Supplementary Material (ESI) for Chemical Communications

Electronic Supporting Information for the article:

Charge Transfer Interactions between Conjugated Block Copolymer and Reduced Graphene Oxides**

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Experimental Section

Chemicals: Graphite powder (< 20 μM), hydrazine solution (35 wt% in water), and perchlorate-doped poly(3,4-ethylenedioxythiophene)-*b*-poly(ethylene oxide) (1 wt% in niromethane) were purchased from Aldrich. PEDOT-*b*-PEO was obtained after the reduction of perchlorate-doped poly(3,4-ethylenedioxythiophene)-*b*-poly(ethylene oxide) by the addition of 10 mL of hydrazine solution at 85 °C for 48 h.

Synthesis of RGO/PEDOT-b-PEO hybrid: As starting material, graphene oxides (GOs) was synthesized from graphite using a modified Hummers method following previous report.[1] Dried GOs (2 mg) were dispersed in 5 mL of dimethylformamide (DMF) by sonication until homogeneous solution for 30 min. Then, varying weight ratios of PEDOT-*b*-PEO (from 5 wt% to 60 wt%) was added to the dispersion and sonicated for 30 min. After mixing with 100 μL of hydrazine solution, the resultant mixture was heated to 90 ^{o}C and stirred for 12 h. The product was filtered and de-ionized (DI) washed with ethanol and water several times, and then dried at 60 ^{o}C under vacuum.

Characterization: Transmission electron microscopy (TEM) images were collected on an E.M. 912 Ω energy-filtering TEM (EF TEM 120kV) and a JEM-3010 HR TEM (300 kV). The scanning electron microscopy (SEM) micrographs were obtained using a field emission scanning electron microscope (FEI Sirion model) equipped with an in-house Schottky emitter in high stability. The atomic force microscopy (AFM) images were recorded on XE-100 instruments (Park systems) in the non-contact mode with silicon probes at scanning rate of 1 Hz. The Fourier transform infrared (FT-IR) spectra were collected on on a JASCO FT-IR 470 plus. Each spectrum was recorded from 4000 to 650 cm^{-1} with using 30 scans. The Raman spectra were recorded from 3500 to 100 cm^{-1} on a Bruker FT Raman spectrophotometer RFS 100/S using a 785 and 1064 nm dual channel laser at a resolution of 1 cm^{-1}. The UV spectra were collected from UV/vis/NIR spectrophotometer (V670, JASCO). Ultraviolet photoelectron spectrophotometer (UPS) data was obtained using AXIS-NOVA (Kratos. Inc.) with UV source of He I (21.2 eV), pass energy of 5 eV, and bias of –15V. The photoluminescence spectra were recorded from 300 to 800 nm on a SPECTRAmax® M2 spectrofluorometer and the SofMax pro software (Molecular Devices). Electrical conductivities of dried films were measured by using the standard 4-point probe technique (Loresta-GP, Mitsubishi Chemical). All electrochemical data were obtained at room temperature within the error range of ± 5 %.

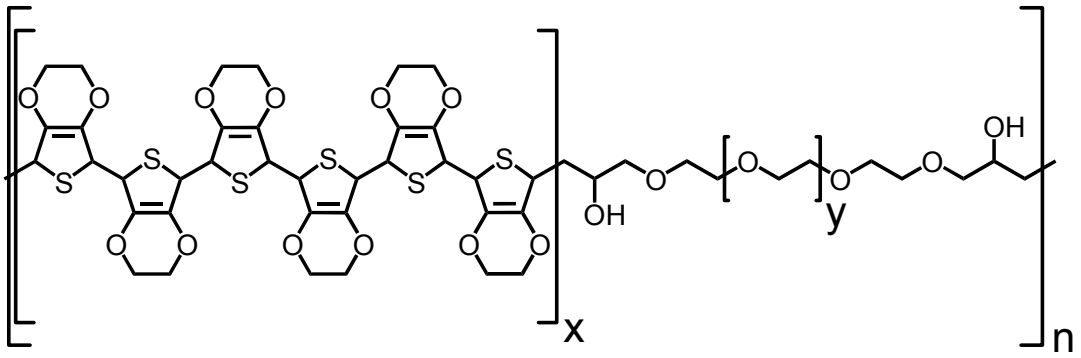

Fig. S1. Chemical structure of Poly(3,4-ethylenedioxythiophene)-block-poly(ethylene glycol).

