Supporting Information

Integration of Material Sintering and p-n Connection for High-Performance PbTe Thermoelectric Modules

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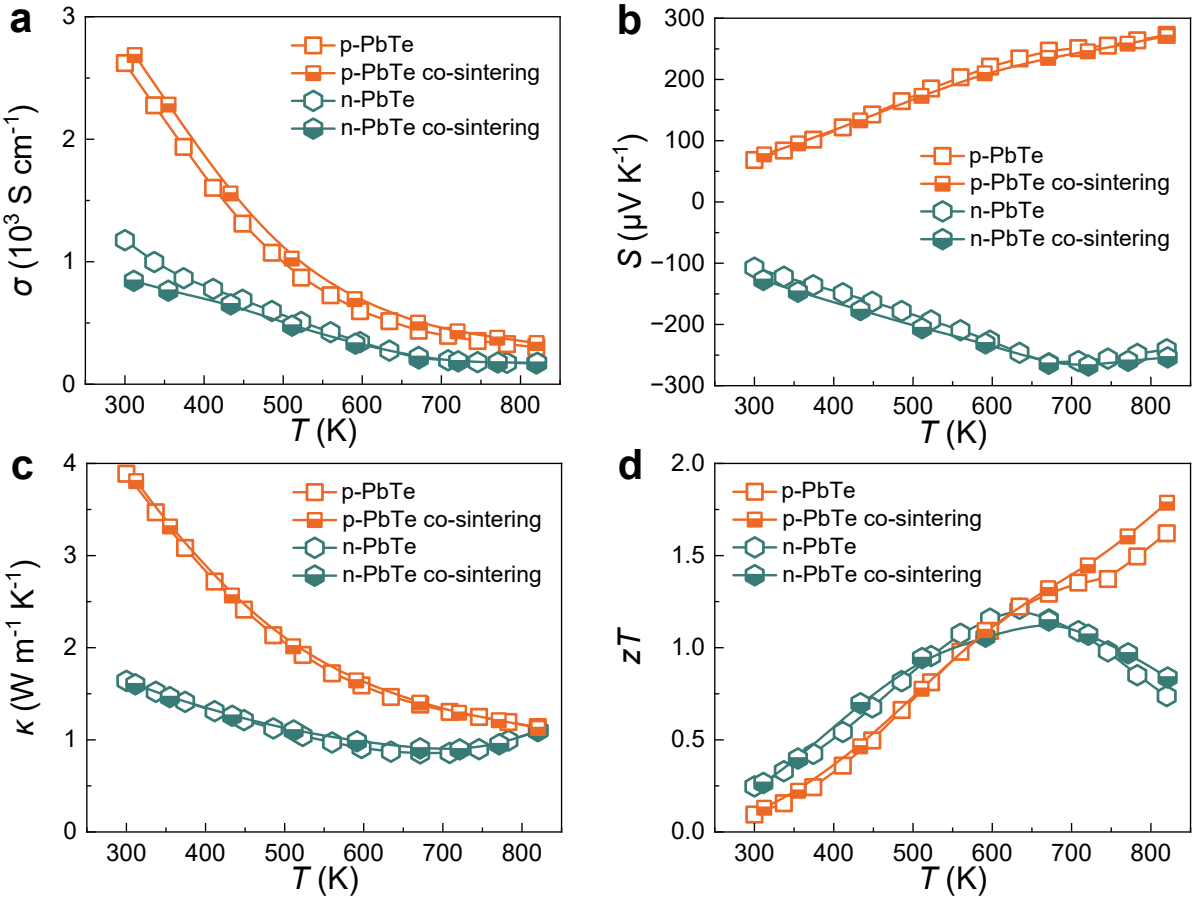

Fig. S1. Temperature-dependent (a) conductivity, (b) Seebeck coefficiece, (c) thermal conductivity, and (d) *zT* of PbTe prepared by conventional sintering and PbTe prepared by co-sintering.

