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

Simultaneous regulation of electrical and thermal transport properties in MnTe chalcogenides via the incorporation of *P*-type Sb_2Te_3

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Fig. SI1: Heat capacity for MnTe + *x* at% Sb_2Te_3 samples (*x*=0, 0. 5, 1, 1.5, 2) samples.

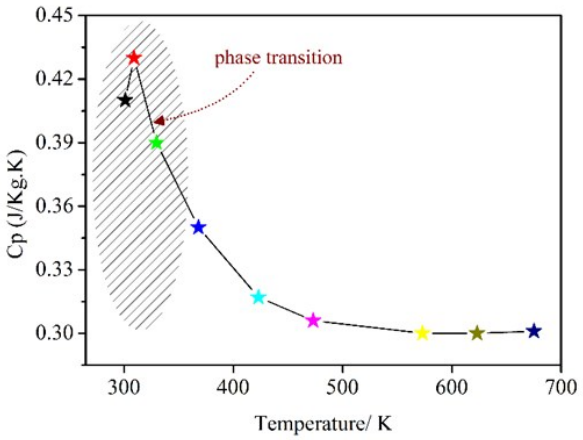
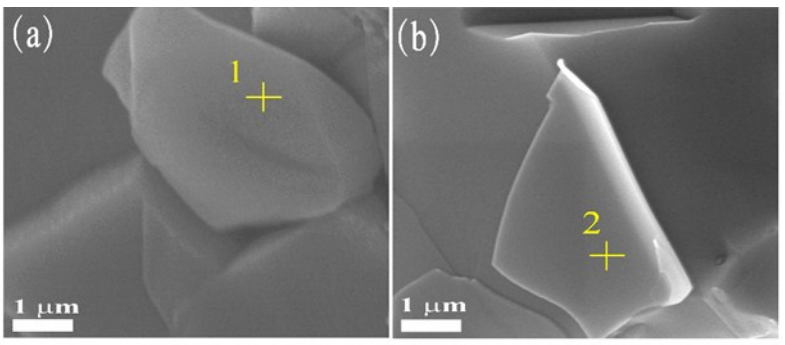


Fig. SI2: SEM and elemental compositions of MnTe + (0.5 and 1) at% Sb_2Te_3 samples.

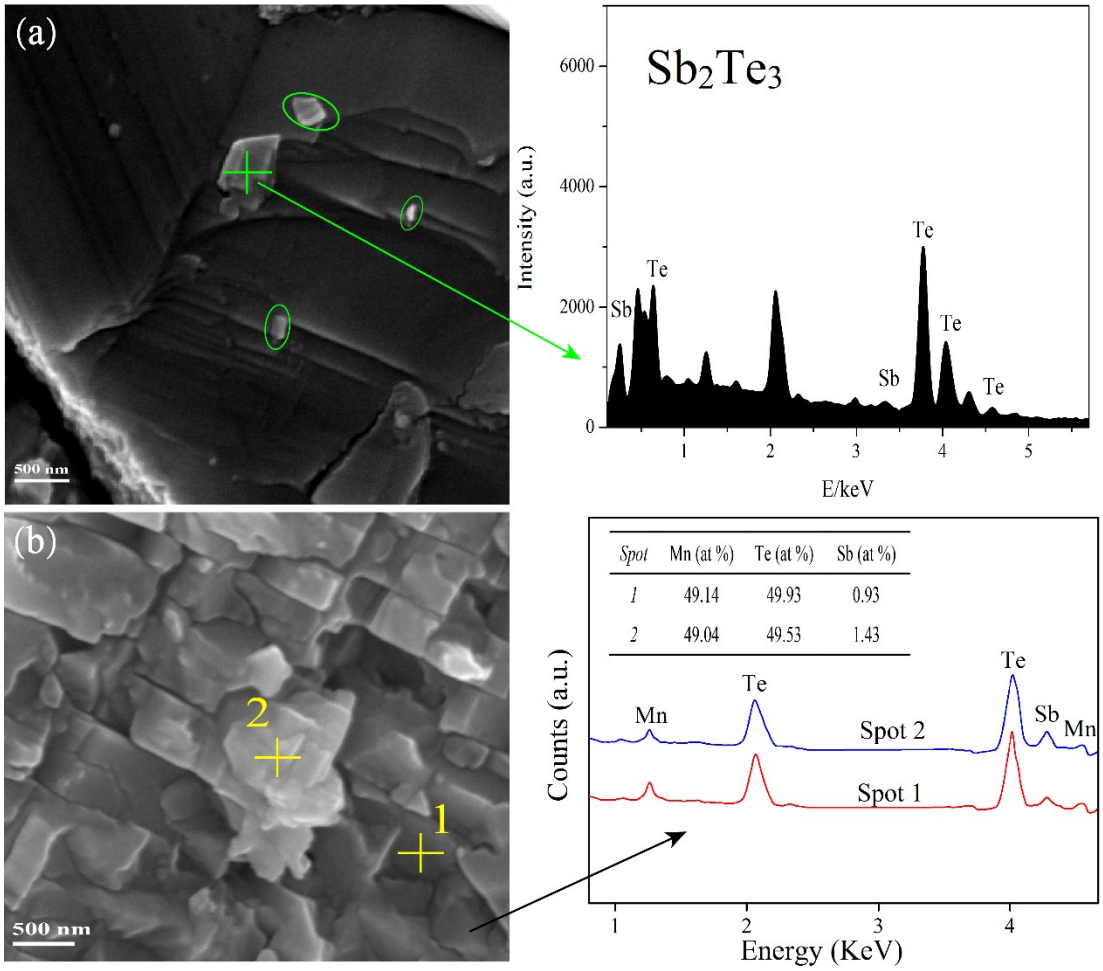


(c)

Spot	Mn (at %)	Te (at %)	Sb (at %)
1	49.4	50.6	0
2	49.96	49.93	0.11

Fig. SI3: SEM and elemental compositions of 1.5 at% Sb_2Te_3 added MnTe sample in

figures (a, b) respectively.



