Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supporting information:

The effect of Nickel doping on electron and phonon transport in n-type nanostructured thermoelectric material CoSbS

Zihang Liu[a,b], Huiyuan Geng[c], Jing Shuai[a], Zhengyun Wang[a], Jun Mao[a], Dezhi Wang[a], Qing Jie[a], Wei Cai[b], Jiehe Sui[a,b,*] and Zhifeng Ren[a*]

[a] Department of Physics and TcSUH, University of Houston, Houston, TX 77204, United States

[b] National Key Laboratory for Precision Hot Processing of Metals and School of Materials Science and Engineering, Harbin Institute of Technology, Harbin 150001, China

[c] State Key Laboratory of Advanced Welding and Joining, Harbin Institute of Technology, Harbin 150001,China

*To whom correspondence should be addressed. E-mail: suijiehe@hit.edu.cn, zren@uh.edu

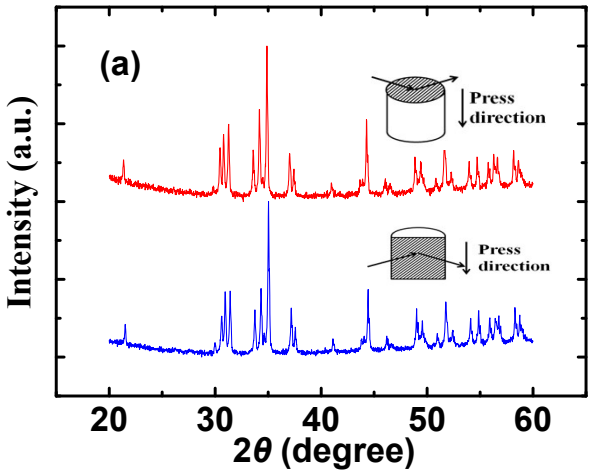
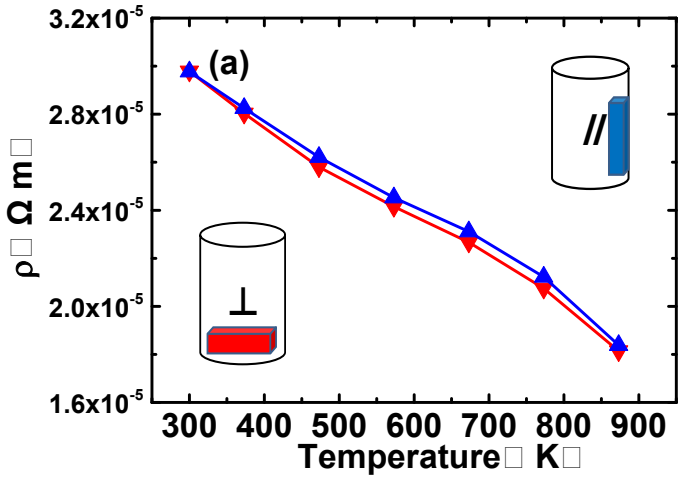
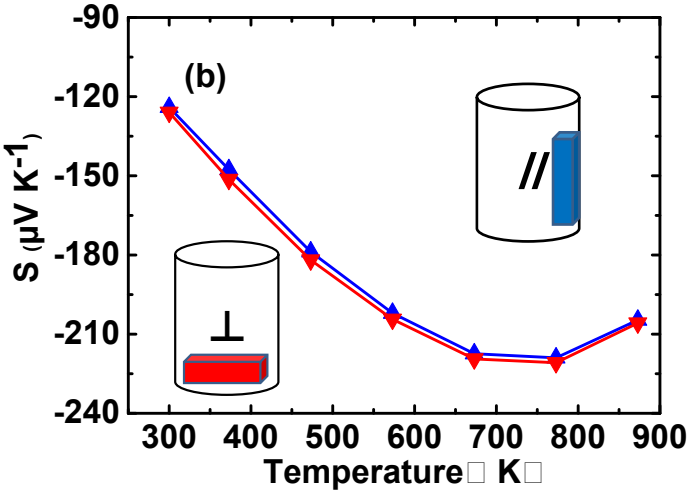
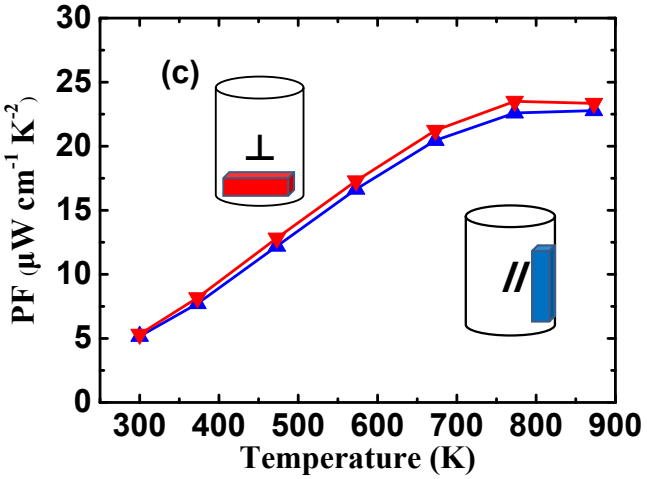
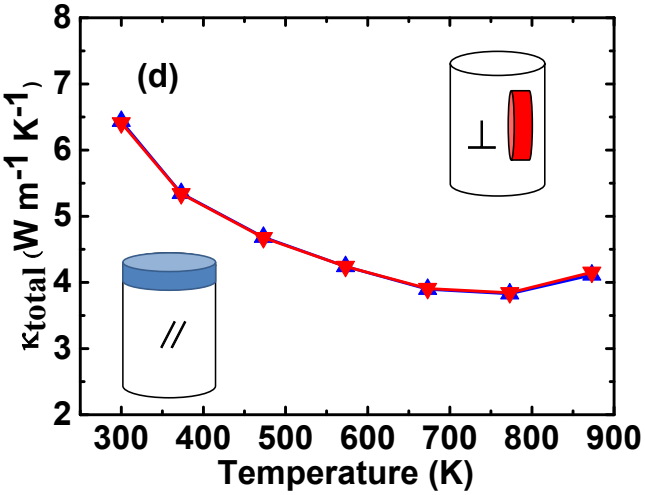


