Electronic Supplementary Information

Low thermal conductivity and high figure of merit for rapidly synthesized n-type $Pb_{1-x}Bi_xTe$ alloys

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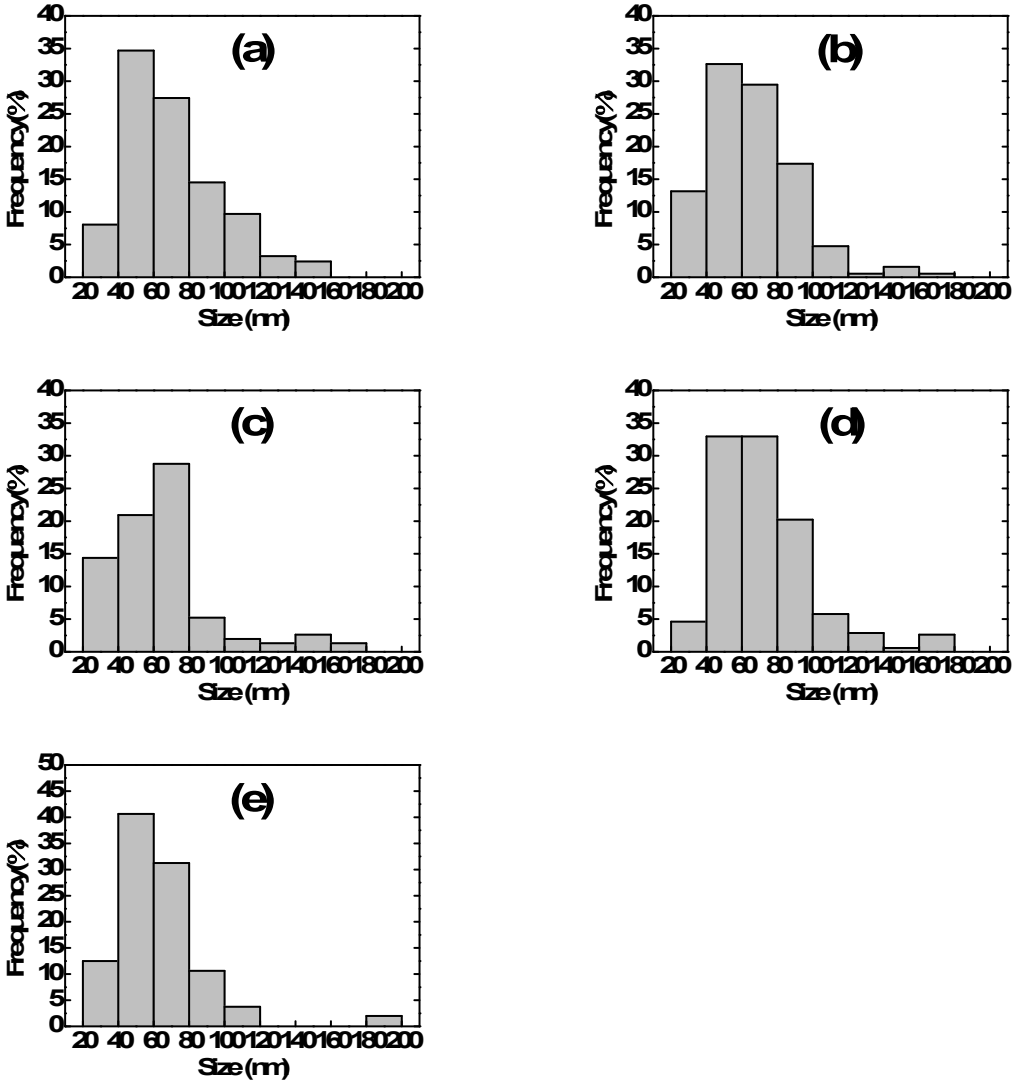

Figure S1. Distribution of grain size of $Pb_{1-x}Bi_xTe$ nano-powders for **(a)** x=0.00, **(b)** x=0.01, **(c)** x=0.02, **(d)** x=0.03, and **(e)** x=0.04.

