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Electronic Supplementary Information

High thermoelectric performance of In-doped Cu_2SnSe_3 prepared by fast combustion synthesis

Yuyang Li,[a] Guanghua Liu,[a,*] Jiangtao Li,[a,*] Kexin Chen,[b] Yemao Han,[a] Min Zhou,[a] Laifeng Li,[a] Mingjun Xia,[a] Xingxing Jiang,[a] Zheshuai Lin[a]

a. Key Laboratory of Cryogenics, Technical Institute of Physics and Chemistry, Chinese Academy of Sciences, Beijing 100190, P. R. China.
b. State Key Laboratory of New Ceramics & Fine Processing, School of Materials Science and Engineering, Tsinghua University, Beijing 100084, P. R. China.

Corresponding authos:

Guanghua Liu, E-mail: liugh02@163.com

Jiangtao Li, E-mail: lijiangtao@mail.ipc.ac.cn

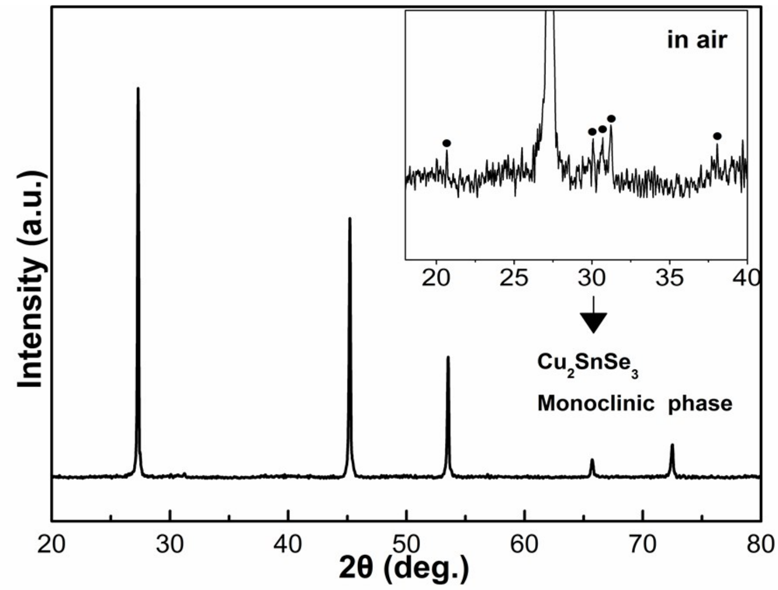

Fig.S1 XRD pattern of the monoclinic Cu_2SnSe_3 prepared by combustion synthesis in air.

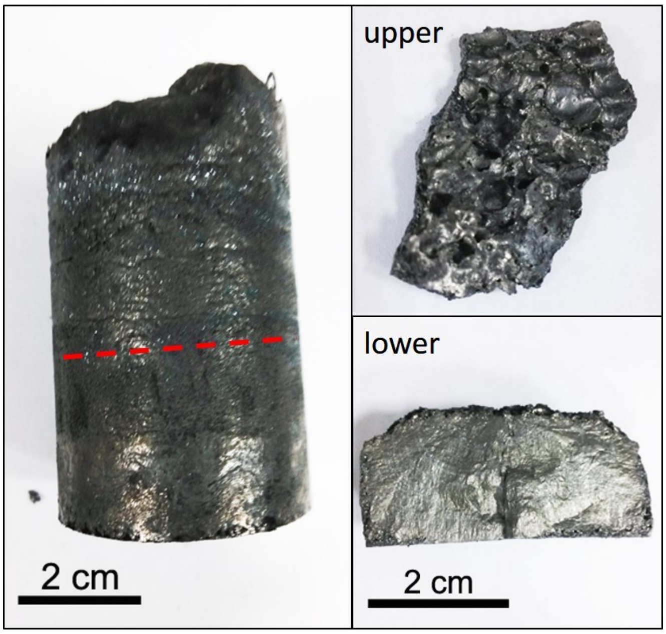

Fig. S2 Photographs of the $Cu_2Sn_{0.9}In_{0.1}Se_3$ sample prepared by high-pressure combustion synthesis in an Ar atmosphere with a pressure of 2 MPa.

