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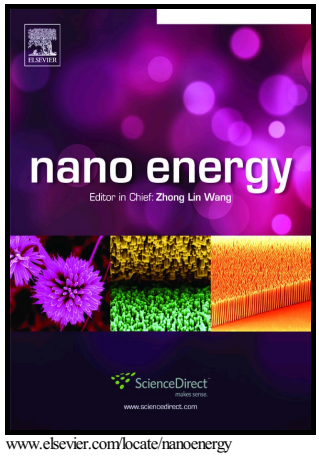

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Systhesizing SnTe nanocrystals leading to thermoelectric performance enhancement via an ultra-fast microwave hydrothermal method

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Abstract

SnTe is a notable member of the IV-VI semiconductors with SnSe and PbTe as two representative thermoelectric materials, which is considered to be a potentially attractive thermoelectric material due to its similar rock-salt crystal structure to PbTe. However, the current researches on SnTe are limited because of the difficult synthesis in aspect of controlling morphology and size, and its thermoelectric figure of merit is also low due to the high thermal conductivity. In this study, a simple and ultra-fast microwave hydrothermal method was designed to synthesize the SnTe particles with controlled sizes from micro-scale to nano-scale. The thermoelectric properties of the corresponding SnTe bulk materials prepared by spark plasma sintering were investigated in a wide temperature range with a focus on the size effect. Due to the enhanced phonon scattering caused by the nanometer size effect, a low thermal conductivity, 0.60 $W \cdot m^{-1}K^{-1}$ at 803 K, was obtained in the bulk specimen using 165-nm-sized nanoparticles. The corresponding maximum *ZT* value at 803 K is enhanced to 0.49, which is about 2.3 times that of the SnTe bulk samples using mechanically alloyed powders.