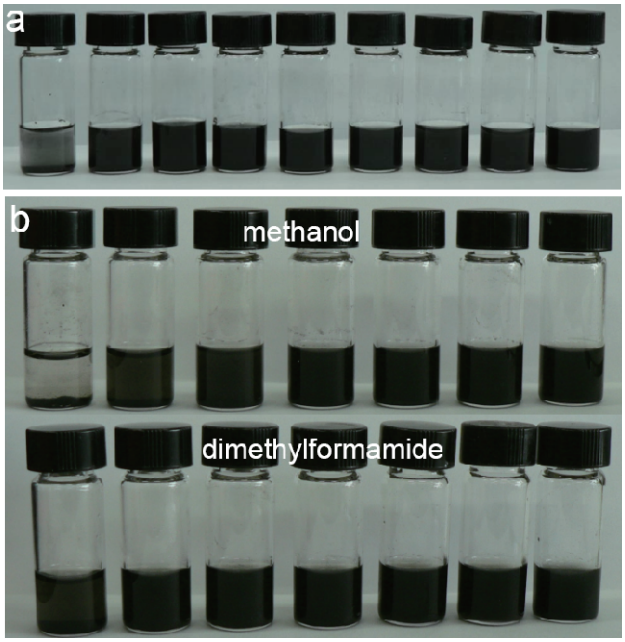

Fig. S2. Photograph images of (a) RGO/PEDOT-*b*-PEO hybrid solution in water, methanol, dimethylsulfoxide, dimethylformamide, chloroform, tetrahydrofuran, acetonitrile, and toluene (left to right) and (b) Solubility of hybrid in methanol (top) and dimethylformamide (bottom) with varying weight ratios of PEDOT-*b*-PEO (left to right: 0, 5, 10, 20, 30, 40, 50wt%).

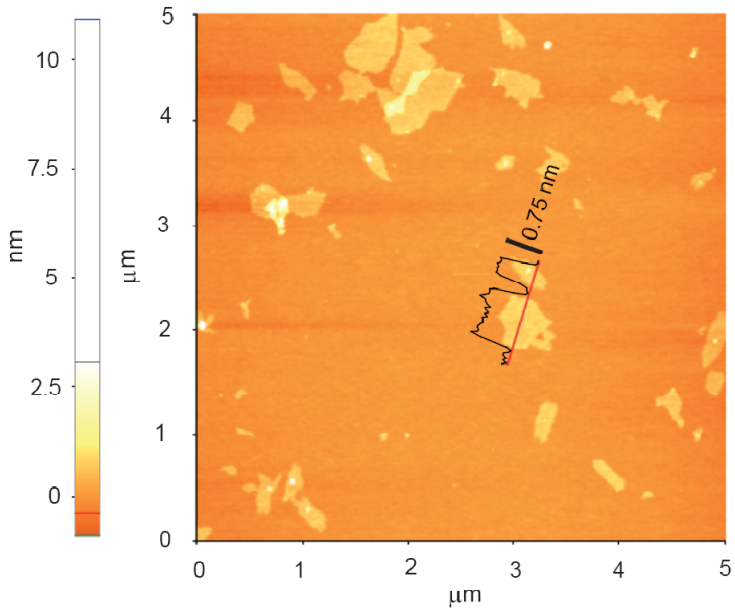

Fig. S3. AFM image of GOs.

