Electronic Supplementary Material (ESI) for Polymer Chemistry

Chemically Modified Graphene by Thermotropic Lquid Cystalline Polymer and its reinforcement effect in polymer matrix

Supporting Information

Ying Jing, Hui Tang*, Guijun Yu and Peiyi Wu*

1. FTIR spectra of the two molecular weight azido-functionalized polymers

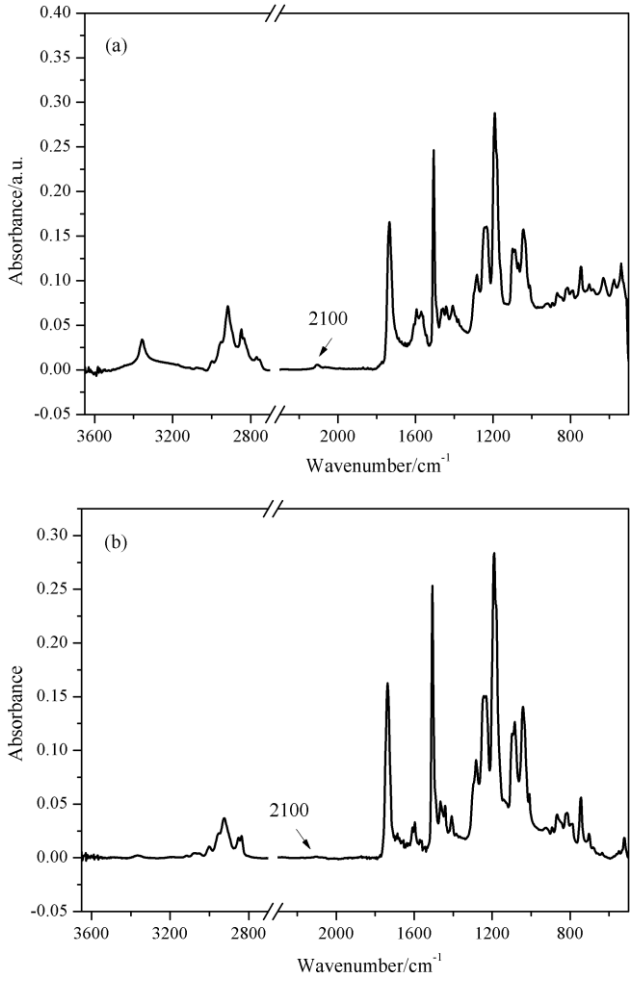

Figure S1. FTIR spectra of (a) PMPCS (i) and (b) PMPCS (ii)

Two molecular weight azido-functionalized polymers were synthesized via ATRP.

FTIR spectra show that azido groups were successfully incorporated into the polymer chains (see Figure S1). One peak we strongly concern is the peak of azido groups located at 2100 cm^{-1}. The intensity of this peak in PMPCS (i) is much more legible than that in PMPCS (ii), because azido groups have more mass fraction in PMPCS (i) than in PMPCS (ii).

2. Angular frequency dependence of storage modulus of the matrixes with different filler contents at various temperatures

