

# ESI - Self-assembly of miscible homopolymer/quasi-block copolymer blends/MWNTs composites: a strategy to obtain ultralow electrical percolation threshold and mechanism

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## Experimental

### 10 Materials

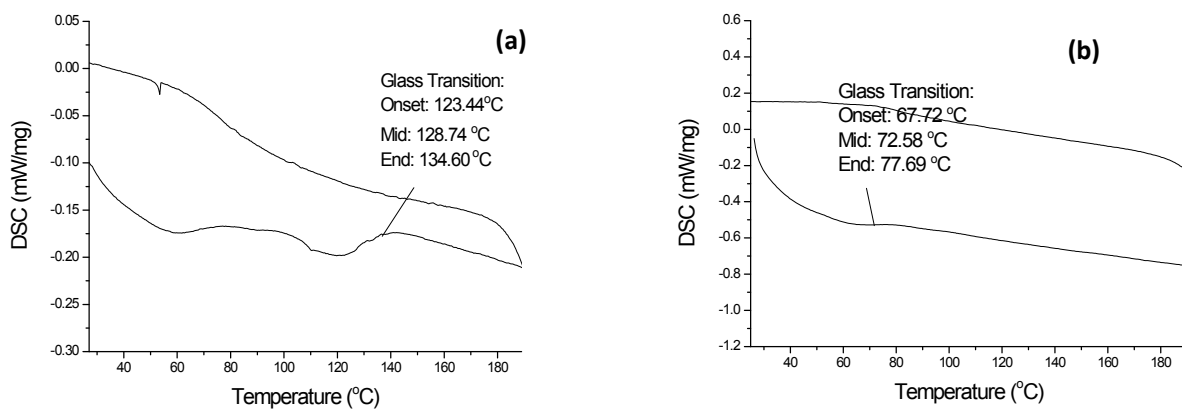
MWNTs (95%, diameter 20-30 nm, length 5-15  $\mu\text{m}$ , Chengdu Organic Chemicals Co., Ltd.), monomers of methyl methacrylate and styrene (chemically pure, Shanghai Chemical Reagent), Poly(vinylene chloride) powder (Shanghai Aladdin Chemical Co., Ltd), powders of sodium hydroxide and magnesium chloride (analytically pure, Shanghai Chemical Reagent), and N-methyl-2-pyrrolidone (analytically pure, Sinopharm Chemical Reagent Co., Ltd.) were 15 utilized in this work without further treatment. Azobisisobutyronitrile (analytically pure, Shanghai Lingfeng Chemical Reagent Co., Ltd) was dissolved and recrystallized by ethanol.