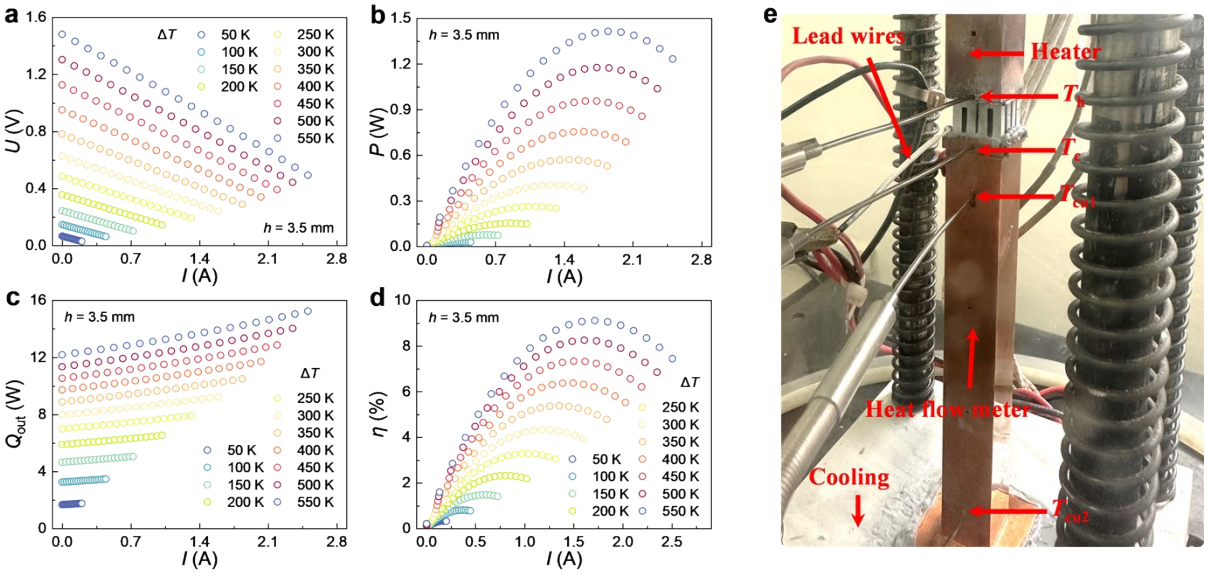

Fig. S2. Characterization of the U-shaped module. Current-dependent (a) output voltage, (b) output power, (c) heat flow out, and (d) efficiency for the module with h = 3.5 mm under several temperature differences. (f) The experimental setup for module efficiency measurement.

