Compliant Thermal Interface Materials Using Graphene

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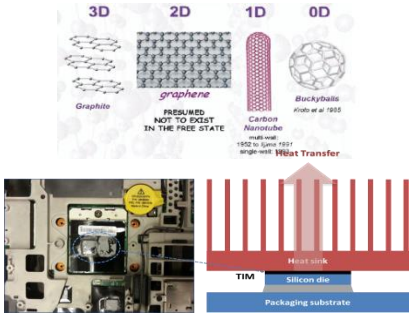
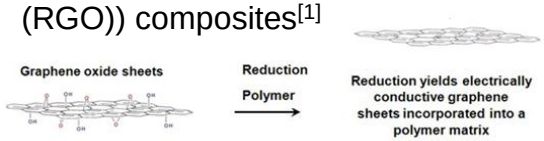
Objective

Develop high-performance thermal interface materials (TIMs) based on graphene

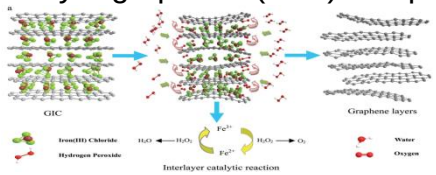


Approach

- Approach 1: Chemically exfoliated graphene oxide (reduced graphene oxide (RGO)) composites[1]

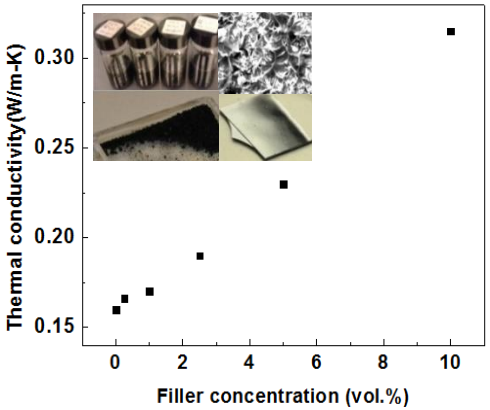


- Approach 2: Interlayer catalytic exfoliation few-layer graphene (FLG) composites[2]

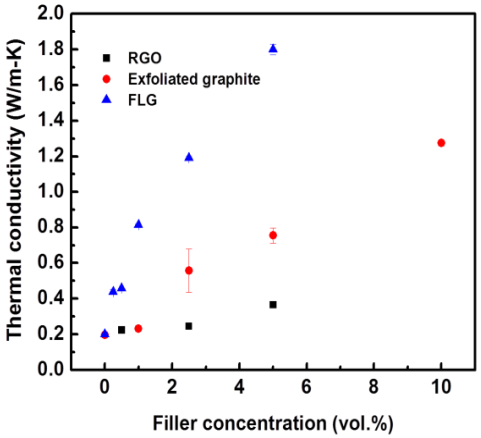


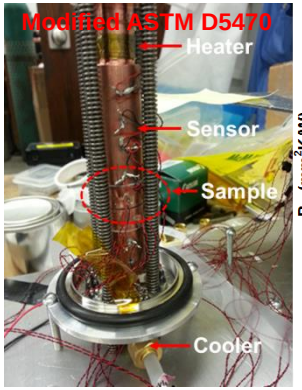
Experiment

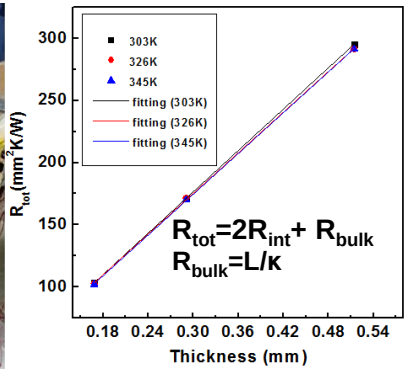
RGO/polystyrene composites [1, 3]



RGO & exfoliated graphite & FLG/epoxy composites







- Thermal interface resistance (R_{int}) between copper and 5 vol.% FLG/epoxy composites is measured to be ~ 5 mm^{2}K/W at RT.

Impact

- Thermal conductivity of polymer composites can be dramatically enhanced by adding graphene fillers (e.g. ~ 800 % enhancement with 5 vol.% FLG prepared by interlayer catalytic exfoliation (ICE)[2]).
- R_{int} of FLG/epoxy composites is comparable to state-of-the-art TIMs.

References

[1] J. Hu, W. Park, X. Ruan, and Y. P. Chen, Proceedings of MRS Spring Meeting (2012).
[2] X. Geng, Y. Guo, D. Li, W. Li, C. Zhu, X. Wei, M. Chen, S. Gao, S. Qiu, Y. Gong, L. Wu, M. Long, M. Sun, G. Pan, and L. Liu, Sci. Rep. 3, 1134 (2013).
[3] W. Park, J. Hu, L. A. Jauregui, X. Ruan, and Y. P. Chen (2013) (submitted).

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