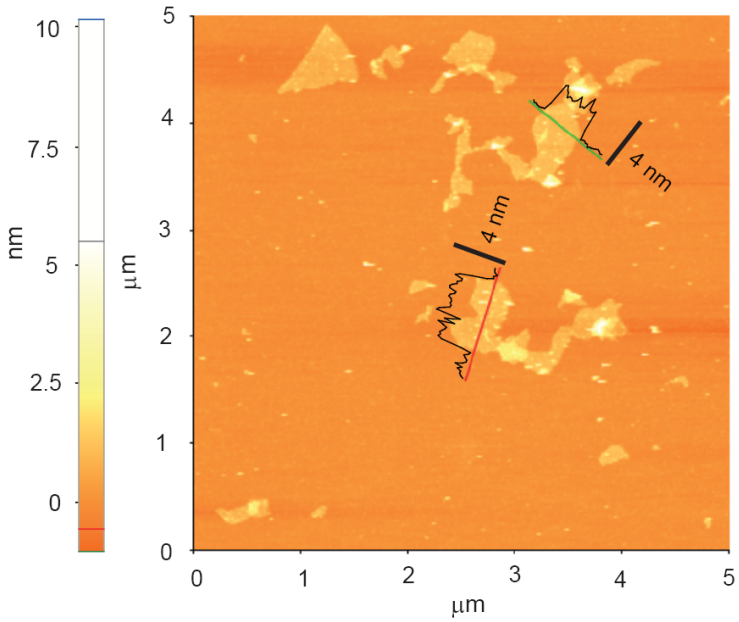

Fig. S4. AFM image of GO/PEDOT-*b*-PEO hybrids.

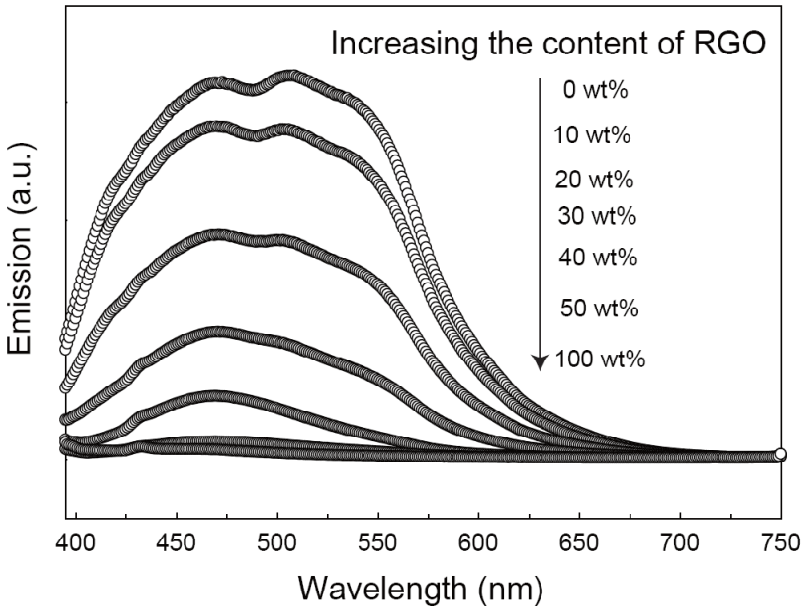

Fig. S5. Changes in the PL emission spectra of RGO/PEDOT-*b*-PEO hybrid with the addition of RGO ranging from 0 to 100 wt%.

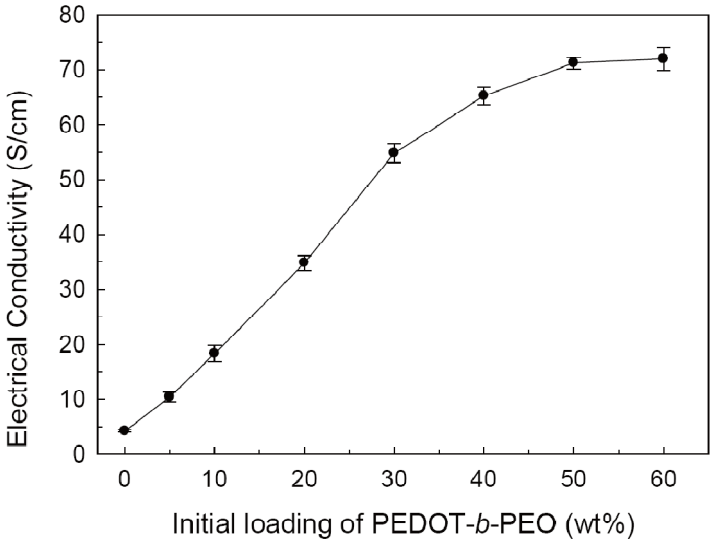

Fig. S6. Electrical conductivity at transmittance 85% at 550 nm for RGO/PEDOT-*b*-PEO films as a function of initial loading contents of PEDOT-*b*-PEO ranging from 0 to 60 wt%.

Reference

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