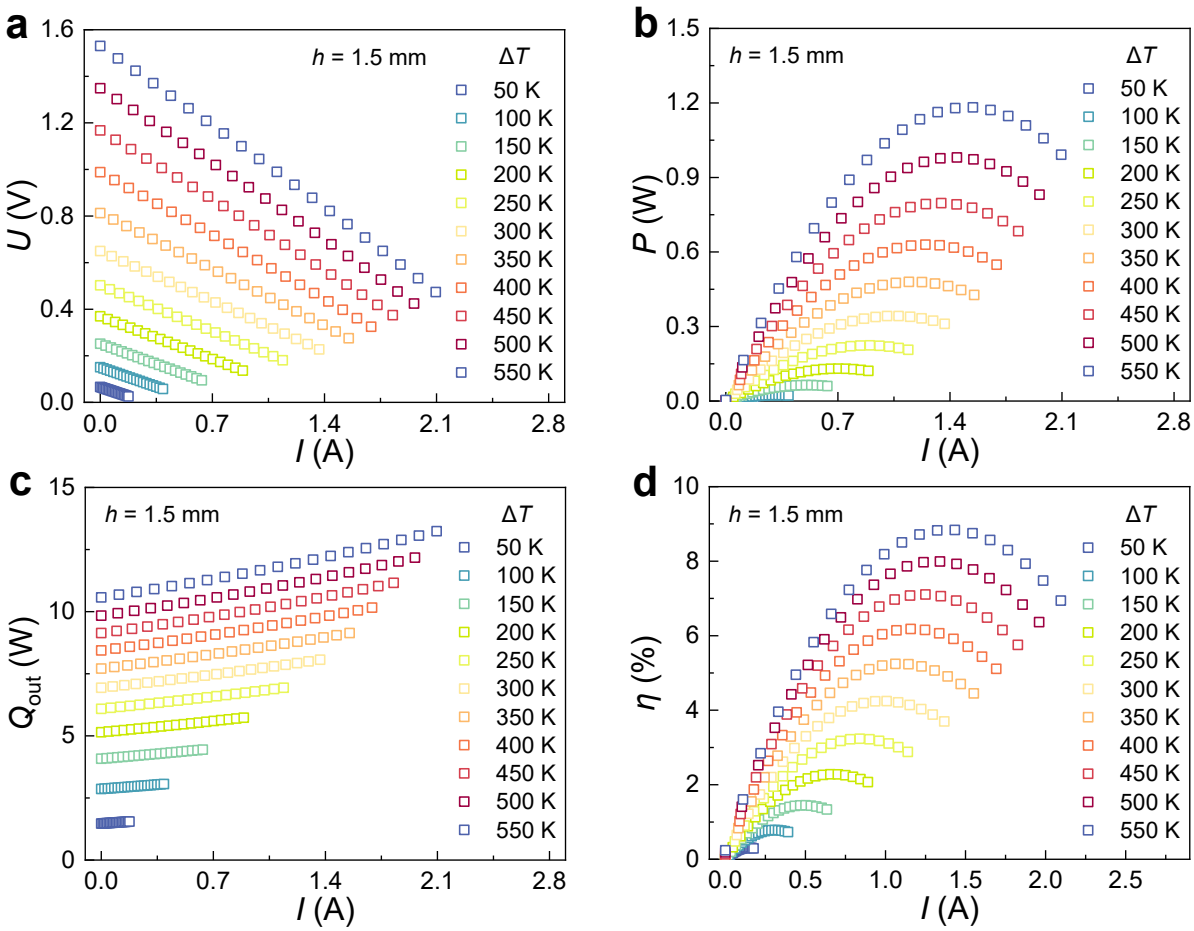

Fig. S3. Characterization of the U-shaped module. Current-dependent (a) output voltage, (b) output power, (c) heat flow out, and (d) efficiency for the module with h = 1.5 mm under several temperature differences.

