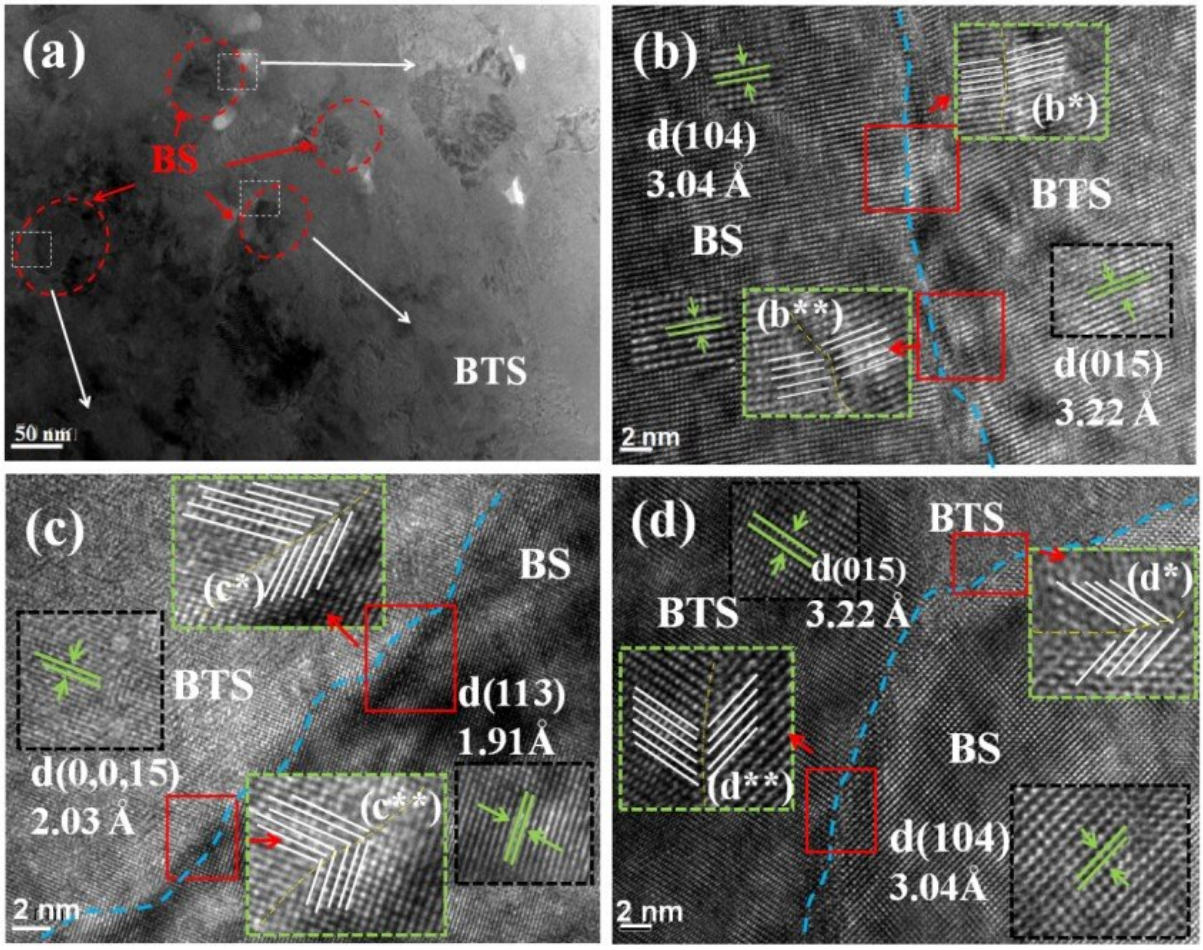
Better thermoelectric properties achieved in n-type composite

October 29 2020, by Zhang Nannan



TEM micrographs for composite specimen f$Bi_2Te_{2.7}Se_{0.3}$ with f =0.3vol%.
Credit: Bushra Jabar

Recently, a research team from the Institute of Solid State Physics, Hefei Institutes of Physical Science showed a way to achieve high thermoelectric properties in n-type $Bi_2Te_{2.7}Se_{0.3}$ (BTS).

After incorporating nanometer-sized particles of 3-D topological insulator Bi_2Se_3 in BTS, the researchers found that this was a new alloy which could not only boost power factor remarkably, but also lower lattice thermal conductivity significantly.

Thermoelectric devices offer an alternative renewable energy resource to alleviate increasing global energy demands and environmental concerns. Currently, n-type BTS is used in both refrigeration and power generation application at/near room temperatures. But the low merit (ZT) for BTS poses a foremost barrier in elevation of energy harvesting applications.

As a result, this BTS-based composite system offered high ZT, a crucial factor in thermoelectric devices.

Thus, researchers require a strategy to improve the power factor in addition to lowering thermal conductivity, and this research offers a new approach to enhance both the power factor and phonon blocking for BTS simultaneously so as to boost its ZT significantly.

More information: Bushra Jabar et al. Enhanced power factor and thermoelectric performance for n-type $Bi_2Te_{2.7}Se_{0.3}$ based composites incorporated with 3D topological insulator nanoinclusions, *Nano Energy* (2020). DOI: 10.1016/j.nanoen.2020.105512

Provided by Chinese Academy of Sciences