Supplementary information

High thermoelectric performance in $Bi_{0.46}Sb_{1.54}Te_3$ nanostructured with ZnTe

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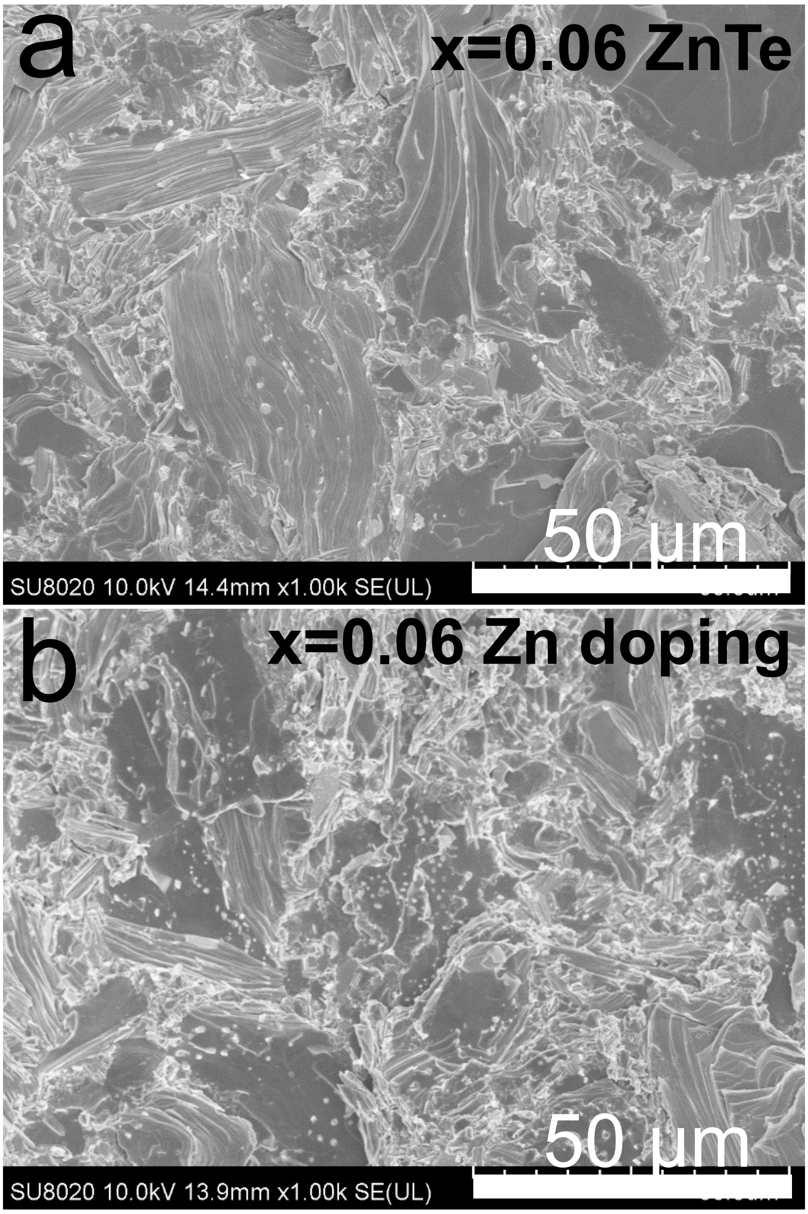

Figure S1: FESEM images of fracture surfaces of sintered samples of (a) $Zn_xBi_{0.46}Sb_{1.54}Te_{3+x}$: x=0.06 and (b) $Zn_x(Bi_{0.46}Sb_{1.54})_{1-x/2}Te_3$:x=0.06.

