

Supporting information

Interfacially Compatibilized PI/PDMS Blends with Reduced Octadecylamine-Functionalized Graphene Oxide: Morphological and Rheological properties

Jaber Nasrollah Gavvani¹, Fatemeh Goharpey^{1*}, Sachin Velankar²

¹Department of Polymer Engineering and Color Technology, Amirkabir University of Technology, P.O.Box-15875-4413, Tehran, Iran

²Department of Chemical Engineering, University of Pittsburgh, Pittsburgh, Pennsylvania 15261

*Corresponding Author; Email address: goharpey@aut.ac.ir
Tel: +982164542437

Preparation of GO nanosheets

GO was synthesized based on expanded graphite using the modified chemical method [1-3]. In a typical experiment, 5 g natural graphite flakes (Sigma-Aldrich, Germany) were mixed with 150 mL sulfuric acid (H_2SO_4) (95.5–96.5%, Sigma-Aldrich, Germany), and stirred in a round-bottom flask at a speed of 150 rpm. Then, 50 cc fuming nitric acid (HNO_3) (Sigma-Aldrich, Germany) was slowly added to the mixture. The mixture was kept at room temperature and stirred for 24 h. After that, 250 mL deionized (DI) water was slowly poured into the mixture. The resulting mixture was washed three times with DI water, followed by centrifuging and drying at 60 °C for 24 h to obtain graphite-intercalated compounds (GICs). In order to obtain fully oxidized graphite, maintain the high initial lateral sizes of the graphite flakes, and improve the yield of the process, expanded graphite (EG) was employed to obtain the GO dispersions. The dry GIC powder was thermally expanded at 1050 °C for 15 s to obtain EG. 1 g of EG was immersed into 400 mL aqueous alcoholic solution (70:30, water:ethanol, by volume), and dispersed by bath sonicator. The resultant was filtered and dried to obtain the intercalated EG. Then 1 g of intercalated EG was mixed with 200 mL of sulfuric acid and stirred in a three-necked flask. 10 g of KMnO_4 (Sigma-Aldrich, Germany) was slowly added to the mixture. The mixture was transferred to an ice bath, and then 250 mL aqueous solution of H_2O_2 (4:1, water: H_2O_2 , by volume; Sigma-Aldrich, Germany) was slowly poured into the mixture, which led to a color change of the dispersion to light brown. After stirring the resulting mixture for 30 min, the GO nanosheets were washed and centrifuged with HCl solution (9:1, water:HCl, by volume; Merck, Germany), then centrifuged again, and finally washed with DI water until the pH of the solution reached 5 to 6. The resulting GO dispersions were diluted by DI water (~ 1 mg/mL) and gently sonicated for 20 min in a bath sonicator to obtain

GO nanosheets. The concentration of GO dispersion was maintained at approximately 3 mg/mL. Afterward, the obtained individual GO nanosheets were reduced to graphene nanosheets by the addition of a hydrazine solution (the ratio of hydrazine to GO being about 3:1) to the dispersion, which was then heated at 80 °C for 24 h.

