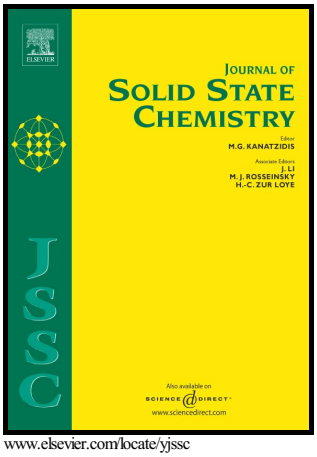

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Structural variations in indium tin tellurides and their thermoelectric properties

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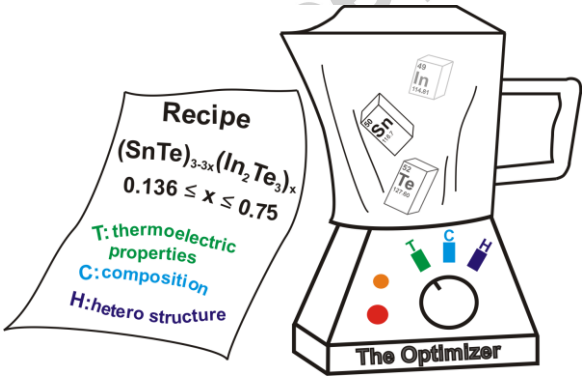
Abstract

Indium-doped tin tellurides are promising and thoroughly investigated thermoelectric materials. Due to the low solubility of In_2Te_3 in SnTe and vice versa, samples with the nominal composition $(SnTe)_{3-3x}(In_2Te_3)_x$ with $0.136 \leq x \leq 0.75$ consist of a defect-rocksalt-type Sn-rich and a defect-sphalerite-type In-rich phase which are endotaxially intergrown and form nanoscale heterostructures. Such nanostructures are kinetically inert and become more pronounced with increasing overall In content. The vacancies often show short-range ordering. These phenomena are investigated by temperature-dependent X-ray diffraction and HRTEM as well as STEM with element mapping by X-ray spectroscopy. The combination of real-structure effects leads to very low lattice thermal conductivity from room temperature up to 500 °C. Thermoelectric figures of merit ZT of heterostructured materials with x = 0.136 reach ZT values up to 0.55 at 400 °C.

Graphical Asbtract



Compositional and structural variations in heterostructures $(SnTe)_{3-3x}(In_2Te_3)_x$ with $0.136 \leq x \leq 0.75$ can be utilized to optimize thermoelectric properties.

Keywords: *tin telluride, indium telluride, heterostructures, TEM, thermoelectrics*