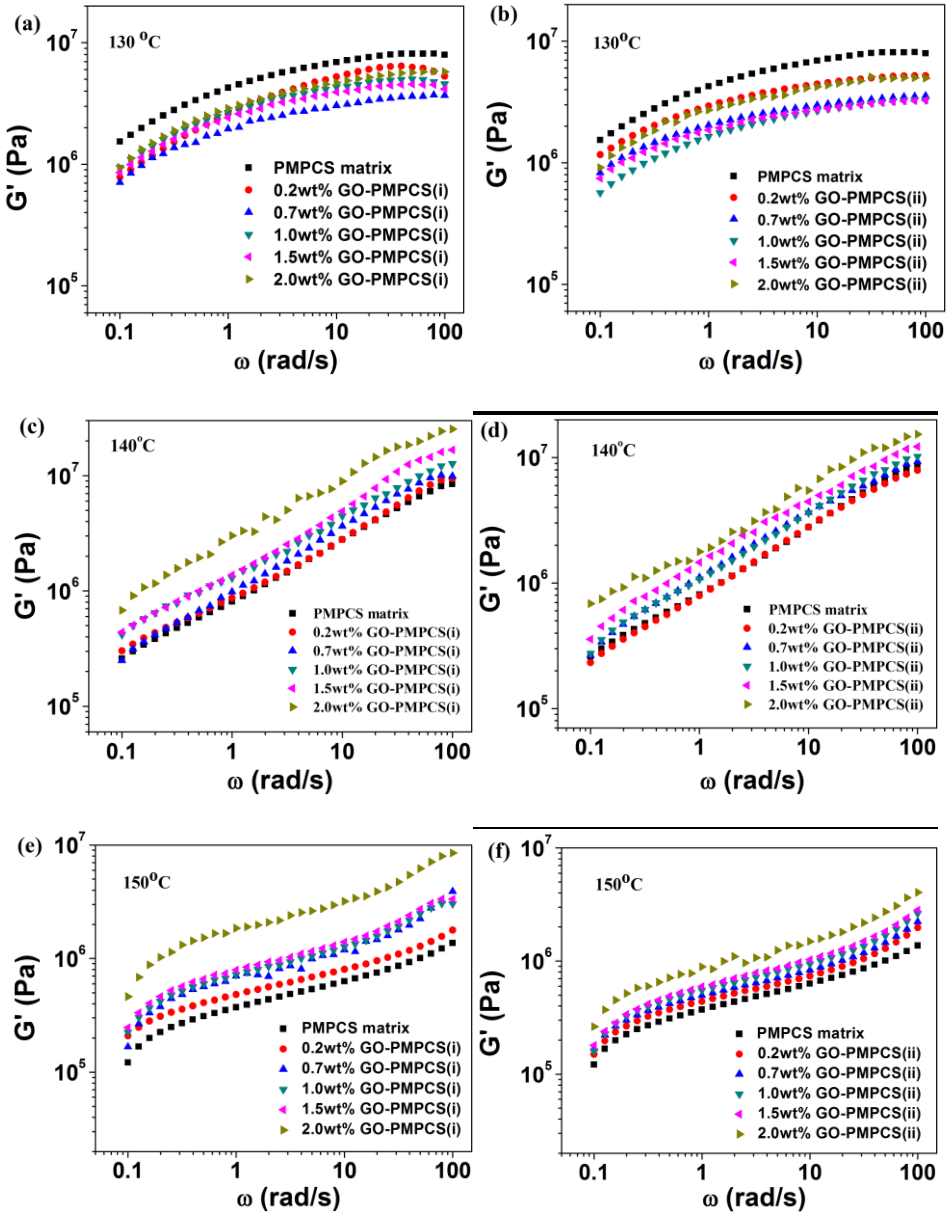

Figure S2. Frequency dependence of storage modulus of the matrixes with different GO-PMPCS composites contents : (a), (b) at 130 ^{o}C; (c),(d) at 140 ^{o}C, (e),(f) at 150 ^{o}C.

At 130 ^{o}C, the storage modulus of PMPCS matrix first decreased with increasing GO-PMPCS composites contents, which was due to the less compaction of PMPCS matrix after small amount of filler addition. With further increase of GO-PMPCS composites contents, the storage modulus increased again due to the reinforcement effect.

At 140 ^{o}C, PMPCS matrix entered unstable mesophase state, and 0.2 wt% of both GO-PMPCS composites had little improvement in the storage modulus of the matrix. However, GO-PMPCS composites contents at 0.7 wt%, 1.0 wt% and 1.5 wt% had better improvement in the storage modulus of the matrix compared with 0.2 wt% of both fillers. For both GO-PMPCS composites, the best effect was observed at 2.0 wt% filler content.

