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Supplementary information

$Bi_{0.5}Sb_{1.5}Te_3$-based Films for Flexible Thermoelectric Devices

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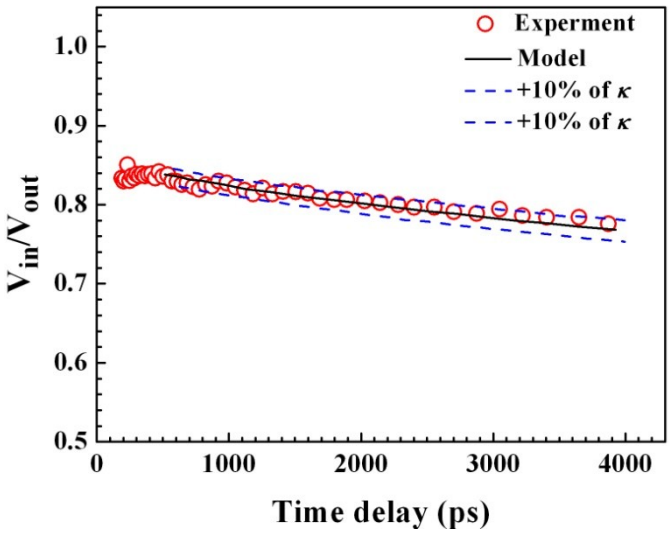

Fig. S1. Measurement of κ based on the TDTR method.

Table S1. Measurement results of κ.

Sample	κ (W m^{-1} K^{-1})		
	Measured value	Average	Error
1	0.7217	0.7835	0.0874
2	0.8453		

The thermal conductivity (κ) was measured by the time-domain thermoreflectance (TDTR) method. The heat capacity (c) of $Bi_{0.5}Sb_{1.5}Te_3$ was calculated based on that of Bi_2Te_3 and Sb_2Te_3. Provided by DuPont, κ and c of PI are 0.12 W m^{-1} K^{-1} and 1.5478 MJ m^{-3} K^{-1}, respectively.

The ratio (V_{in}/V_{out}) of the in-phase V_{in} and out-of-phase V_{out} signals was fitted as a function of time delay by a diffusive thermal model to extract the thermal properties, as shown in Fig. S1. Measurements were performed more than twice to confirm the reliability of the TDTR method, with the average value determined to be the final κ of

the samples, as shown in Table S1.

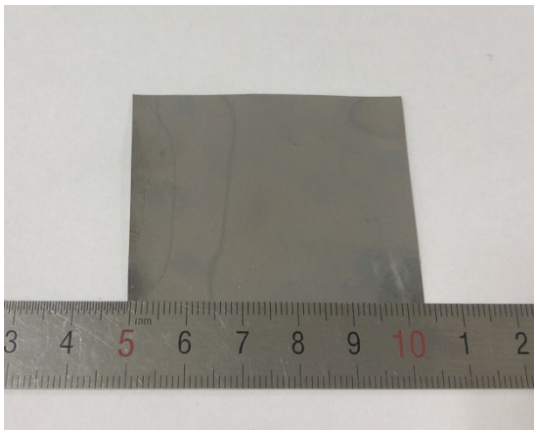

Fig. S2. Photograph of the fabricated flexible $Bi_{0.5}Sb_{1.5}Te_3$-based film.

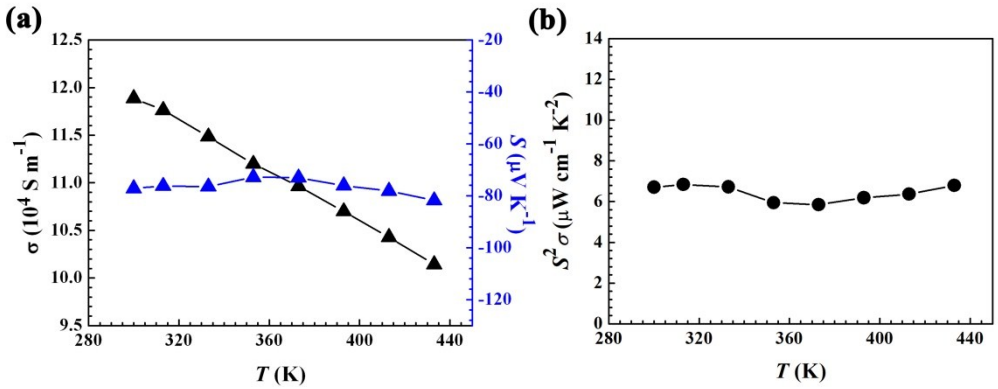

Fig. S3. Temperature-dependent TE properties of Bi_2Te_3 films: (a) σ and S, and (b) $S^2\sigma$.

Bi_2Te_3 thin films were prepared on PI substrates under Ar atmosphere at 653 K using the magnetron sputtering method. The hot-pressed Bi_2Te_3 (99.999 at.%) target was used as the source material and connected to a direct power supplier with sputtering power of 20 W. The pressure of the deposition chamber was below 7.5×10^{-4} Pa. During the deposition process, the distance between the substrate and the targets was fixed at 140 mm. The working pressure was about 3.0 Pa, with the substrate holder rotating at around 30 rpm. The thickness of the thin films is about 420 nm.

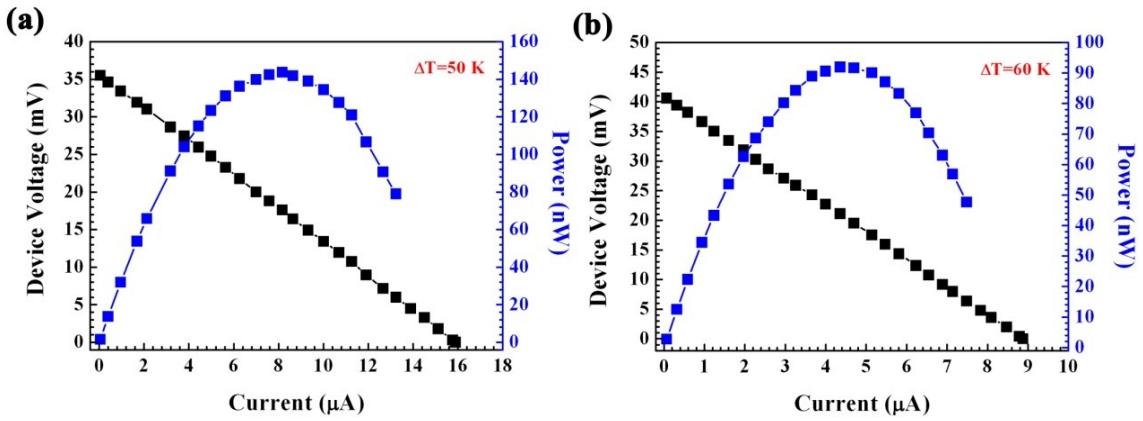

Fig. S4. Current-dependent device-operating voltage and power output tested at different ΔT: (a) 50 K and (b) 60 K.