Electronic Supplementary Material (ESI) for RSC Advances.

Supplementary Information

Enhanced Dielectric Properties of Acrylic Resin Elastomer based Nanocomposite with Thermally Reduced Graphene Nanosheets

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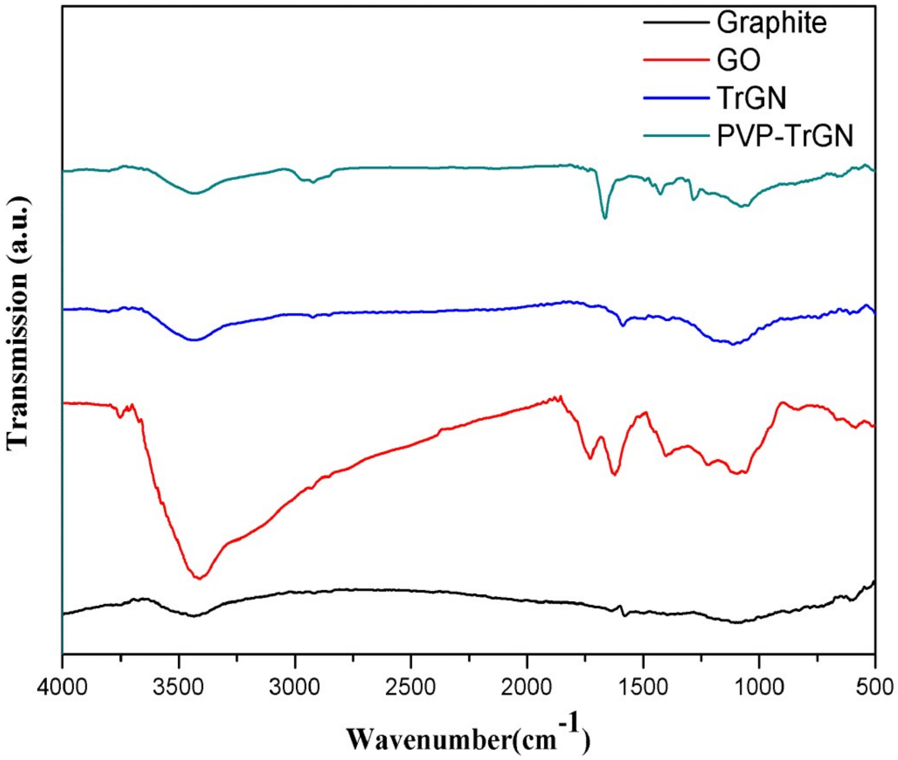