Spot	Mn (at %)	Te (at %)	Sb (at %)
1	49.14	49.93	0.93
2	49.04	49.53	1.43

Fig. SI4: HRTEM of MnTe + 1.5at% Sb_2Te_3 sample.

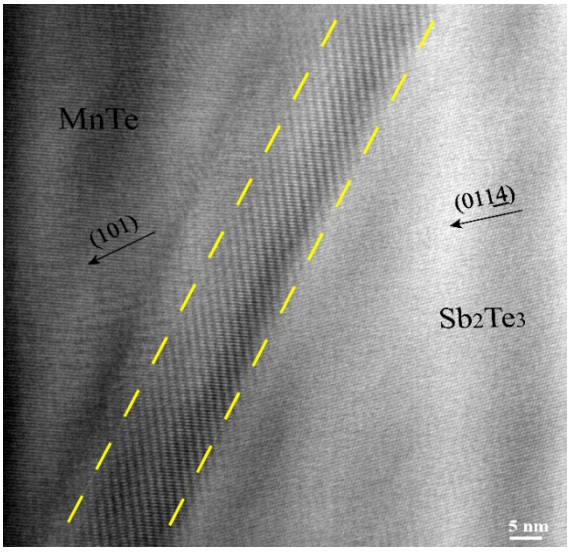
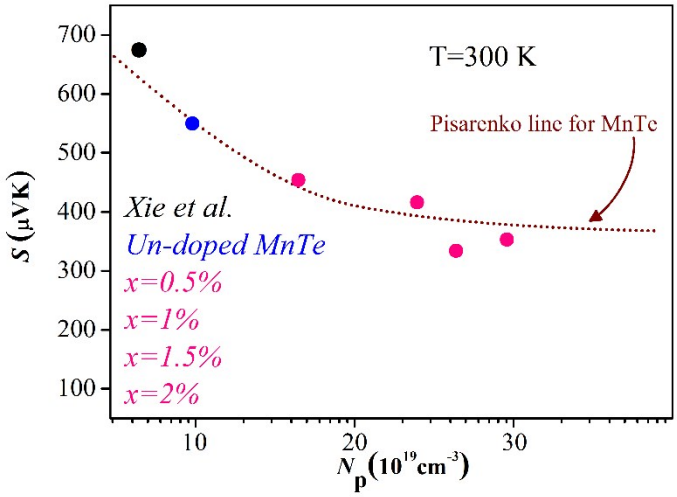


Fig. SI5: Pisarenko relation between *S* and carrier concentration of MnTe + *x* at%

Sb_2Te_3 samples (*x*=0, 0. 5, 1, 1.5, 2) samples.



SI Table. 1: Lorenz number, carriers concentration and mobility of MnTe + *x* at% Sb_2Te_3 samples.

Nominal composition	L(10^{-8}WΩK^{-2})	n_H(cm^{-3})	μ_H ($cm^2.V^{-1}.s^{-1}$)
x=0	1.4902	8.99E18	9.37632
x=0.5	1.4945	5.99E19	7.98316
x=1	1.5029	2.67E20	3.26835
x=1. 5	1.518	4.65E20	2.37632
x=2	1.5111	7.51E20	1.8056

SI6:

Approximating a single parabolic band model [1], the Lorenz number (L) was carried out by the following equation;

$$L = (\frac{k_B}{e})^2[\frac{(r+7/2)F_{r+5/2(\varphi)}}{(r+3/2)F_{r+1/2(\varphi)}} - \{\frac{(r+7/2)F_{r+3/2(\varphi)}}{(r+3/2)F_{r+1/2(\varphi)}}\}^2]$$

Fermi integration $F_n(\varphi)$;

$$F_n(\varphi) = \int_0^\infty \frac{x^n}{1+e^{x-n}}dx$$

Here, r is the scattering parameter (r = -1/2) and φ (=E_F/k_BT) is the reduced Fermi energy which can be derived with the help of measured Seebeck coefficient followed by Single band approximation:

$$S = \pm \frac{k_B}{e} \{ \frac{(r+5/2)F_{r+3/2(\eta)}}{(r+3/2)F_{r+1/2(\eta)}} - \varphi \}$$

And hence this approximation were made for all MnTe + *x* at% Sb_2Te_3 (*x*= 0, 0.5, 1, 1.5 and 2) samples to calculate L, as given below in Fig. SI6:

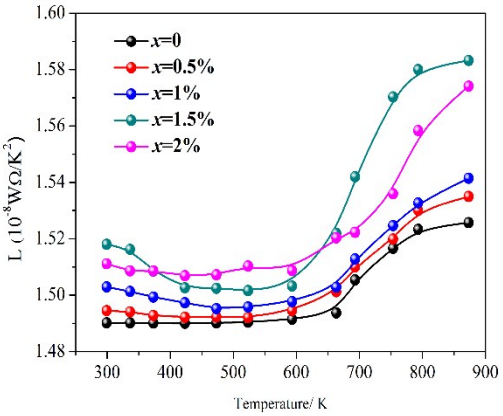


Fig. SI6: The calculated Lorenz number.

Reference

[1] W. Xie, S. Populoh, K. Gałzka, X. Xiao, L. Sagarna, Y. Liu, M. Trottmann, J. He and A. Weidenkaff, J. Appl. Phys., 2014, 115, 103707.