Electronic Supplementary Material (ESI) for Nanoscale.

A Facile Route to Fabricate Thermally Conductive and Electrically Insulating Polymer Composites with 3D Interconnected Graphene at An Ultralow Filler Loading

Shiqiang Song [a,b], *Jinyuan Wang* [b], *Cheng Liu* [a], *Jincheng Wang* [a,*], *Yong Zhang* [b]

[a] College of Chemistry and Chemical Engineering, Shanghai University of Engineering Science, Shanghai 201620, People's Republic of China

[b] School of Chemistry and Chemical Engineering, State Key Laboratory for Metal Matrix Composite Materials, Shanghai Jiao Tong University, Shanghai 200240, People's Republic of China

E-mail: * wjc406@126.com

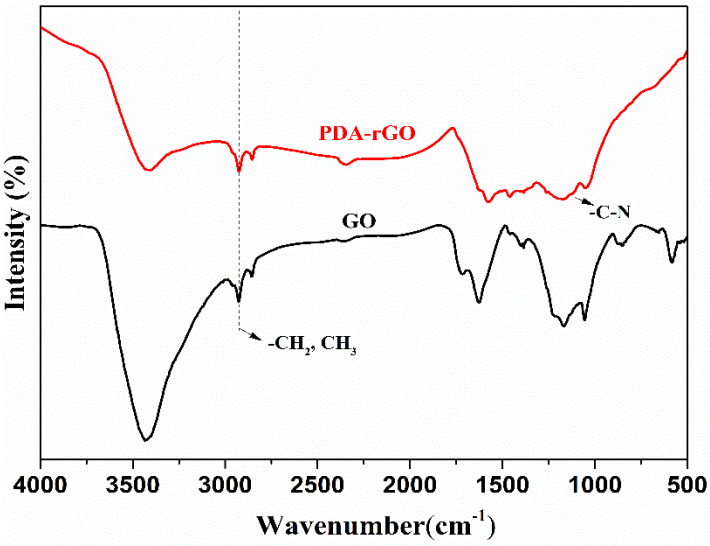

Fig S1. FTIR spectra of GO and PDA-rGO.

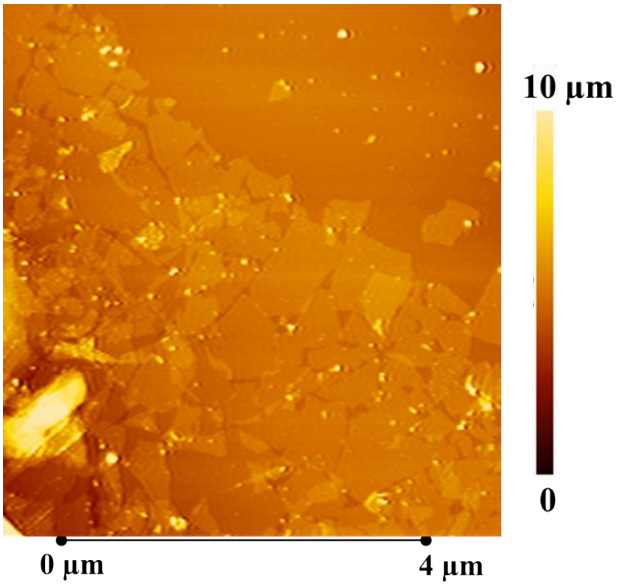

Fig S2. The AFM image of PDA-rGO.

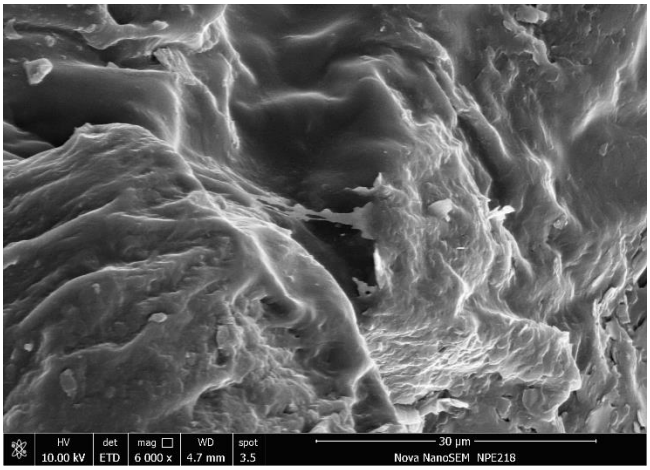

Fig S3. The SEM image of the composites at PDA-rGO loading of 0.96 wt%.

Table S1. The density and PDA-rGO loading in Sponge SR and its composites, respectively.

Sponge samples	**Density (mg cm^{-3})**	**Composites**	**PDA-rGO loadings (wt %)**	**Sponge SR loadings (wt%)**	**Density (g cm^{-3})**
Sponge-Ⅰ	322	PDA-rGO/SR composite-Ⅰ	0.10	31.3	1.19
Sponge-Ⅱ	334	PDA-rGO/SR composite-Ⅱ	0.38	27.4	1.22
Sponge-Ⅲ	328	PDA-rGO/SR composite-Ⅲ	0.96	32.4	1.23
Sponge-Ⅳ	330	PDA-rGO/SR composite-Ⅳ	1.46	28.2	1.20
Sponge-Ⅴ	323	PDA-rGO/EP composite	0.96	30.0	1.15
Sponge-Ⅵ	331	PDA-rGO/SBR composite	0.96	31.1	0.96

Table S2. The material parameters in the analysis systerm.

Materials	**Density (g cm^{-3})**	**Specific heat capacity($J^{-1}Kg^{-1}K^{-1}$)**	**In-plane thermal conductivity (W m^{-1} k^{-1})**	**Cross-plane thermal conductivity (W m^{-1} k^{-1})**
SR	1.09	678	0.13	0.13
rGO	1.89	2000	208.2	4.17

Table S3. The structure parameters in the analysis systerm.

Models	Length (μm)	Width (μm)
Block of PDMS matrix	50	50

	Average Diamater (μm)	Average thickness (nm)
Circular layer of rGO	2.5	2.7