Figure S1 FTIR spectra of natural graphite, GO, TrGN and PVP-TrGN

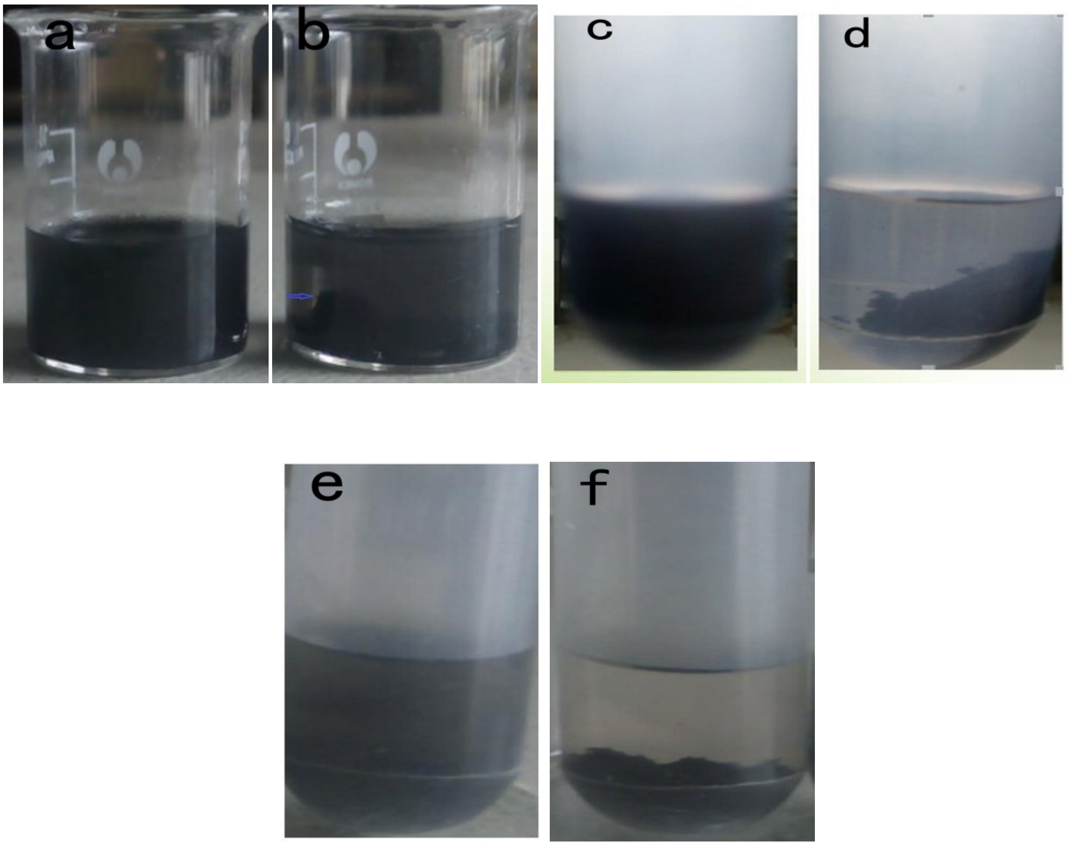
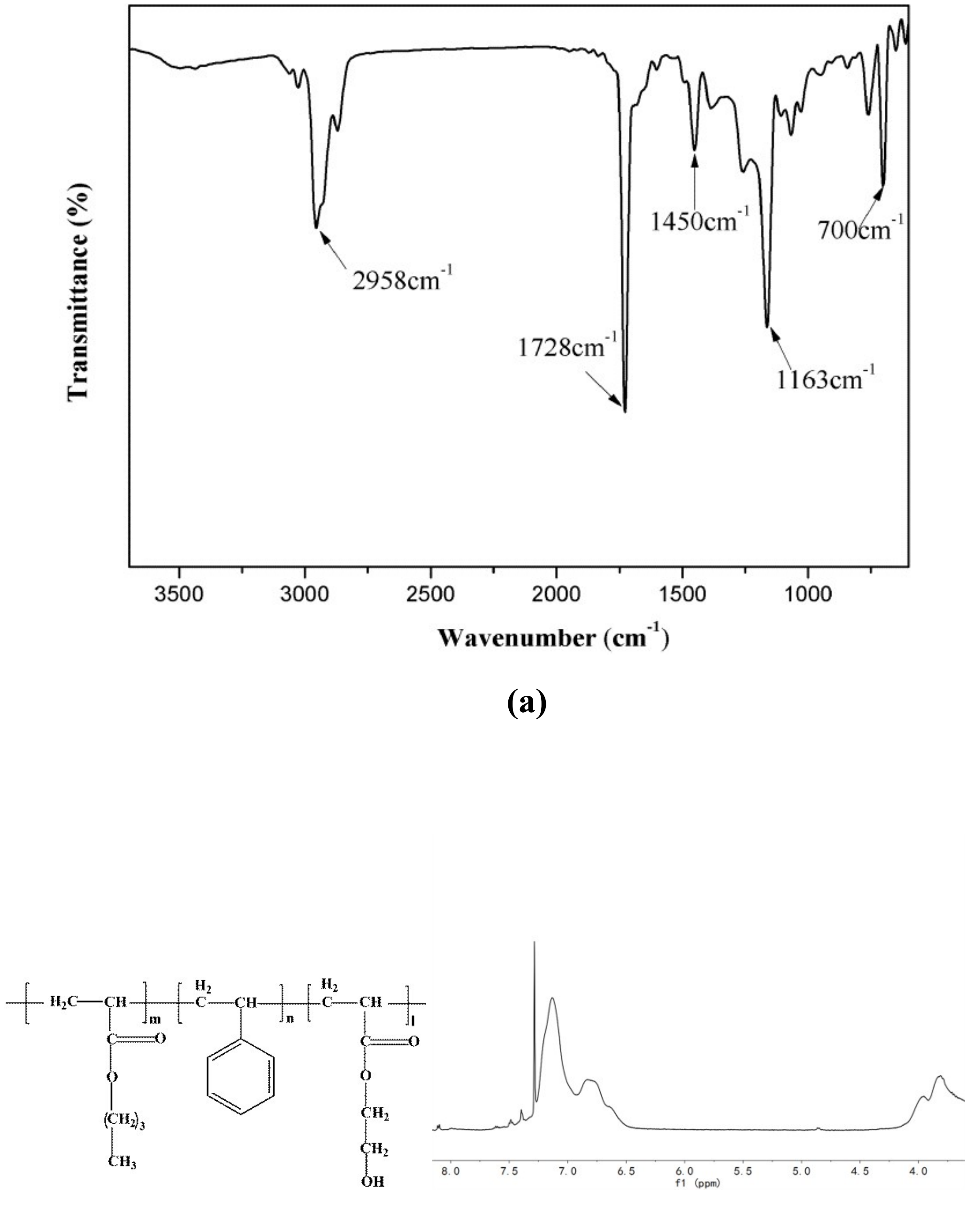