Figure S1. XRD patterns of planes perpendicular and parallel to the hot press direction of $Co_{0.94}Ni_{0.06}SbS$ samples. insert: the schematic diagram of the measured sample.




(b)
S (μV K-1)
-90
-120
-150
-180
-210
-240
300
400
500
600
700
800
900
Temperature□ K□
//
⊥


(c)
PF (μW cm-1 K-2)
30
25
20
15
10
5
0
300
400
500
600
700
800
900
Temperature (K)
⊥
//


(d)
κtotal (W m-1 K-1)
8
7
6
5
4
3
2
300
400
500
600
700
800
900
Temperature (K)
⊥
//

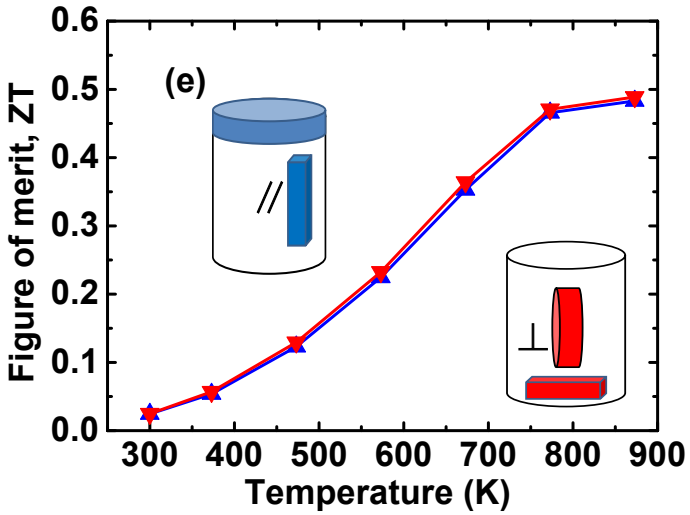


Figure S2. Temperature dependent thermoelectric performance for $Co_{0.94}Ni_{0.06}SbS$ samples. (a) Electrical resistivity; (b) Seebeck coefficient; (c) Power factor; (d) Total thermal conductivity; (e) ZT values. insert: the schematic diagram of the measured sample.

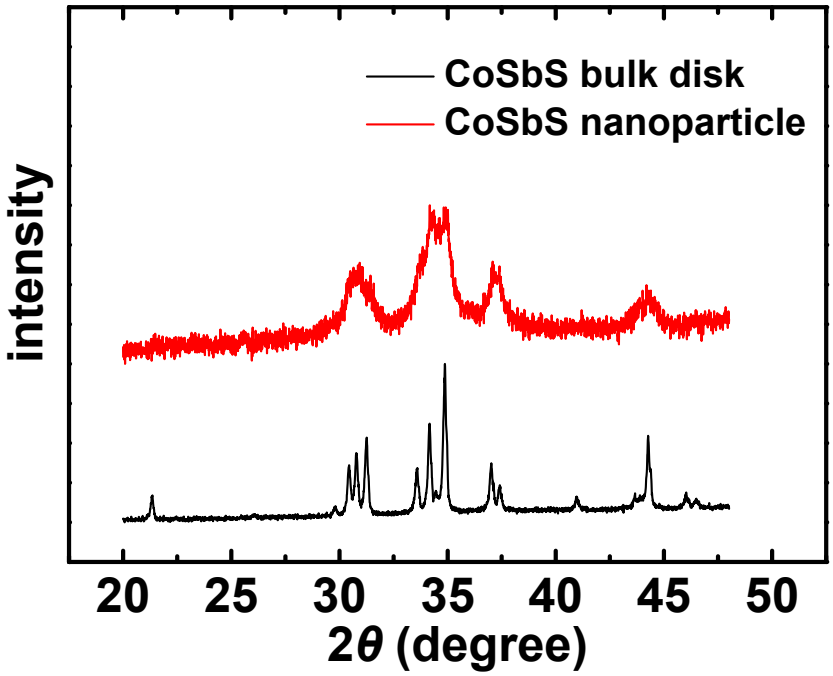


Figure S3. XRD patterns of hot pressed CoSbS bulk disk and ball-milling CoSbS nanoparticles.

