In-plane Thermoelectric Properties of Flexible and Room Temperature Doped Carbon Nanotube Films

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Figure S1. (a) Schematic diagram of the setup to measure Seebeck coefficient with the image in (b) showing the setup with the MWCNT film places across the hot and cold sides. While in (b) the temperature probe has been moved aside to show a better view of the film, during measurement the probe is placed on the film as in (a) to measure thermal gradient and Seebeck voltages on the same side of the film.

Figure S2. SEM images at 10000X magnification for (a) pristine MWCNT film and (b) 5-MWCNT/PEI film. Both scale bars are 5 μm .

Figure S3. Thickness variation as a function of concentration of PEI in ethanol.

Table S1. Thermoelectric properties of pristine and n-type MWCNT films. ZT for the films is calculated by assuming that the thermal conductivities of the PEI doped films remain constant as the concentration varies from 5 to 20 wt.% PEI.

Film Type	Thickness (μm)	Seebeck Coefficient t ($\mu\text{V/K}$)	Electrical Conductivity (S/m)	Power Factor ($\mu\text{W/mK}^2$)	Thermal Conductivity (W/mK)	ZT (at 300 K)
p-type MWCNT	8.4 ± 0.5	56.19 ± 0.002	107977.61 ± 0.01	340.94 ± 0.02	5.5 ± 0.8	0.019
5- MWCNT/PEI	10.2 ± 1.5	- 54.29 ± 0.004	134238.78 ± 30036.18	395.59 ± 62.53	8.1 ± 1.2	0.015
10- MWCNT/PEI	10.7 ± 1.3	- 50.72 ± 3.07	166084.83 ± 8365.31	429.36 ± 51.79	8.1 ± 1.2	0.016
15- MWCNT/PEI	9.9 ± 0.7	- 50.60 ± 1.25	203003.99 ± 28278.62	521.66 ± 69.33	8.1 ± 1.2	0.019
20- MWCNT/PEI	9.1 ± 1.7	- 43.82 ± 11.10	211463.31 ± 34596.35	402.21 ± 97.04	8.1 ± 1.2	0.015

Figure S4. Comparison of κ and PF for various reported TE materials containing CNTs (cited work indicated by $\square$ with red for p-type and blue for n-type). Data for the materials are from the cited sources: MWCNT-PANI,¹ MWCNT-PTh,² SWCNT-PEDOT:PSS,³ SWCNT-PEI,⁴ SWCNT,⁴ MWCNT-PEI,⁵ and MWCNT-PEDOT:PSS.⁵ This work (indicated by $\star$) shows high PF with lower κ than other reported materials.

References

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