Figure S2 Dispersion performance comparison of PVP-TrGN (a) (c) (e) and TrGN (b) (d) (f) in DMF (a) (b) after sonication (the arrow in the figure points to the agglomeration of TrGN) (c) (d) after centrifugation (the dispersion was in a centrifuge tube) (e) (f) left overnight (the dispersion was in a centrifuge tube)

After sonication, the dispersion of PVP-TrGN in DMF was homogeneous, while the TrGN without the modification of PVP presented obvious agglomeration in DMF. After centrifugation, due to absence of PVP, TrGN aggregated and settled at the bottom of the container, however, PVP-TrGN still had a certain ability of dispersion. Furthermore, the upper layer liquid of PVP-TrGN/DMF was still not completely clarified after it had been left overnight.



(a)

(b)

Figure S3 (a) FTIR and (b) ^{1}H-NMR spectrum with chloroform-d as the solvent of neat ARE

According to the FTIR spectrogram, the absorption peaks appeared at 700, 1450, 1493, 1603 and 3028 cm^{-1} were associated with benzene ring structure of the styrene. Among these the characteristic peaks at 700 cm^{-1} and 3028 cm^{-1} can be assigned to out-of-plane bending vibration and stretching vibration of C-H bond in benzene ring separately. The peaks appeared at 1450 cm^{-1}, 1493 cm^{-1} and 1603 cm^{-1} can be attributed to C=C skeleton vibration in benzene ring. The peak at 1163 cm^{-1} can be ascribed to stretching vibration of C-O-C in the side chain of ARE. The strongest peak appeared at 1261 cm^{-1} and the peak at 1728 cm^{-1} corresponded to the absorption peaks of C-O bond and carbonyl in BA and HEMA separately. The peaks appeared at 1392 cm^{-1} and 2958 cm^{-1} were indexed to telescopic vibration of the C-H bond in the methyl.

According to the ^{1}H-NMR spectrogram, the wide absorption peak near the chemical shift of 3.607 ppm corresponded to the vibration absorption of methylene adjacent to oxygen atoms ($-O-CH_2$) in molecular side chain. The weak peak near 4.810 ppm was attributed to vibration of hydrogen atom in the hydroxyl (-OH). The wide peak at 6.812 ppm can be ascribed to vibration of hydrogen atoms of C-H adjacent to benzene ring in molecular backbone. The absorption peak at 7.132 ppm corresponded to vibration of hydrogen atoms on the ortho and para of styrene in molecular chain. The peak near 7.292 ppm was associated with hydrogen atoms at the meta position of styrene.