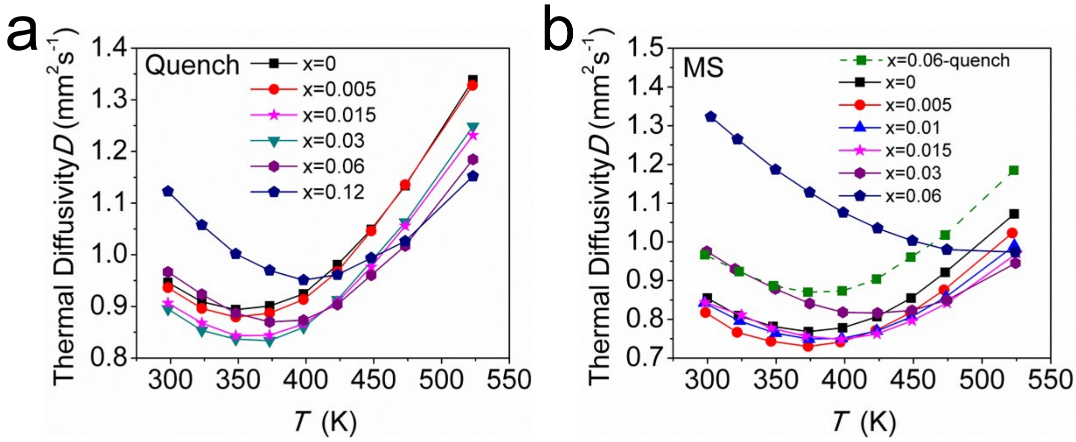

Figure S2: The thermal diffusivity D of samples prepared by (a) conventional and (b) MS method.

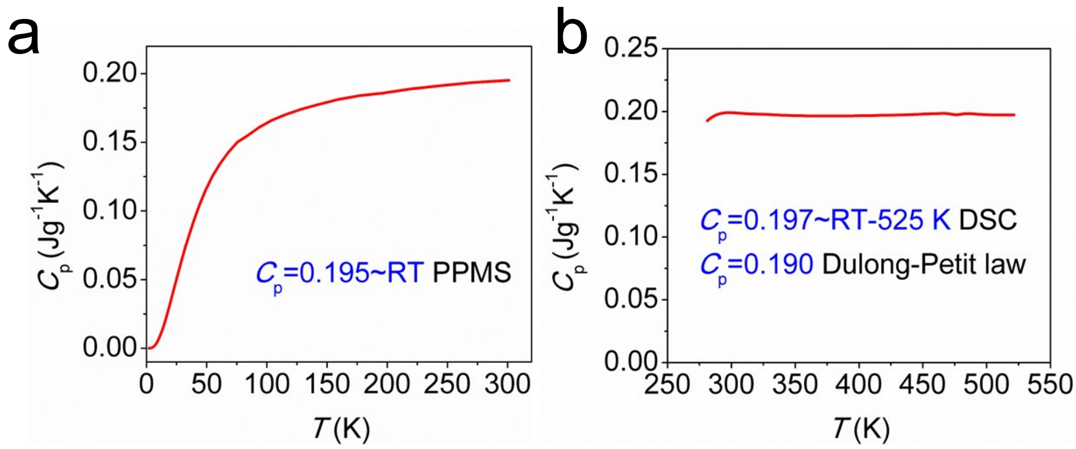

Figure S3: The heat capacity C_p of MS samples with ZnTe x = 0.015 measured by (a) PPMS and (b) DSC. At room temperature, the heat capacity C_p measured by PPMS is 0.195 Jg^{-1}K^{-1}, while the heat capacity C_p measured by the DSC is 0.197 Jg^{-1}K^{-1} in the temperature range between 300 K and 525 K. The test results from both systems are close to the value (0.190 Jg^{-1}K^{-1}) calculated by Dulong-Petit law. All samples prepared by conventional and MS methods show quite similar C_p. In order to avoid underestimating the thermal conductivity, we use C_p as a constant of 0.197 Jg^{-1}K^{-1} to calculate the thermal conductivity in this paper.

