Low thermal conductivity from liquid like behavior of Cu in SnTe thermoelectric

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SnTe is a lead-free thermoelectric material of which maximum power conversion efficiency is achievable in the intermediate temperature range of 600-900K. It is a promising less toxic alternative to PbTe. In contrast to PbTe, SnTe has been ignored for thermoelectric applications because of too high thermal conductivity due to the high hole concentration arising from inherent Sn vacancies in the lattice, small band gap (~0.18 eV) and a large split of energy between light-heavy hole valance bands. As a result, its thermoelectric figure of merit (ZT) has been limited to ~0.5 at 873K. In this work, we demonstrate thermal conductivity of SnTe can be reduced down to ~1.2W/mK at 873K by incorporating liquid like behavior of Cu atoms into the interstitial voids of the SnTe lattices. Consequently, the best composition sample exhibits a ZT ~1.5 at 873K.