# Supporting information:

## Synergistically optimized electrical and thermal transport properties in SnTe *via* alloying high-solubility MnTe

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Table S1. Densities (*d,* g/cm$^3$) of all samples $Sn_{1-x}Mn_xTe$ (x=0, 1%, 3%, 5%, 7%, 9%, 11%, 13%, 15%, 17%, 19%, 20%, 25% and 50%, in mole ratio) investigated in this study.

| x | 0 | 1% | 3% | 5% | 7% | 9% | 11% | 13% | 15% | 17% | 19% | 20% | 25% | 50% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *d* | 6.26 | 6.274 | 6.212 | 6.161 | 5.819 | 6.075 | 5.953 | 5.943 | 5.63 | 5.86 | 5.805 | 5.811 | 6.126 | 5.763 |

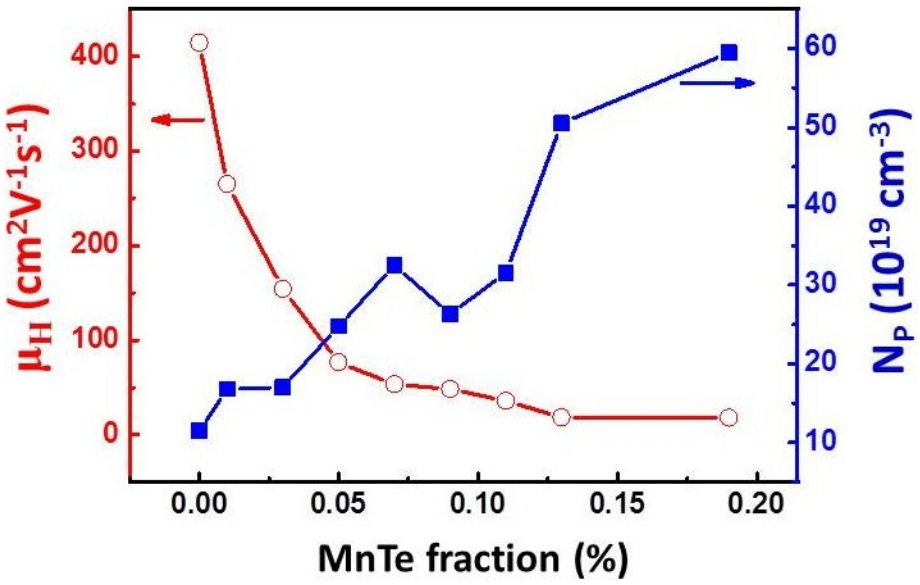


Figure S1. Carrier concentration and mobility in SnTe sample as a function of alloying MnTe fraction at room temperature.

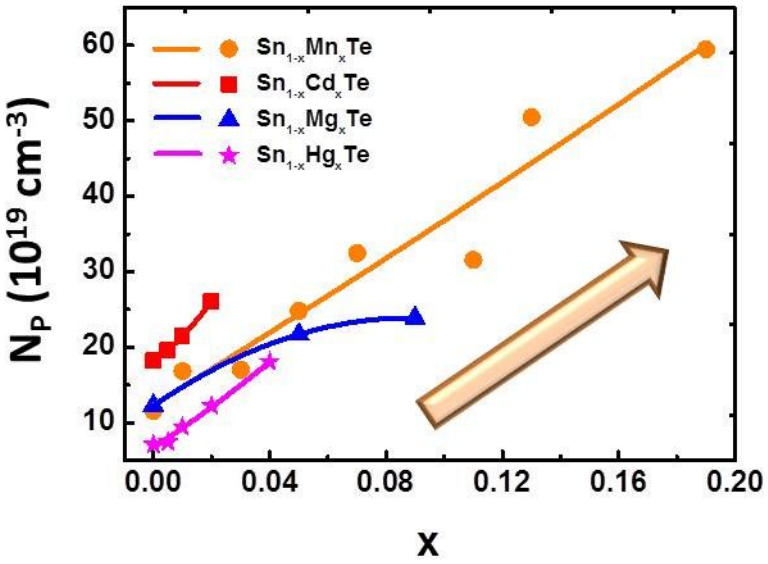


Figure S2. Room temperature hole concentration ($N_P$) as a function of Mn, Cd, Mg and Hg fraction alloying in SnTe.