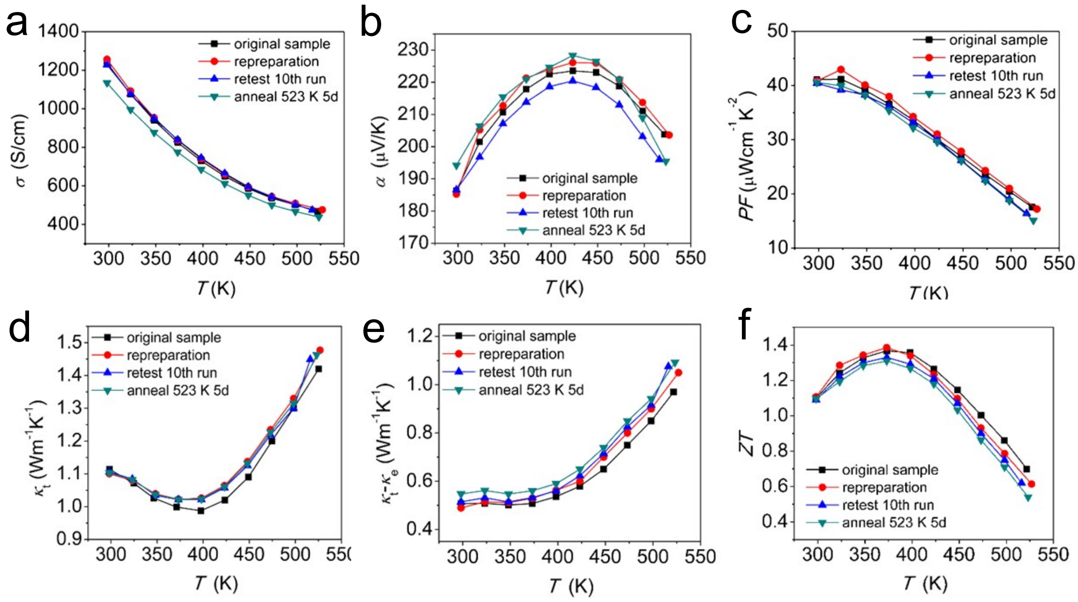

Figure S4: Temperature dependence of (a) the electrical conductivity, (b) the Seebeck coefficient (c) the power factor (d) the total thermal conductivity (e) the lattice thermal conductivity, and (f) the *ZT* value for samples after different treatments.

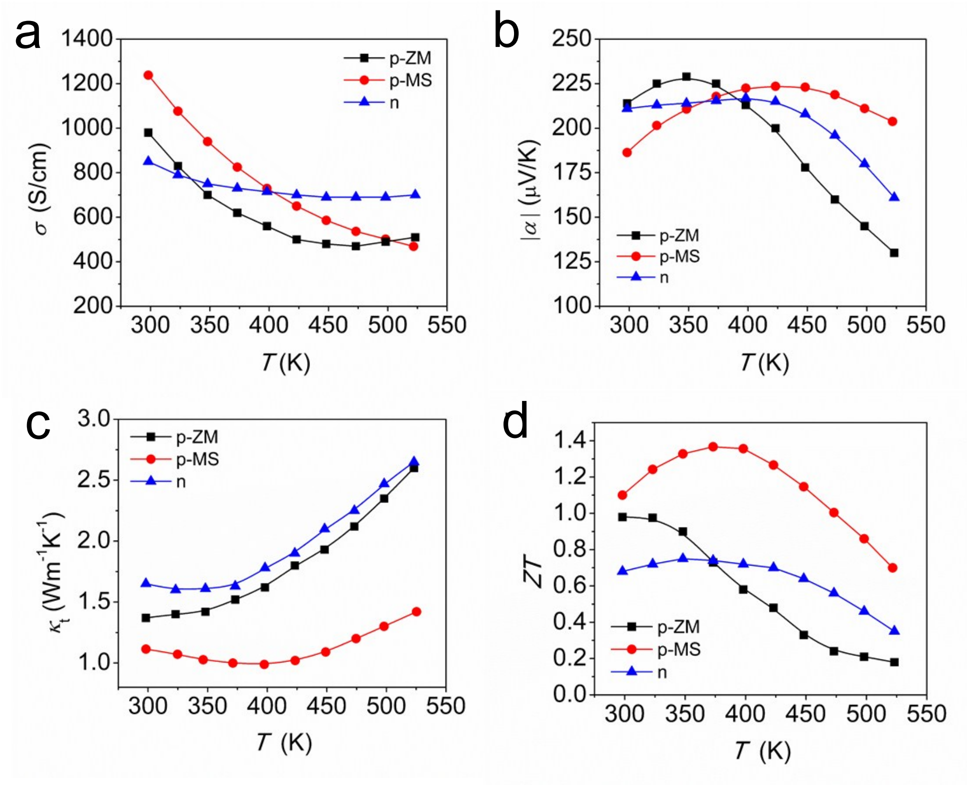

Figure S5: The thermoelectric properties of materials fabricating modules.