### Preparation of polymer/MWNTs composites

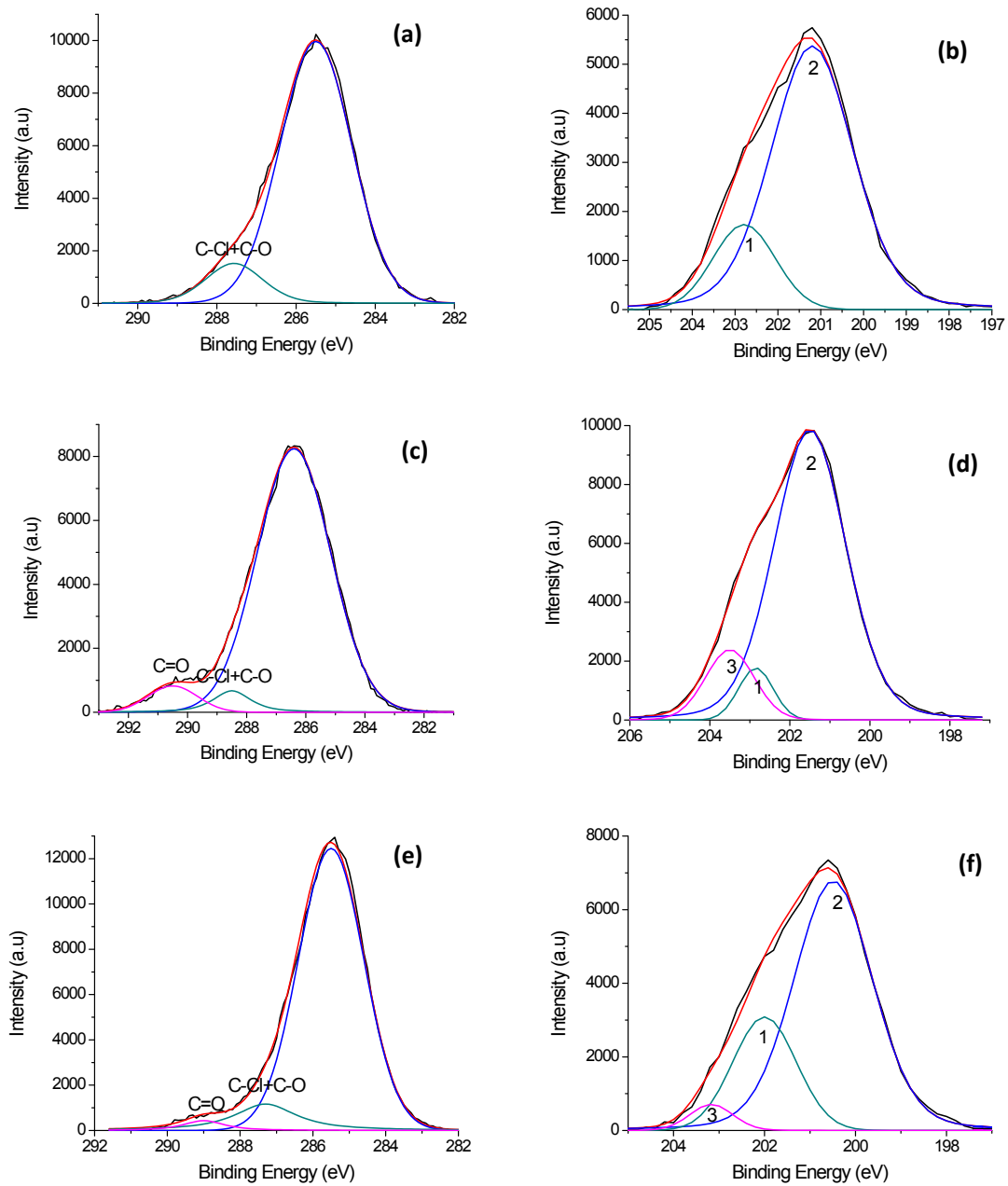
Synthesis of quasi-block copolymer was reported in our recent paper. NMP solutions of polymers (both qb and PVC 20 are soluble in NMP) and MWNTs were prepared in beakers with concentrations of approximately  $10 \text{ mg mL}^{-1}$  and  $0.1 \text{ mg mL}^{-1}$ , respectively. Solutions of carbon nanotubes were sonicated for 30 min and mixed with the polymer solutions to stir for 2 min and stored in 10 ml tubes with caps. One-side-polished stainless steel tablets were rinsed with detergent and water. The so-prepared stainless steel tablets were used as electrodes and coated with 0.5~0.8 ml 25 stock solutions and dried and annealed into a membrane under  $65^\circ\text{C}$  for 8 h.

### Characterization

The electrical conductivity of the composite was measured by digital multimeter (VC890D) and dc kelvin bridge at room temperature. Differential scanning calorimetry (DSC 204 F1) detection was both conducted at a heating rate of  $10^\circ\text{C min}^{-1}$ , under the protection of an  $\text{N}_2$  atmosphere, with synchronization enabled. The chemical structure and 30 property of composites were analysed by X-ray Photo- electron Spectroscopy (Perkin-Elmer PHI 5000C ESCA System) using non-mono chromatized Mg-K $\alpha$  radiation for excitation. The Field emission scanning electron microscopy (FESEM) imaging was performed with a JSM6700F.



SI Fig. 1 DSC curves of (a) pure qb/PVC(2-5), (b) 0.148%qb/PVC(2-5)



**SI Fig. 2** C 1s and Cl 2p<sub>3</sub> spectrum of (a,b) 0.57%qb/PVC(2-5); (c,d) 0.071%qb/PVC(2-5)  
(e,f) 0.286%qb/PVC(2-5)

