Electronic Supplementary Information

Synergistic tuning of carrier and phonon scattering for high performance of n-type Bi$_2$Te$_{2.5}$Se$_{0.5}$ thermoelectric material

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1. The lattice parameters of the samples with different content of MnTe$_2$.

![Figure S1. Lattice parameters of Bi$_2$Te$_{2.5}$Se$_{0.5}$ + x at.% MnTe$_2$](image)

2. Rietveld refinements.

The XRD patterns of $x=3.0$ and $x=4.0$ samples have been refined by the GSAS with EXPGUI interface$^{[1,2]}$. The refined composition for $x=3.0$ and $x=4.0$ are

Bi$_{1.864(2)}$Te$_{2.531(1)}$Se$_{0.468(9)}$Mn$_{0.135(6)}$ and Bi$_{1.863(6)}$Te$_{2.530(8)}$Se$_{0.469(2)}$Mn$_{0.136(4)}$. 
Figure S2. Rietveld refinements for $x=3.0$ sample.

Figure S3. Rietveld refinements for $x=4.0$ sample.

3. Estimation for the band gap by Goldsmid-Sharp method$^3$

Figure S4. Estimation for the band gap by Goldsmid-Sharp method

4. Power factors of the samples with different content of MnTe$_2$. 
Figure S5. The power factor for Bi$_2$Te$_{2.5}$Se$_{0.5}$ + $x$ at% MnTe$_2$

References