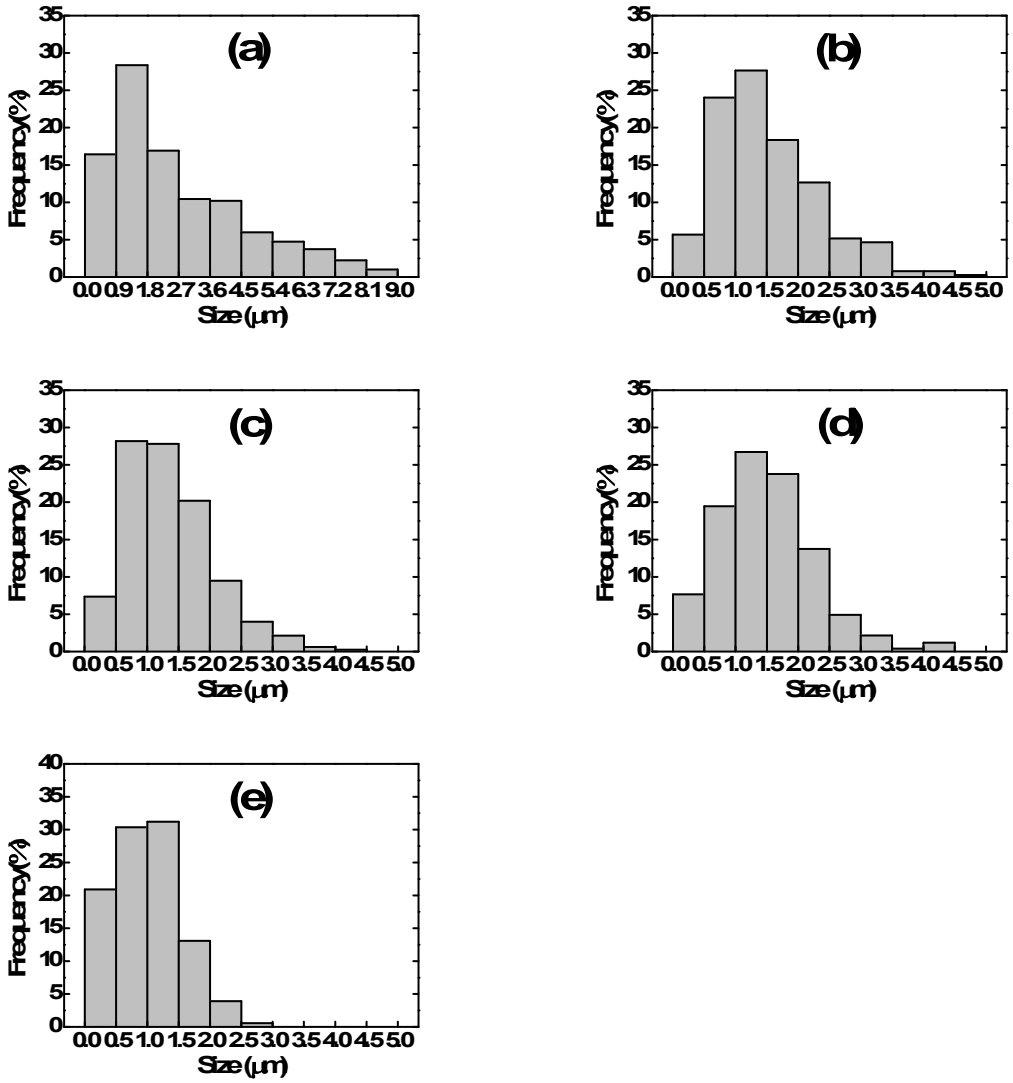

Figure S2. Distribution of grain size of $Pb_{1-x}Bi_xTe$ bulk alloys for **(a)** x=0.00, **(b)** x=0.01, **(c)** x=0.02, **(d)** x=0.03, and **(e)** x=0.04.