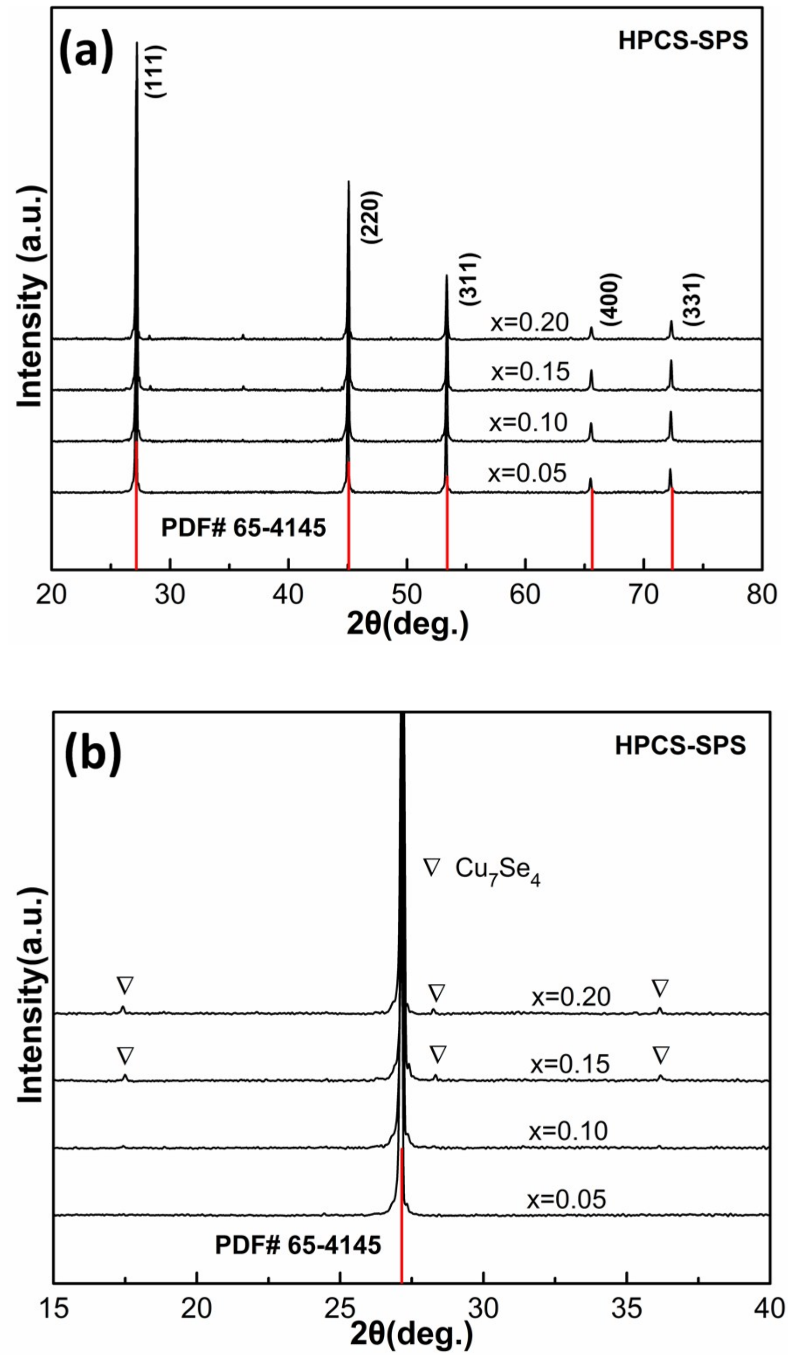

Fig.S3 XRD patterns of the $Cu_2Sn_{1-x}In_xSe_3$ samples after spark plasma sintering: (a) an overview; (b) an enlarged view to clearly show the small peaks. No significant difference was observed in the XRD patterns of the samples just synthesized and after spark plasma sintering.