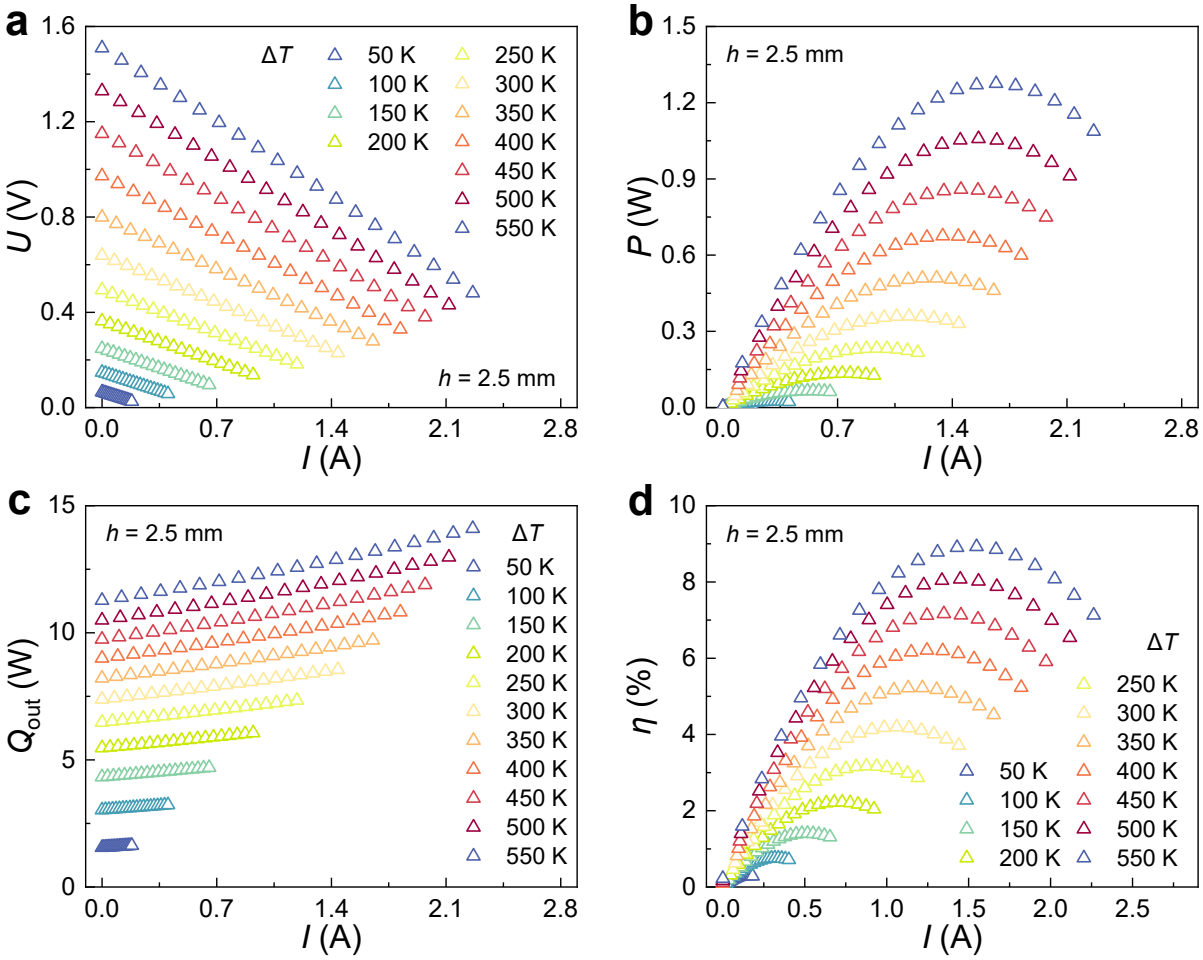

Fig. S4. Characterization of the U-shaped module. Current-dependent (a) output voltage, (b) output power, (c) heat flow out, and (d) efficiency for the module with $h = 2.5$ mm under several temperature differences.