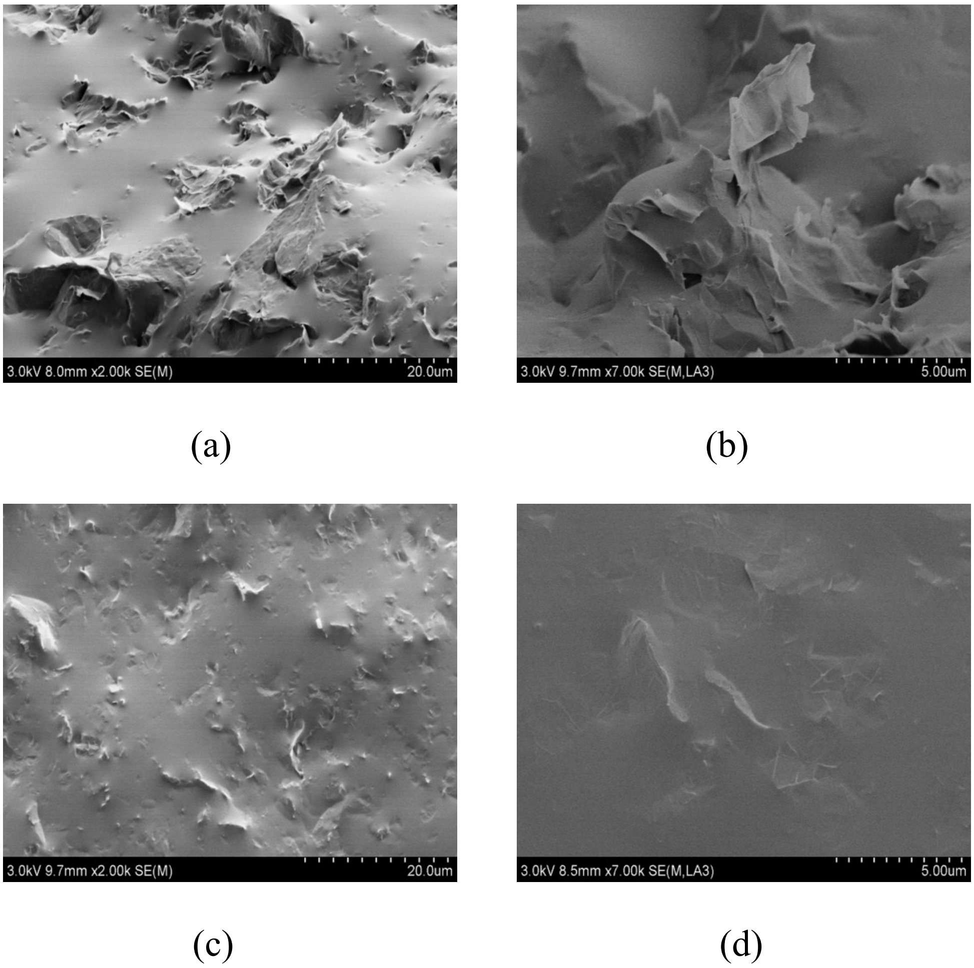


Figure S4 SEM images (cross-sectional view) of ARE/0.5% TrGN (a) (b) and ARE/0.5% PVP-TrGN (c) (d). Figs (a) (c) have a magnification of 2000 times and Figs (b) (d) have a magnification of 7000 times