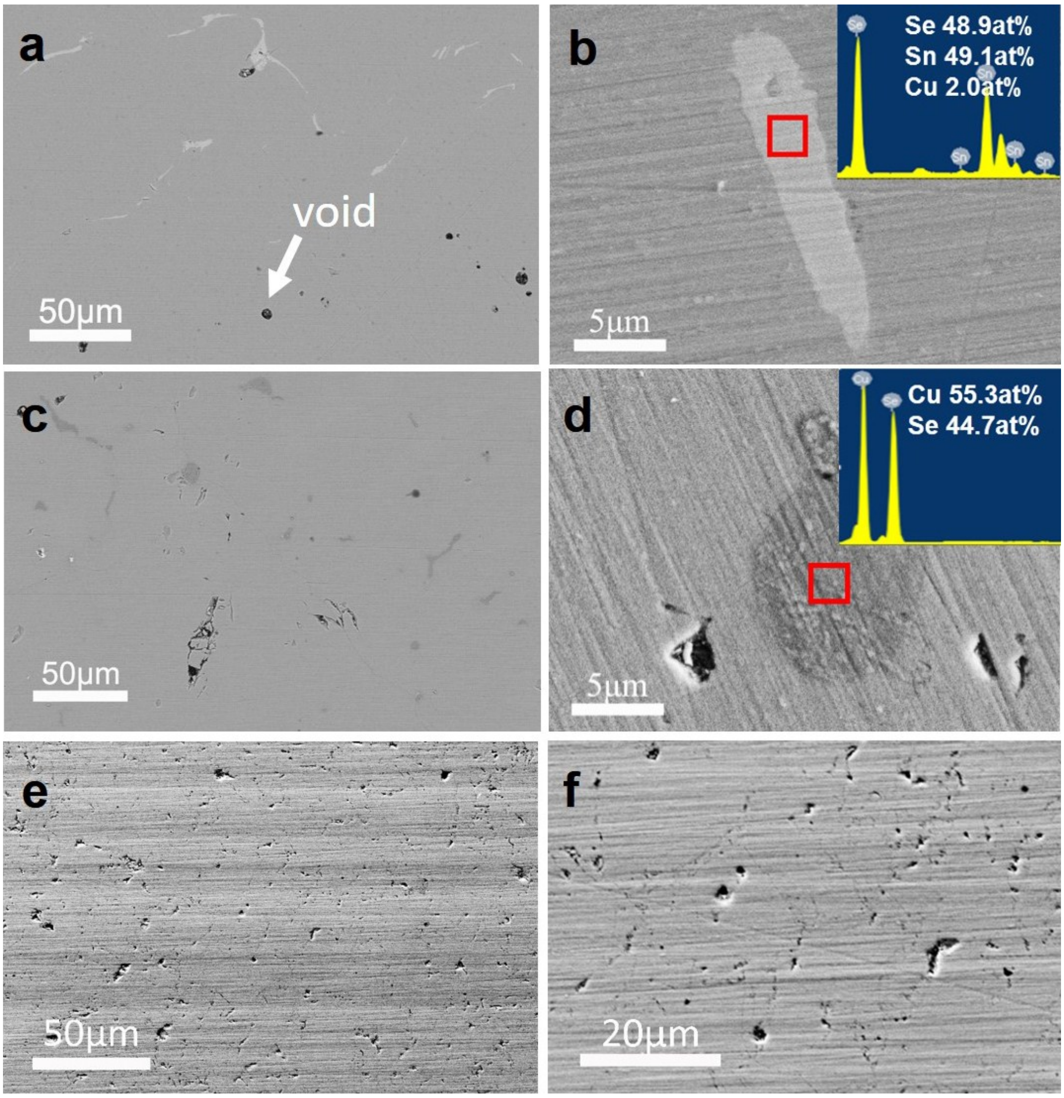

Fig.S4 Back-scattered electron images and EDS results of the $Cu_2Sn_{1-x}In_xSe_3$ samples: (a) and (b) prepared by high-pressure combustion synthesis, x=0.05, with SnSe as the secondary phase; (c) and (d) prepared by high-pressure combustion synthesis, x=0.20, with a Cu-rich secondary phase; (e) and (f) prepared by high-pressure combustion synthesis followed with spark plasma sintering, x=0.1, with much more grain boundaries compared with the just synthesized samples before spark plasma sintering.