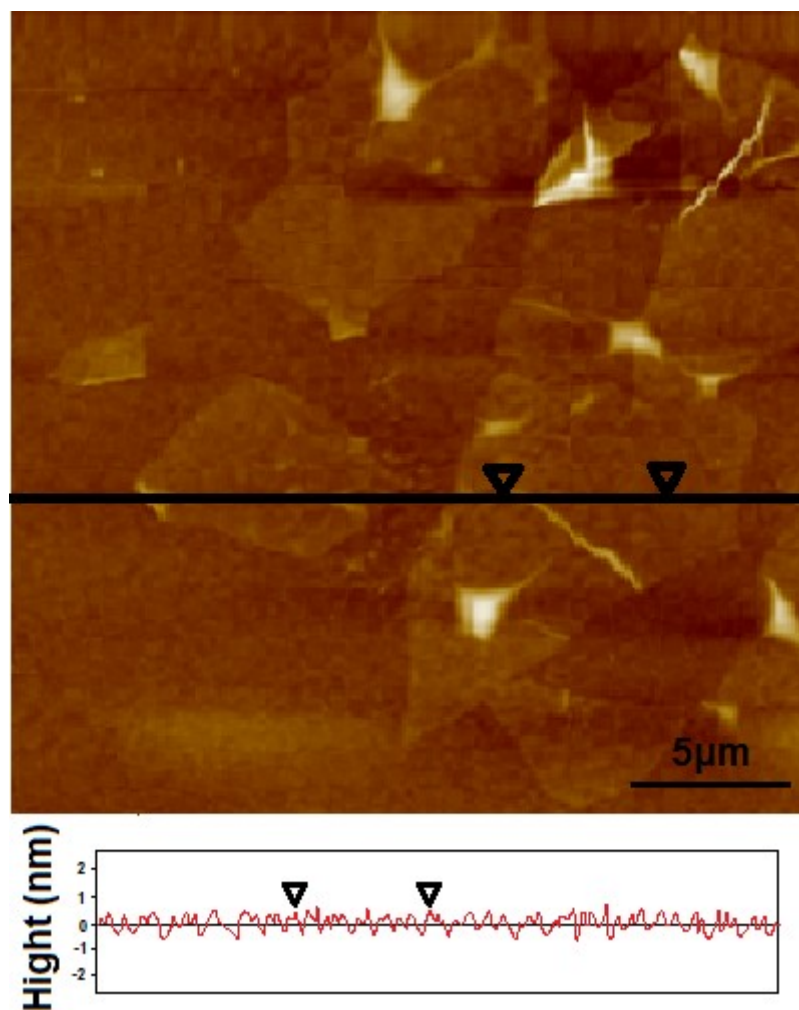


Fig. S1 AFM image (a) and section analysis (b) of as-exfoliated GO suspension.

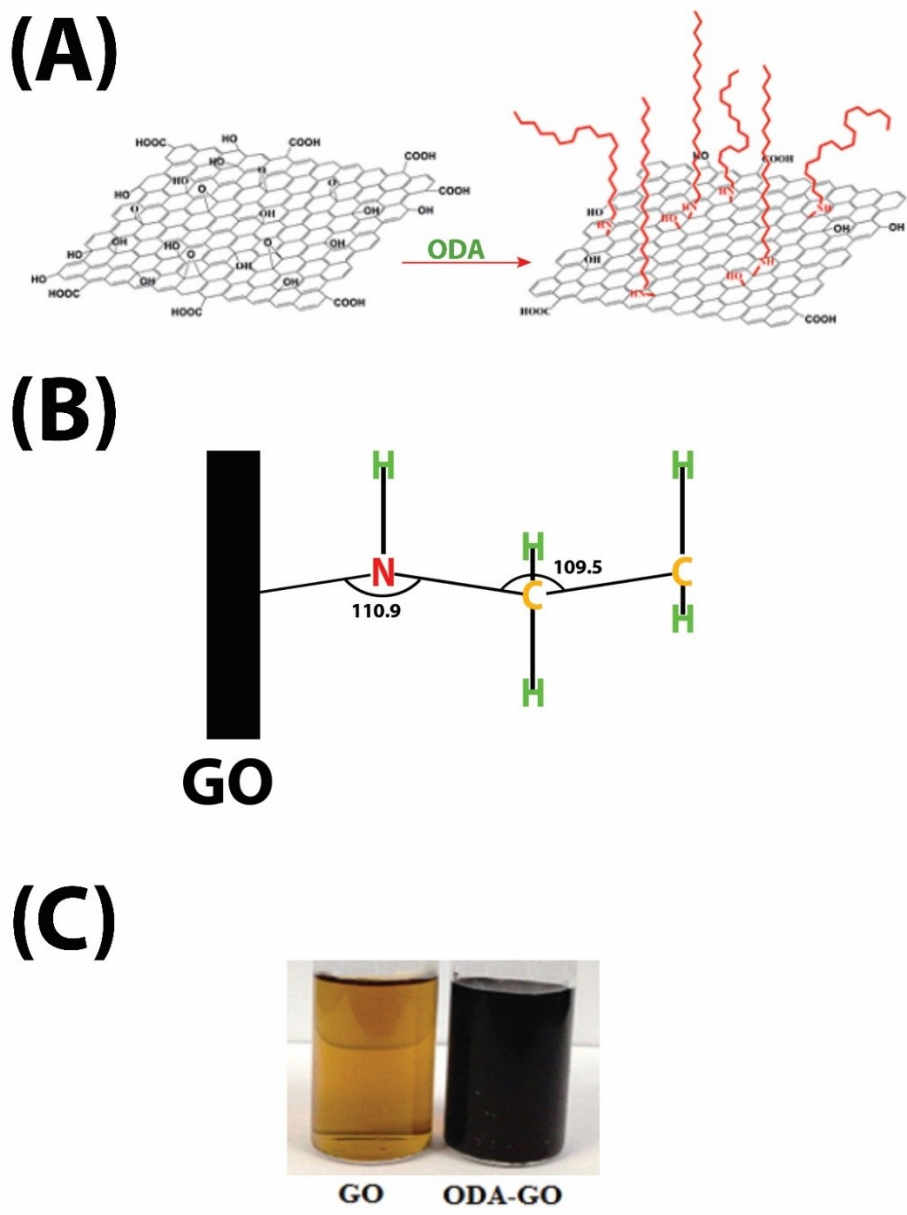


Fig. S2 (A) Schematic illustration of simultaneous ODA functionalization of GO and its reduction, (B) Theoretically attached ODA chain on GO surface, (C) (LEFT) $0.1 \text{ mg}\cdot\text{mL}^{-1}$ of aqueous GO solution and (RIGHT) $0.1 \text{ mg}\cdot\text{mL}^{-1}$ ODA-GO solution in THF.