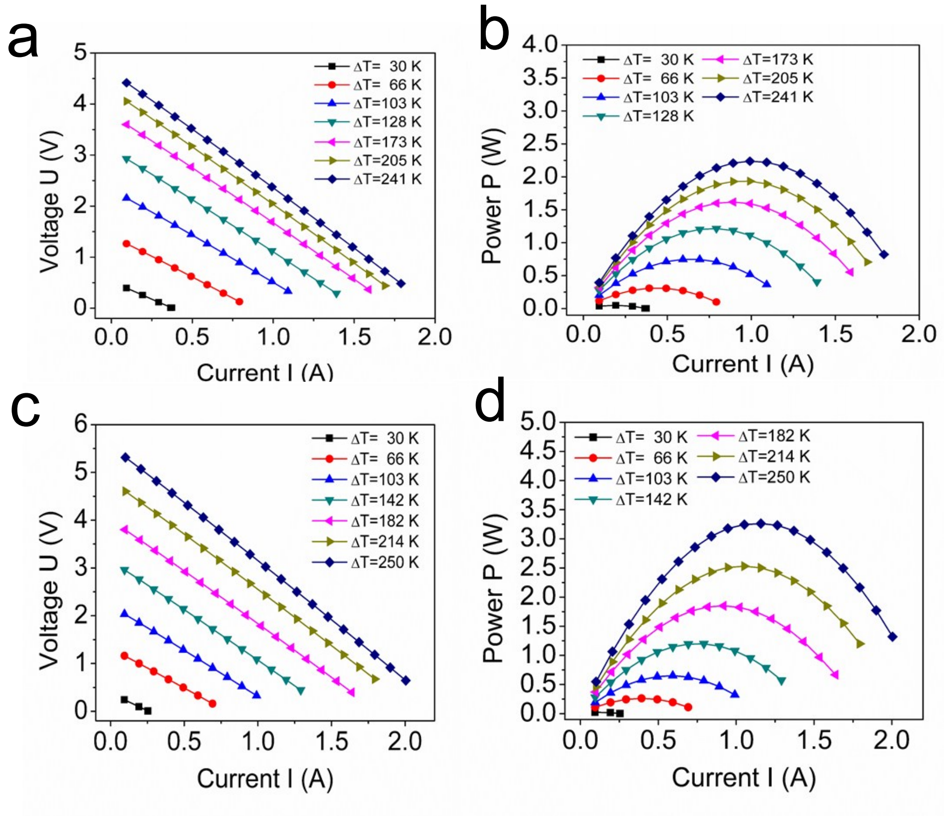

Figure S6: The output performance of (a-b) ZM module and (c-d) MS module.

Table S1: Density of bulk samples prepared by conventional and MS methods.

Density ρ (gcm^{-3})	x=0	x=0.005	x=0.01	x=0.015	x=0.03	x=0.06	x=0.12
Quench	6.65	6.67	6.64	6.62	6.63	6.58	6.60
MS	6.67	6.59	6.64	6.64	6.70	6.66	-

Table S2: Performance parameters of the fabricated modules.

T/□		△	T_h/℃	T_c/℃	Q/J s^{-1}	P_{max}/W	η_{max}/%
100	ZM	66.5	81.9	15.4	14.3	0.31	2.17
100	MS	65.5	80.1	13.6	15.6	0.31	1.98
150	ZM	102.7	122.2	19.5	24.1	0.75	3.11
150	MS	102.6	122.8	20.2	26.9	0.79	2.92
200	ZM	138.0	162.2	24.2	32.5	1.21	3.70
200	MS	142.0	165.0	23.0	35.6	1.36	3.81
250	ZM	172.5	201.0	28.5	42.9	1.70	3.92
250	MS	181.7	205.9	24.2	43.0	1.89	4.41
300	ZM	204.7	238.1	33.4	53.1	2.03	3.83
300	MS	213.6	245.3	31.7	52.8	2.52	4.77
350	ZM	241.2	279.2	38.0	64.5	2.35	3.65
350	MS	249.3	282.9	33.6	64.9	3.25	5.01