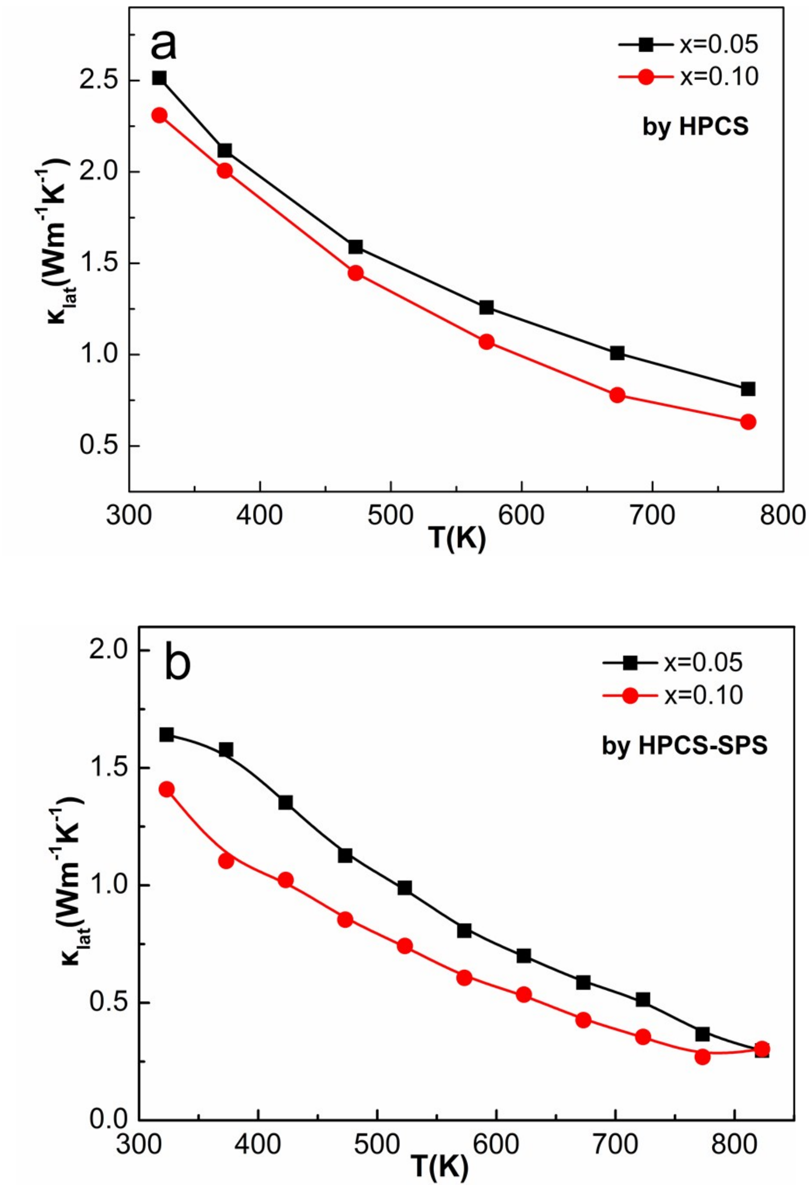

Fig.S5 Lattice thermal conductivities of $Cu_2Sn_{1-x}In_xSe_3$ (x=0.05, 0.10) samples: (a) prepared by one-step HPCS, (b) prepared by HPCS-SPS.

The lattice thermal conductivities are calculated according to the Wiedemann-Franz Law ($\kappa=\kappa_e+\kappa_L=L_0\sigma T+\kappa_L$), where κ_e is the thermal conductivity contributed by carriers, L_0 is the Lorentz number, σ is the electrical conductivity, and T is the absolute temperature. In our calculation, the Lorentz number of $L_0=2.0\times10^{-8}$ $W\Omega K^{-2}$ is used according to the report by Shi et al. (X. Shi, L. Xi, J. Fan, W. Zhang and L. Chen, Chemistry of Materials, 2010, 22, 6029-6031.)