At 150 ^{o}C, PMPCS matrix entered stable mesophase. With the increase of GO-PMPCS composites contents, the storage modulus of the matrix kept improving. The best improvement effect at this temperature was also found in 2.0 wt% filler content.

3. Mesomorphic structure and thermal behavior of PMPCS matrixes with different GO-PMPCS composites contents

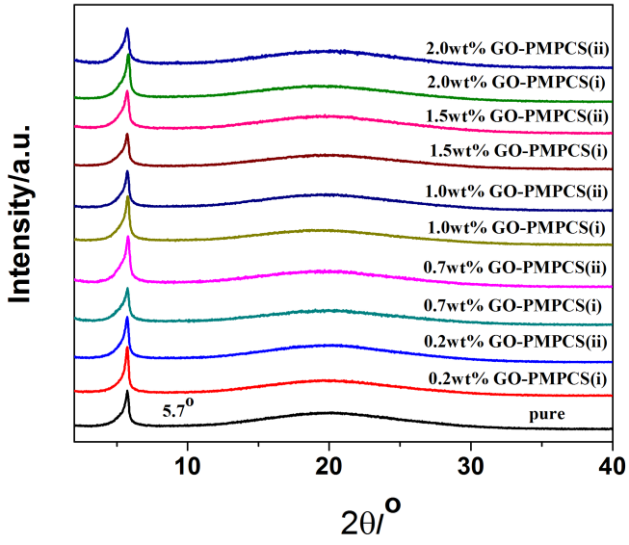

Fig.S3. Wide-angle X-ray diffraction spectra of PMPCS matrix with different GO-PMPCS composites contents.

After quenched to room temperature from 170 °C, a narrow diffraction peak at 2θ=5.7° (d-spacing of 1.48 nm), corresponding to hexagonal columnar nematic (Φ_{HN}) structure could be clearly seen with different GO-PMPCS composites contents. Generally, the incorporation of two kinds of GO-PMPCS composites with contents from 0.2 wt% to 2.0 wt% did not disrupt the mesomorphic structure of PMPCS matrix.

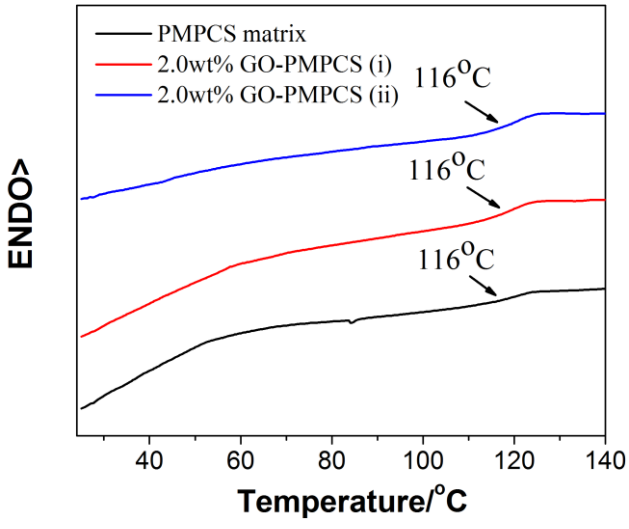

Fig.S4. DSC curves of PMPCS matrix, PMPCS matrix with 2.0 wt% GO-PMPCS (i) and 2.0 wt% GO-PMPCS (ii). The heating rate was 20 ^{o}C min^{-1}.

DSC thermogram of PMPCS was featureless except the glass transition at 116 ^{o}C. Because neither of the two GO-PMPCS composites showed any feature in the DSC curves in the whole temperature range (not shown), the thermograms of PMPCS matrix with GO-PMPCS composites (2.0 wt%) only showed the glass transition of PMPCS. It could be seen that the glass transition temperature remained the same in PMPCS matrix with 2.0 wt% GO-PMPCS (i) and 2.0 wt% GO-PMPCS (ii). It was worth noting that the addition of GO-PMPCS composites even in 2.0 wt% content did not change the glass transition temperature of PMPCS.