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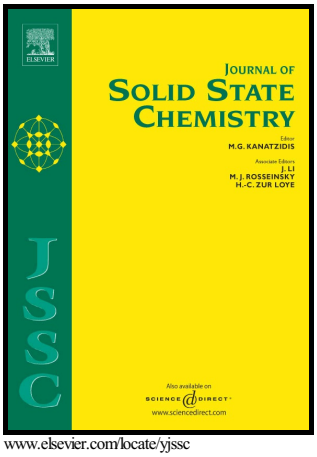

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Enhancing thermoelectric and mechanical performances in BiCuSeO by increasing bond covalency and nanostructuring

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Abstract

The layered oxyselenide BiCuSeO thermoelectric ceramics are attracting much scientific attention for its excellent thermoelectric properties. Herein, $Bi_{1-x}Sb_xCuSe_{1-x}Te_xO$ (x=0, 0.01, 0.02, 0.04, 0.06, 0.08) ceramics have been prepared by ball milling (BM) and resistance pressing sintering (RPS) process. The effects of Sb/Te doping and grain size on the thermoelectric/mechanical properties are investigated systematically. For the former, it can tune the Fermi level and promote the band convergence, decreasing the band gap and concurrently enhancing the carrier concentration; for the latter, it can profoundly modify microstructure into an all-scale hierarchical architecture to scatter phonons with broad range of mean free paths, effectively reducing the lattice thermal conductivity. The results indicates that the