# Supporting Information for

**Trapping carbon nanotubes at the interface of a polymer blend through adding graphene oxide: a facile strategy to reduce electrical resistivity**

Jie Chen, Ying Shen, Jing-hui Yang, Nan Zhang, Ting Huang, Yong Wang[*], Zuo-wan Zhou

Key Laboratory of Advanced Technologies of Materials (Ministry of Education), School of

Materials Science & Engineering, Southwest Jiaotong University, Chengdu, 610031, China

## 1. Experimental section:

### 1.1 Materials

PLLA (2002D, with D-isomer content of 4.3%, $M_w$ of $2.53 \times 10^5$ g/mol, melt flow rate (MFR) of 6 g/10min (190 °C /2.16 kg), and density of 1.24 g/cm$^3$) was purchased from NatureWorks[®], USA. EVA (Elvax 40L-03, 40 wt% VA) with the MFR of 19 g/10 min (190 °C/2.16 kg) and the density of 0.97 g/cm$^3$ was obtained from DuPont Industrial Polymers (USA). Multiwalled carbon nanotubes (CNTs) were FloTubes[TM] 9000 (CNano Technology, Beijing) whose purity was more than 95%. Their average diameter and length were 11 nm and 10 mm, respectively, and the surface area was 230–250 m$^2$/g. Graphite was obtained from Qingdao Heilong Graphite Co., Ltd.

### 1.2 Sample preparation

GO was prepared according to modified Hummer's method [1] and the corresponding data of the GO can be seen in our previous work.[2] After the surface modification, some functional groups, including carboxyl and hydroxyl groups, were introduced to the surface of the GOs.

Two master batches, i.e. CNT/PLLA and GO/PLLA containing 10 wt% CNTs and 10 wt% GO, respectively, were first prepared through melt compounding. Then the master batches were diluted to prepare the composites. To prepare the ternary CNT/PLLA-EVA composites, CNT/PLLA master batch was melt-compounded with PLLA and EVA for 6 min. To prepare the quaternary CNT/GO/PLLA-EVA composites, GO/PLLA master batch was first diluted by melt-blending with PLLA and EVA for 2 min, then the CNT/PLLA master batch was added into the melt; after that, the melt compounding was proceeded further for 6 min. In the present work, the weight ratio

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[*] Corresponding author: Tel: 86 28 87603042; E-mail: yongwang1976@163.com (Yong Wang)

between PLLA and EVA was maintained at 60/40 so that the blend could exhibit the co-continuous structure.[3] The concentrations of CNTs was varied from 0.1 to 2.0 wt% while the concentration of GO was maintained at 0.3 wt%. The melt compounding was carried out in an internal mixer at a melt temperature of 200 °C and a rotate speed of 60 rpm.

*1.3 Scanning electron microscopy (SEM)*

The phase morphologies of the different composites and the location of CNTs and GO in the composites were characterized using a scanning electron microscope (SEM) Fei Inspect (FEI, the Netherlands). The accelerating voltage was 10 kV. All the samples were first cryogenically fractured in liquid nitrogen before SEM characterization, then the fractured surfaces were etched in n-heptane at 45 °C for 5 h to remove EVA phase from the PLLA matrix, and then the etched surfaces were carefully washed with fresh n-heptane and ethanol with the aid of sonication, successively. After that, the fractured surfaces were sputter-coated with a thin layer of gold.

*1.4 Transmission electron microscopy (TEM)*

A transmission electron microscope (TEM) Tecnai G2 (FEI, F20, USA) was used to further characterize the location of CNTs and/or GO in the nanocomposites. An ultrathin section with a thickness of about 90 nm, which were cut using a cryo-diamond knife on a microtome EM UC6/FC6 (LEICA, Germany), was used for TEM characterization.

*1.5 Electrical resistivity measurement*

The electrical resistivity was measured on a compression-molded sample (with a diameter of 80.0 mm and a thickness of 1.0 mm) using a Digital High Resistance Test Fixture PC68 (Shanghai Precision Instrument Manufacture, China). Before measurement, all the samples were cleaned by ethyl alcohol to avoid the influence of the dust on the surface of samples.

## References

1. W. S. Hummers, R. E. Offeman, *J. Am. Chem. Soc.* **1958**, 80, 1339-1340.

2. J. H. Yang, C. X. Feng, J. Dai, N. Zhang, T. Huang, Y. Wang, *Polym. Int.,* **2013**, 62, 1085-1093.

3. Y. Y. Shi, Y. L. Li, F. M. Xiang, T. Huang, C. Chen, Y. Peng, Y. Wang, *Polym. Adv. Technol.* **2012**, 23, 783-790.