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# Anisotropic thermal conductivity of sputtered $\text{Bi}_{0.5}\text{Sb}_{1.5}\text{Te}_3$ films after current-assisted thermal treatment

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## Abstract

Rhombohedral bismuth telluride exhibits highly anisotropic transport properties in different crystallographic directions. Although the degree of anisotropy is diminished in polycrystalline solids, the development of crystallographic texture will lead to distinct thermoelectric properties in the in-plane and out-of-plane directions of thin films. In this study, both in-plane and out-of-plane thermal conductivities of sputtered  $\text{Bi}_{0.5}\text{Sb}_{1.5}\text{Te}_3$  (BST) films subjected to thermal/electrical treatments were measured experimentally by the two-wire 3-omega method. The in-plane thermal conductivity of the electrically treated sample is nearly twice as high as that of the thermally treated sample, which is mainly attributed to the enhanced (00 $l$ ) film texture of the electrically treated BST film. The understanding of anisotropic thermal transport behavior shall help the design and performance modeling of BST-based thermoelectric thin film devices.

**Keywords:** thermoelectric; heat conduction; crystal structure; anisotropy; sputtering; texture.

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