys formed from GeTe and Sb_2Te_3 building blocks. In this work, thin films of Sb_2Te_3 and $\text{Ge}_1\text{Sb}_4\text{Te}_7$ deposited by RF magnetron are investigated to establish the dependence of acoustic hardening on Sb_2Te_3 rich phase change alloy. Using the measured elastic properties and acoustic phonon velocities, the dependence of thermal conductivity on the Sb_2Te_3 fraction in $\text{Ge}_1\text{Sb}_4\text{Te}_7$ by surface Brillouin scattering based on the minimum conductivity model is established.

Apply to be considered for a student award (Yes / No)?

Yes

Level for award (Hons, MSc, PhD, N/A)?

MSc

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