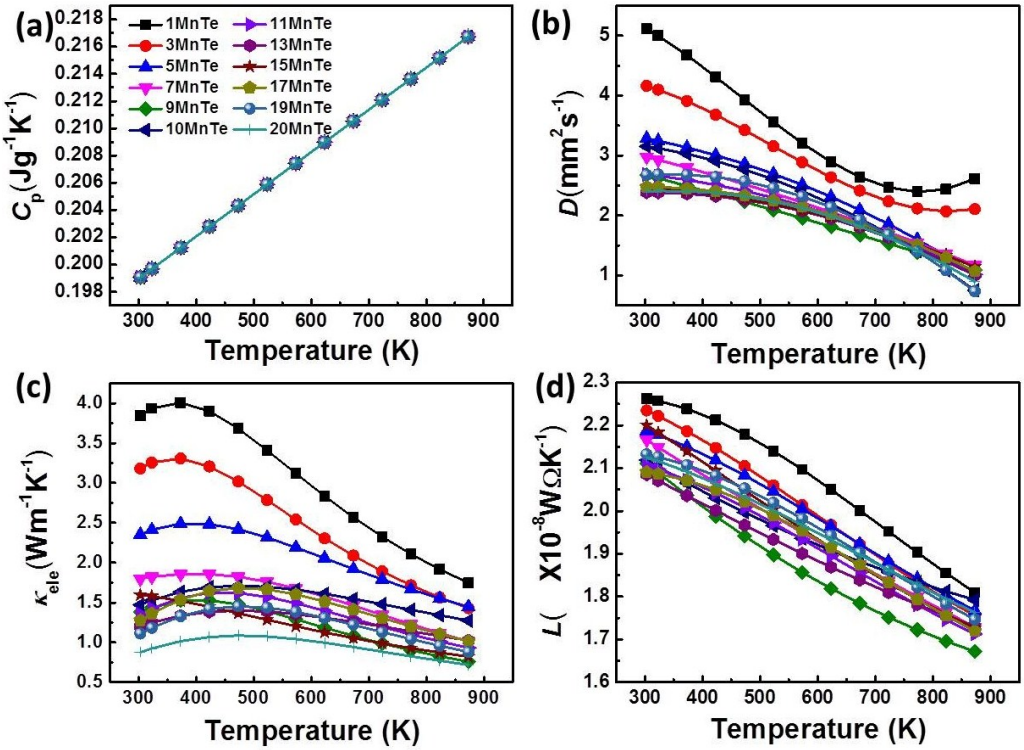


Figure S3. Temperature dependent (a) Heat capacity $C_p$, (b) thermal diffusivity $D$, (c) electronic thermal conductivity, (d) Calculated Lorenz number $L$ for $Sn_{1-x}Mn_xTe$.

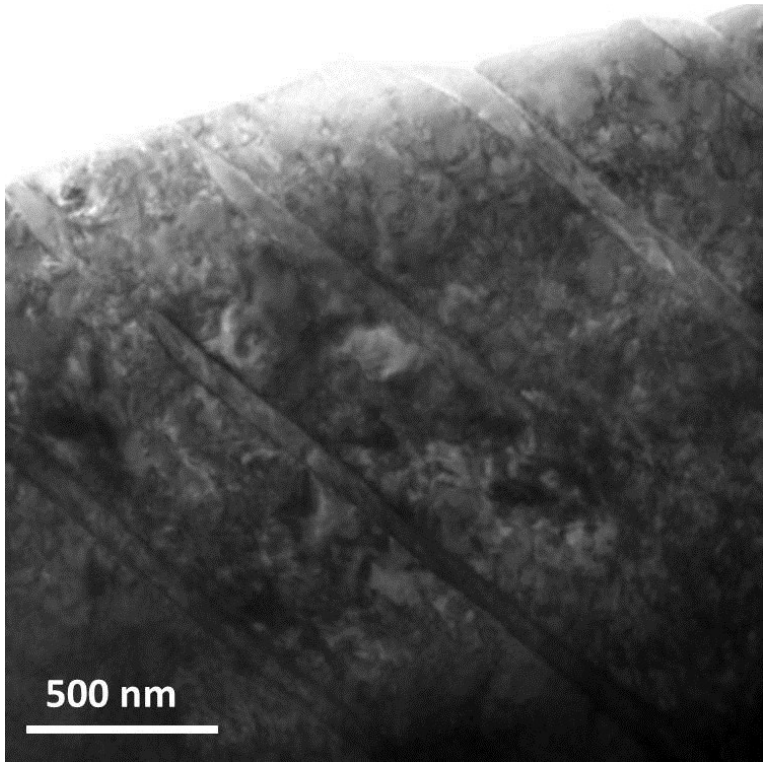


Figure S4. Medium-magnification TEM image of SnTe alloyed with 19% MnTe .