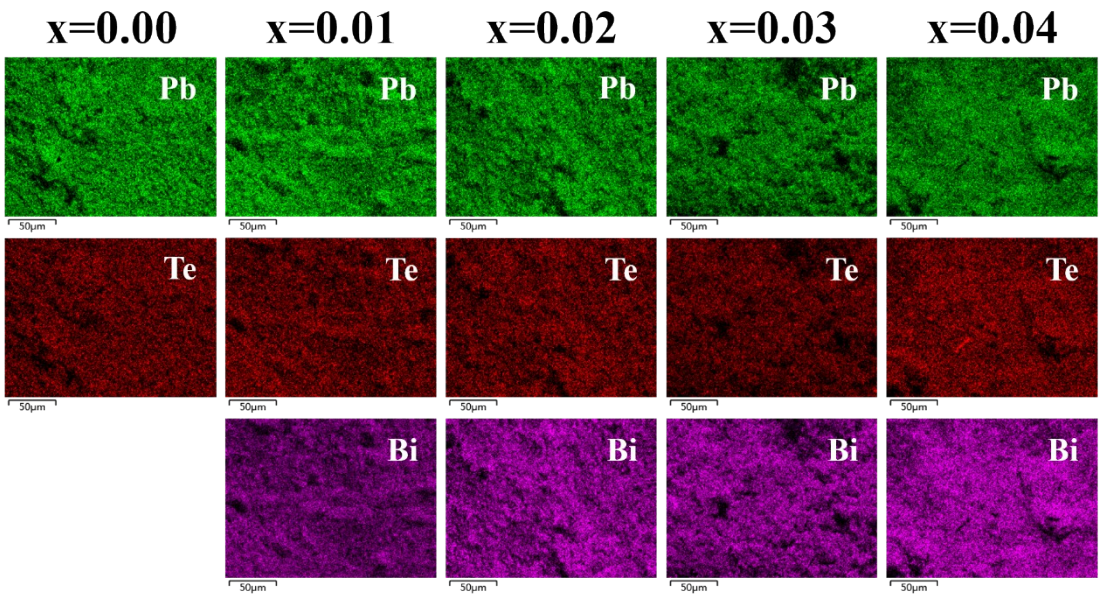

Figure S3 The EDS mapping for $Pb_{1-x}Bi_xTe$ nano-powders.

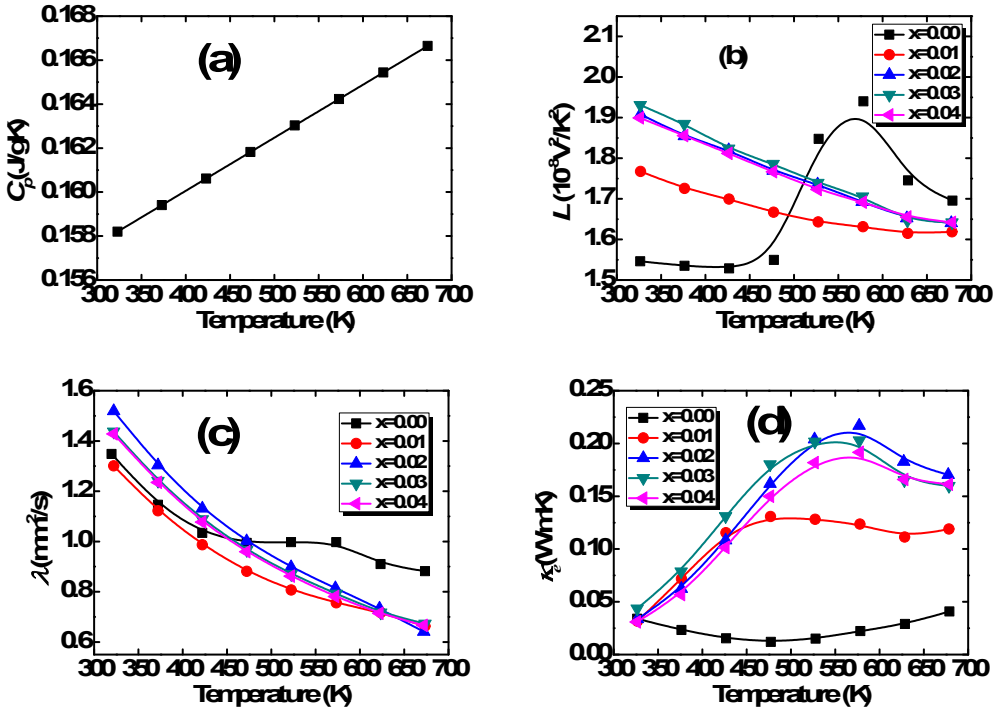

Figure S4 Temperature dependence of **(a)** the heat capacities derived from the equation of Cp (k_B atom)=3.07+4.7×10^{-4}×(T/K−300)[1], **(b)** the Lorenz numbers derived from the equation of L=1.5+exp(-|S|/116)[2], **(c)** the thermal diffusivities, and **(d)** the electronic thermal conductivities for $Pb_{1-x}Bi_xTe$ alloys.