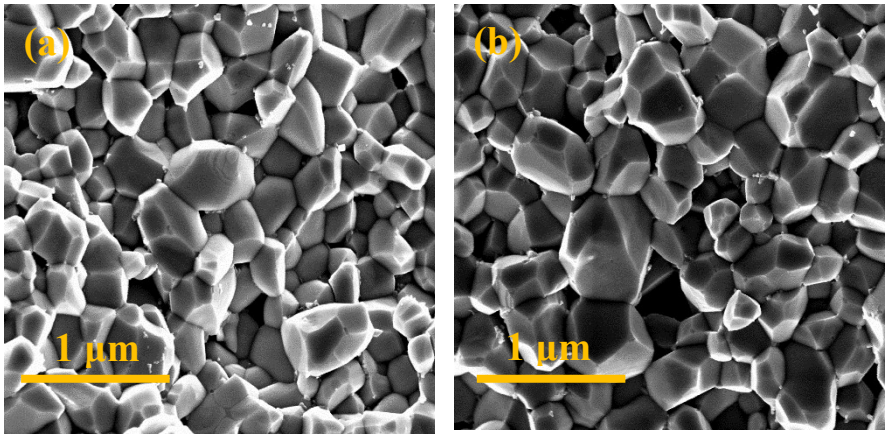


Figure S4. Typical SEM images of undoped CoSbS (a) and $Co_{0.94}Ni_{0.06}SbS$ (b).

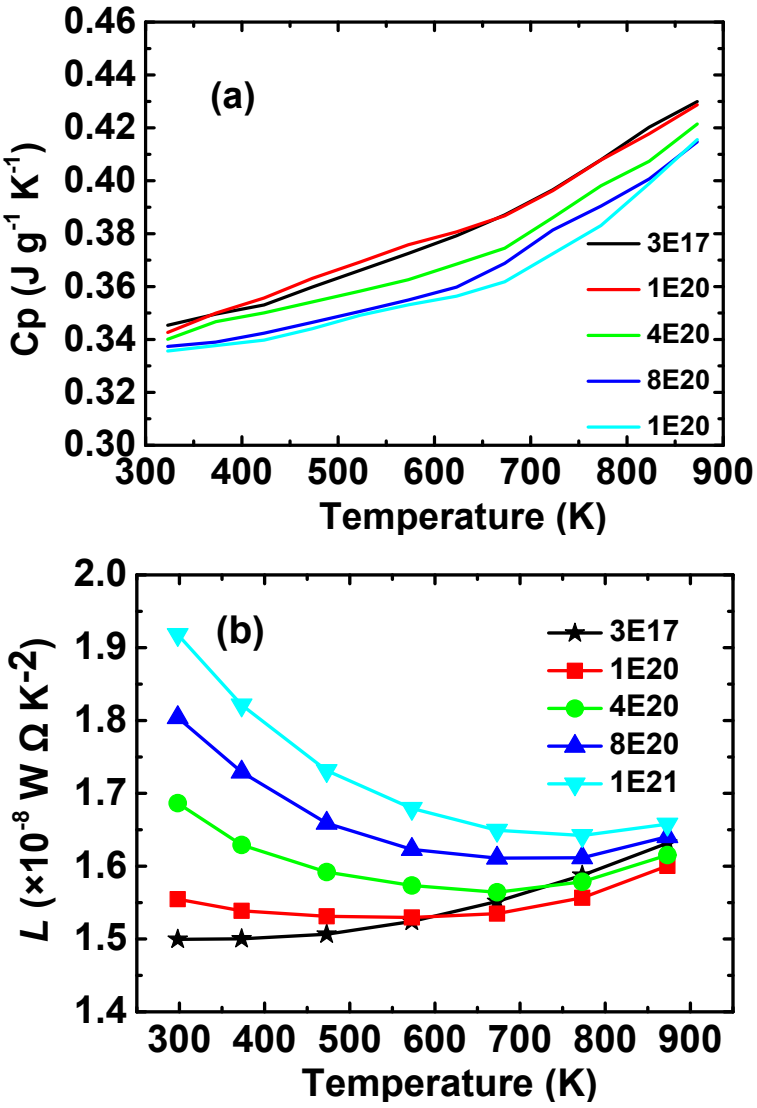


Figure S5. (a) Heat capacity and (b) The calculated Lorenz number as a function of temperature for $Co_{1-x}Ni_xSbS$.