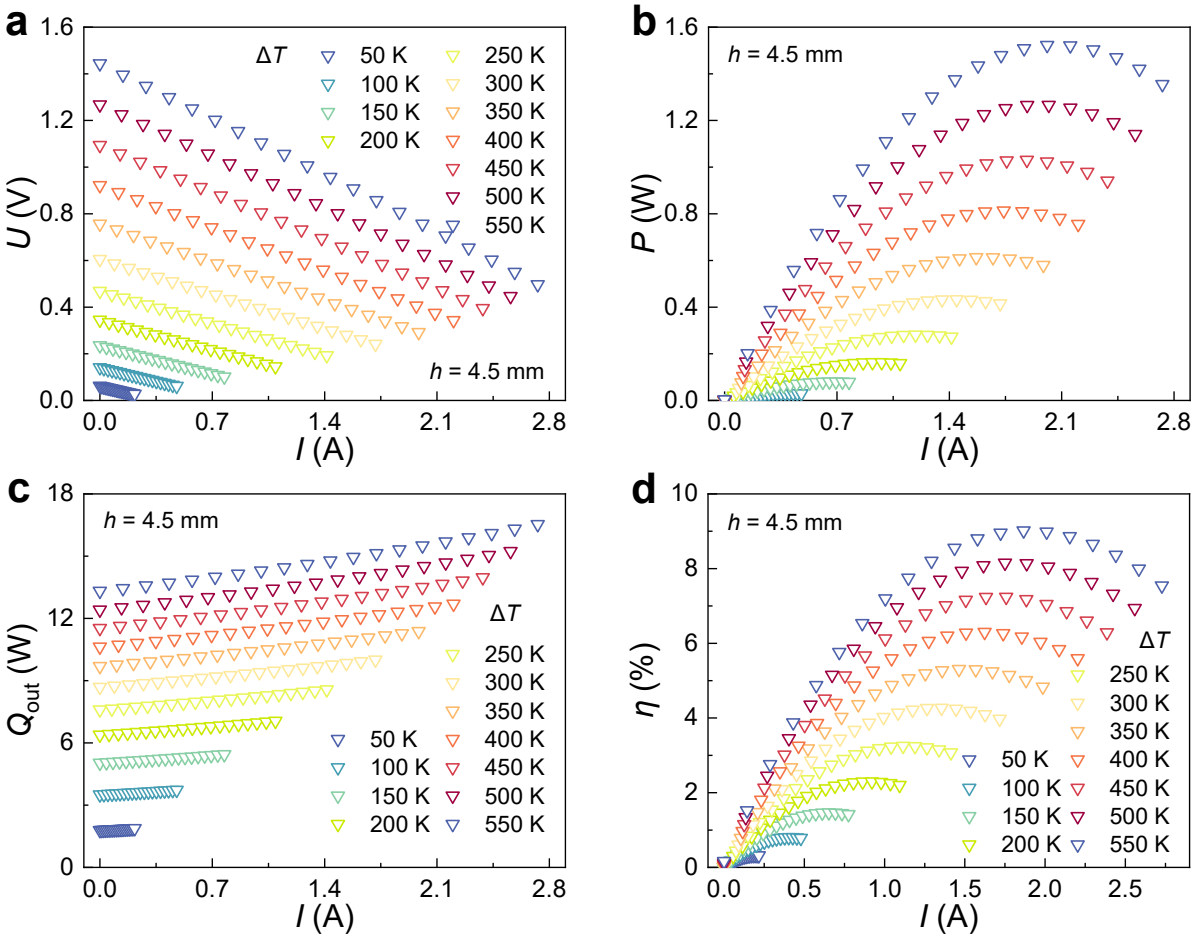

Fig. S5. Characterization of the U-shaped module. Current-dependent (a) output voltage, (b) output power, (c) heat flow out, and (d) efficiency for the module with $h = 4.5$ mm under several temperature differences.

Table S1. Calculation of electronic transport properties

Material properties	Ceramic plate (Al_2O_3)	Electrode (Cu)	p-leg ($Pb_{0.98}Na_{0.02}Te$)	n-leg ($Pb_{0.9}Ge_{0.1}Te_{0.996}I_{0.004}$)	SnTe	FeSb
Density (kg m^{-3})	3940	8940	8090	7870	7300	8100
Thermal expansion coefficient (10^{-6} K^{-1})	7	16~18 (300 K~850 K)	20~21 (300 K~850 K)	18~21 (300 K~850 K)	18~20 (300 K~850 K)	15~20 (300 K~850 K)
Yang 's modulus	380	120	25	35	60	80

(GPa)						
Poisson ratio	0.25	0.33	0.25	0.25	0.30	0.30
Thermal conductivity (W m^{-1} K^{-1})	30	400~230 (300 K~850 K)	3.9~1.1 (300 K~850 K)	1.3~0.9 (300 K~850 K)	15~2 (300 K~850 K)	20~3 (300 K~850 K)
Specific heat (J kg^{-1} K^{-1})	780	382~431 (300 K~850 K)	150~170 (300 K~850 K)	150~170 (300 K~850 K)	190~300	180~300