

Supporting Information

Phonon-glass electron-crystal in ZnO-multiwall carbon nanotube nanocomposites

Woo Hyun Nam^a, Bo Bae Kim^d, Young Soo Lim^{c,*}, Kyun Seong Dae^{a,b}, Won-Seon Seo^d,
Hyung-Ho Park^e, Jeong Yong Lee^{a,b,*}

^a *Center for Nanomaterials and Chemical Reactions, Institute for Basic Science (IBS),
Daejeon, 34141, Korea*

^b *Department of Materials Science and Engineering, KAIST, Daejeon, 34141, Korea*

^c *Department of Materials System Engineering, Pukyong National University, Busan, 48513,
Korea*

^d *Energy and Environmental Division, Korea Institute of Ceramic Engineering and
Technology, Jinju, 52851, Korea*

^e *Department of Materials Science and Engineering, Yonsei University, Seoul, 03722, Korea*

* Corresponding author. *E-mail address:* yslim@pknu.ac.kr (Y. S. Lim), j.y.lee@kaist.ac.kr (J. Y. Lee)

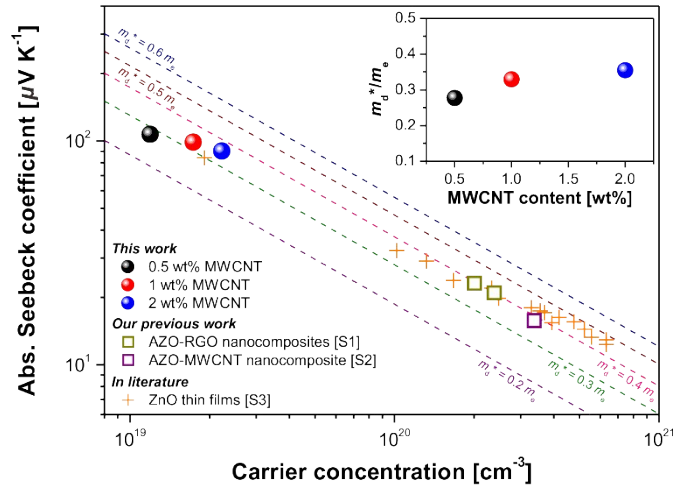


Fig. S1 Pisarenko plot at room-temperature showing the dependence of the Seebeck coefficients on the carrier concentration for the nanocomposites. The dashed lines indicate the contour lines of the DOS effective mass. For comparison, reported Seebeck coefficients in AZO-RGO and AZO-MWCNT nanocomposites, and ZnO thin films are also shown. Inset represents the DOS effective mass of the nanocomposites as a function of MWCNT content.

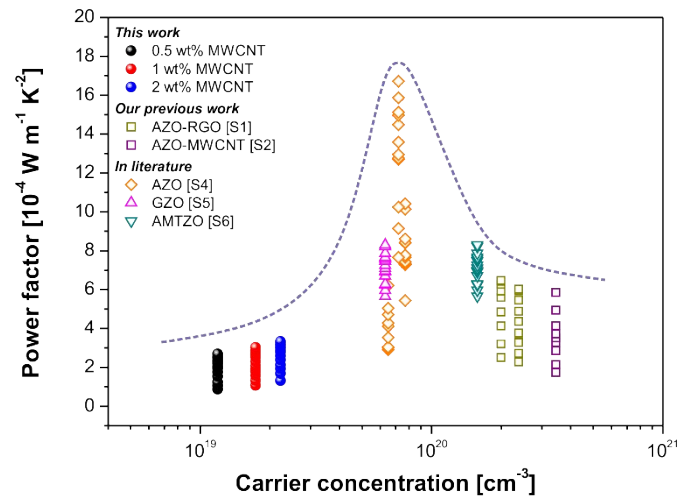


Fig. S2 Power factors of the ZnO-MWCNT nanocomposites as a function of carrier concentration. For comparison, reported power factors of ZnO composites are also shown. The optimum carrier concentration in ZnO can be estimated to be $\sim 7 \times 10^{19} \text{ cm}^{-3}$.

Supporting information references

1. W. H. Nam, B. B. Kim, S. G. Seo, Y. S. Lim, J.-Y. Kim, W.-S. Seo, W. K. Choi, H.-H. Park and J. Y. Lee, *Nano Lett.*, 2014, **14**, 5104-5109.
2. W. H. Nam, B. B. Kim, Y. S. Lim, W.-S. Seo, H.-H. Park and J. Y. Lee, *J. Am. Ceram. Soc.*, 2016, **99**, 2077-2082.
3. W. M. Kim, I. H. Kim, J. H. Ko, B. Cheong, T. S. Lee, K. S. Lee, D. Kim and T. Y. Seong, *J. Phys. D: Appl. Phys.*, 2008, **41**, 195409.
4. T. Tsubota, M. Ohtaki, K. Eguchi and H. Arai, *J. Mater. Chem.*, 1997, **7**, 85-90.
5. E. Guilmeau, P. Díaz-Chao, O. I. Lebedev, A. Rečnik, M. C. Schäfer, F. Delorme, F. Giovannelli, M. Košir and S. Bernik, *Inorg. Chem.*, 2017, **56**, 480-487.
6. T. Tian, L. Cheng, L. Zheng, J. Xing, H. Gu, S. Bernik, H. Zeng, W. Ruan, K. Zhao and G. Li, *Acta Mater.*, 2016, **119**, 136-144.