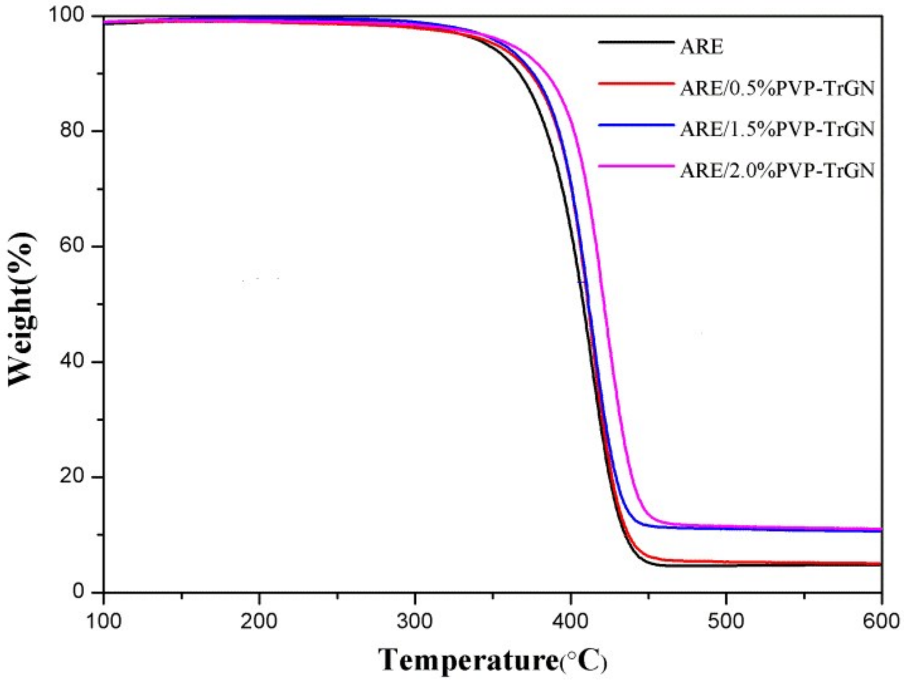


Figure S5 TG curves for neat ARE and different ARE/PVP-TrGN composites

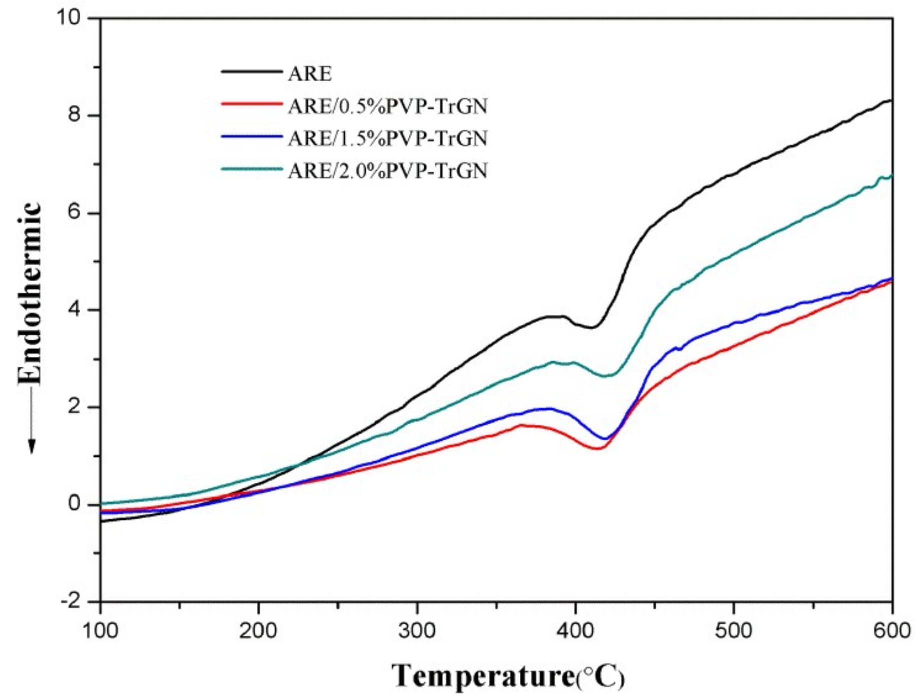


Figure S6 DSC curves of neat ARE and different ARE/PVP-TrGN composites