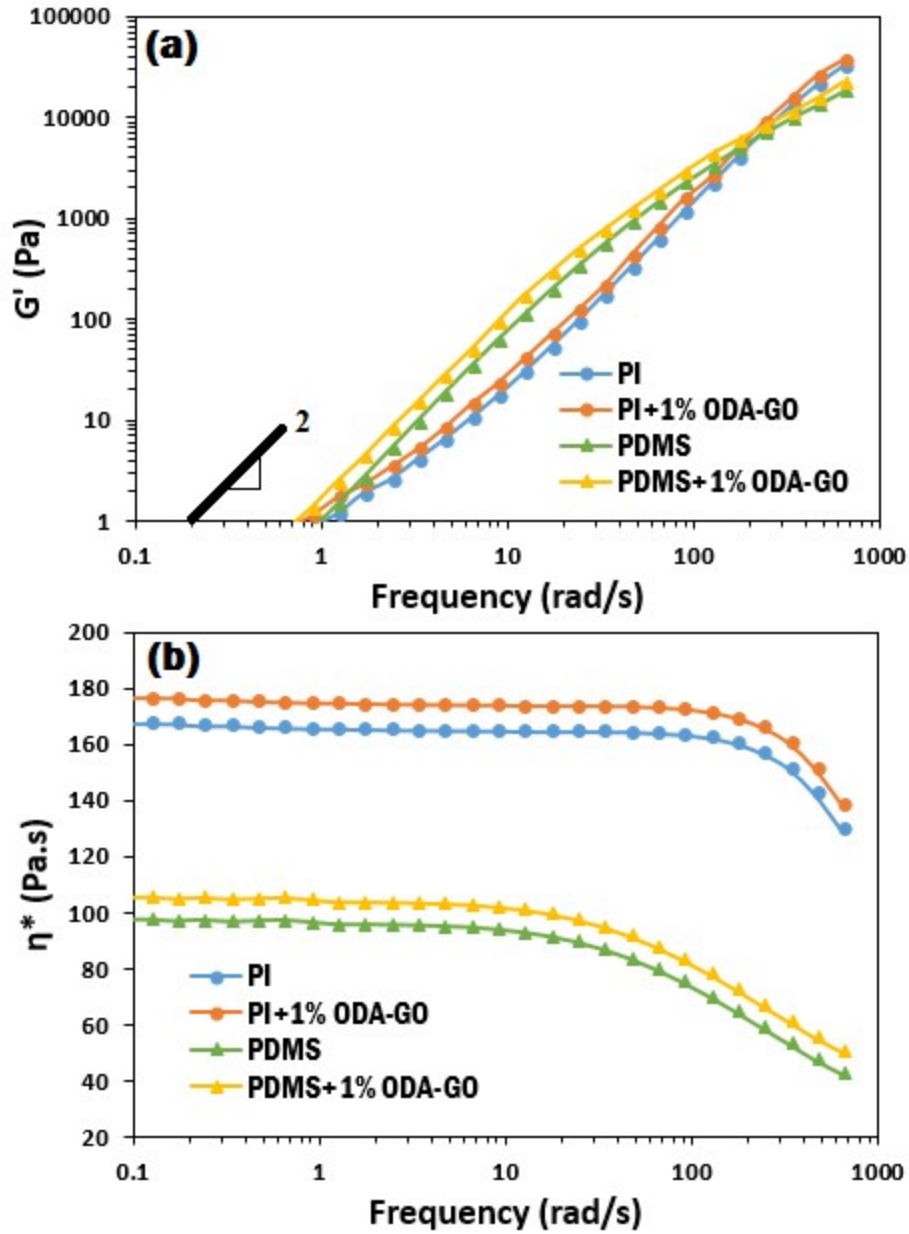


Fig. S3 As loaded oscillatory for pure PI and PDMS with 1 wt% ODA-GO content.

Reference

1. Dehsari, H.S., et al., *Efficient preparation of ultralarge graphene oxide using a PEDOT: PSS/GO composite layer as hole transport layer in polymer-based optoelectronic devices*. RSC Advances, 2014. 4(98): p. 55067-55076.

2. Aboutalebi, S.H., et al., *Spontaneous formation of liquid crystals in ultralarge graphene oxide dispersions*. *Advanced Functional Materials*, 2011. **21**(15): p. 2978-2988.
3. Gavani, J.N., H. Adelnia, and M.M. Gudarzi, *Intumescent flame retardant polyurethane/reduced graphene oxide composites with improved mechanical, thermal, and barrier properties*. *Journal of Materials Science*, 2014. **49**(1): p. 243-254.