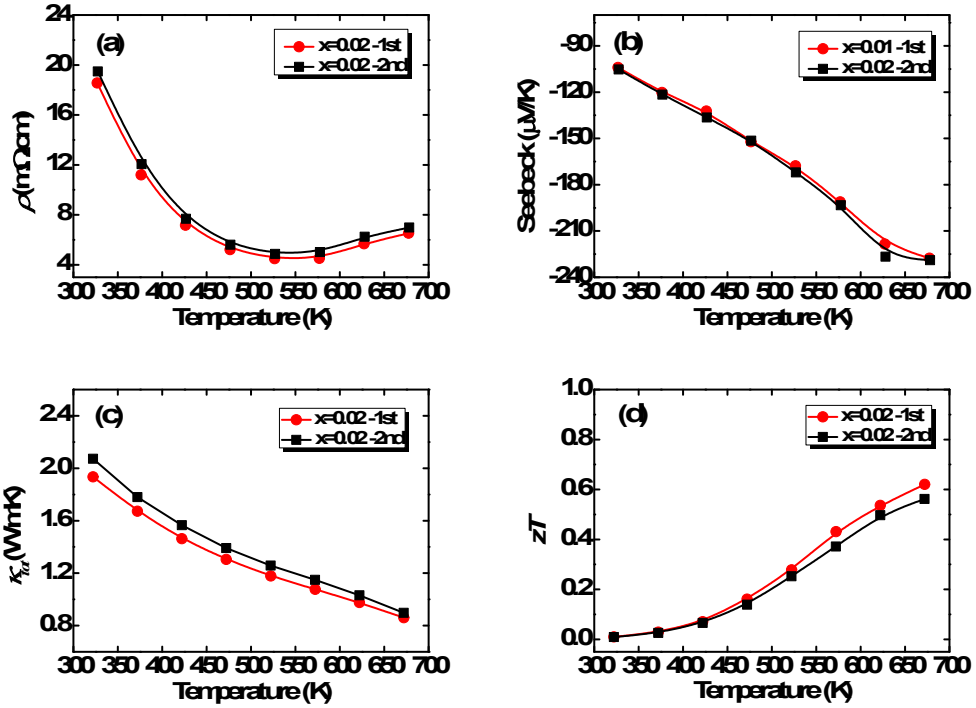

Figure S5 Repeated measurements of **(a)** electrical resistivity, **(b)** Seebeck coefficient, **(c)** total thermal conductivity and **(d)** figure of merit for $Pb_{0.98}Bi_{0.02}Te$ alloys.

Table S1. Experimental densities, theoretical densities and relative densities for $Pb_{1-x}Bi_xTe$ alloys.

Compositions	Experimental Density (g/cm^3)	Theoretical Density (g/cm^3)	Relative density (%)
x=0.00	8.05	8.24	97.7
x=0.01	8.07	8.26	97.7
x=0.02	8.06	8.27	97.4
x=0.03	8.05	8.26	97.4
x=0.04	8.07	8.27	97.5

Table S2. The atom percentage of each element in $Pb_{1-x}Bi_xTe$ nano-powders obtained from EDS results.

Compositions	Pb (at%)	Te (at%)	Bi (at%)
x=0.00	50.8	49.2	0.0
x=0.01	50.4	48.8	0.8
x=0.02	49.7	48.5	1.7
x=0.03	50.6	47.5	1.9
x=0.04	49.8	48.3	1.9

Reference

1. R. Blachnik and R. Igel, *Zeitschrift für Naturforschung B*, 1974, **29**, 625–629.

2. H. S. Kim, Z. M. Gibbs, Y. Tang, H. Wang and G. J. Snyder, *APL Materials*, 2015, **3**, 041506.