Electronic Supplementary Material (ESI) for Polymer Chemistry

Supporting Information

Dispersion of Single-Walled Carbon Nanotubes with Poly(pyridinium salt)s

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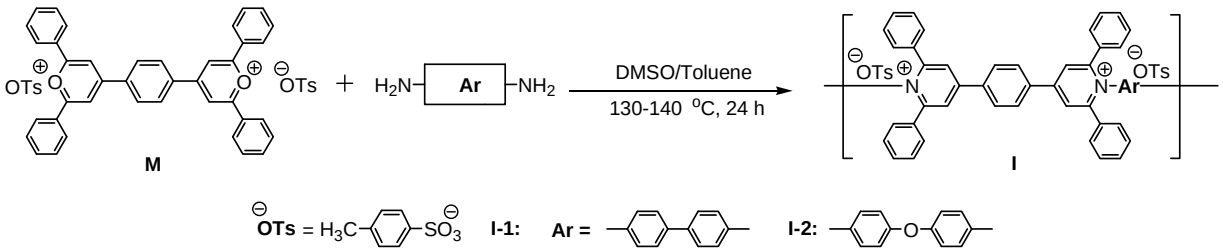
Synthesis of Monomer, M

The 4,4´-(1,4-phenylene)bis(2,6-diphenylpyrylium *p*-toluene sulfonates), **M**, was synthesized according to the reported procedure in the literature.[1,2]

Synthesis of polymers I-1 and I-2

The bis(pyrylium salt) **M** was polymerized with either benzidine or 4,4´-oxydianiline by ring-transmutation polymerization reaction[3] to yield polymers **I-1** and **I-2** that was carried out on heating in DMSO as shown in Scheme 1.



Scheme 1. Synthesis of polymers **I-1** and **I-2.**

Materials and Characterization

Single-walled carbon nanotubes (diameter = 1–2 nm, length = 0.5–2.0 μm, purity > 90 wt %) were purchased from Cheap Tubes Inc. and used without further purification. Dimethyl sulfoxide (DMSO) was HPLC-grade and ethyl acetate was reagent-grade solvent.

The ^{1}H NMR spectra were recorded with a Varian NMR spectrometer operating at 400

MHz at room temperature. The proton chemical shifts were referenced to tetramethylsilane (TMS). The NMR samples were prepared in d_6–DMSO with a concentration of 10 mg/mL. Dilute solution for UV–Vis and photoluminescence spectroscopy study was prepared by dissolving 0.5 mg of the dry polymer/SWNT composite in 15 mL of the DMSO at room temperature. A few drops of the resulting solutions were transferred to a quartz cell and diluted further with DMSO to adjust the optical density to obtain a light colored solution. UV–Vis absorption spectra were recorded with a Varian Cray 3 Bio UV−Vis spectrophotometer at room temperature. Photoluminescence spectra in solutions were recorded with a Perkin−Elmer LS 55 luminescence spectrometer with a xenon lamp light source. Lyotropic LC properties of the composites were obtained using a polarized optical microscope (POM, Nikon, Model Labophot 2) equipped with crossed polarizer. Samples of these composites for lyotropic properties were made by dissolving known amounts of composites into known amounts of DMSO. A Tecnai-G2-F30 supertwin transmission electron microscope (TEM) system with a 300 keV Schottky field emission gun was used to characterize the samples. Bulk morphology was analyzed using the conventional bright field (BF) mode, and all TEM images were recorded using a slow-scan CCD camera attached to a Gatan GIF 2000 energy filter. To prepare samples by the solution-drop method, 3 wt% of composite in DMSO was placed onto a 3 mm diameter carbon-coated copper grid using a small tipped transfer-pipette. The solvent was evaporated from the sample under reduced pressure inside TEM chamber, leaving the fine particulate objects deposited on the carbon film, which was then used in the TEM study. The major components of the Raman microscope are a Lexel RamanIon krypton ion laser (647.1 nm), a Nikon MM-40 measuring microscope, a Jobin-Yvon TRIAX 550 monochromator, and a Princeton Instruments Spec-10 liquid nitrogen cooled CCD. The Raman system is calibrated using emission lines from a neon

lamp.

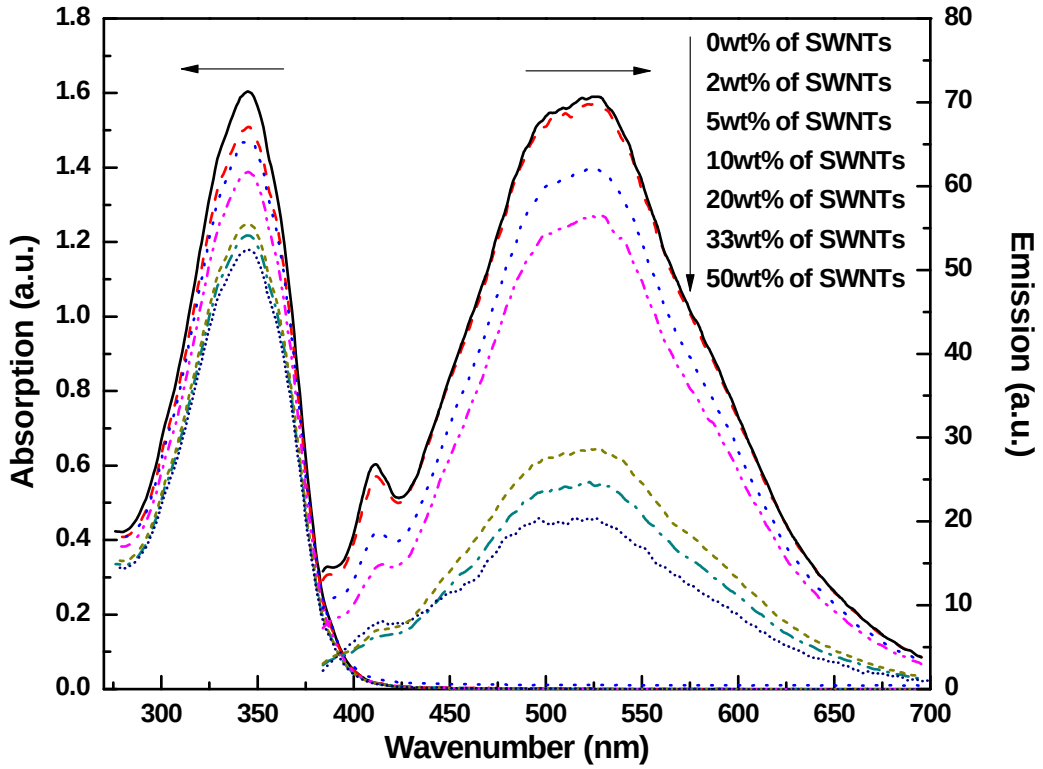


Figure S1. UV–Vis absorption spectra of **I-2**/SWNT composites in DMSO (left arrow) and emission spectra of **I-2**/SWNT composites at excitation wavelength of 364 nm in DMSO (right arrow).

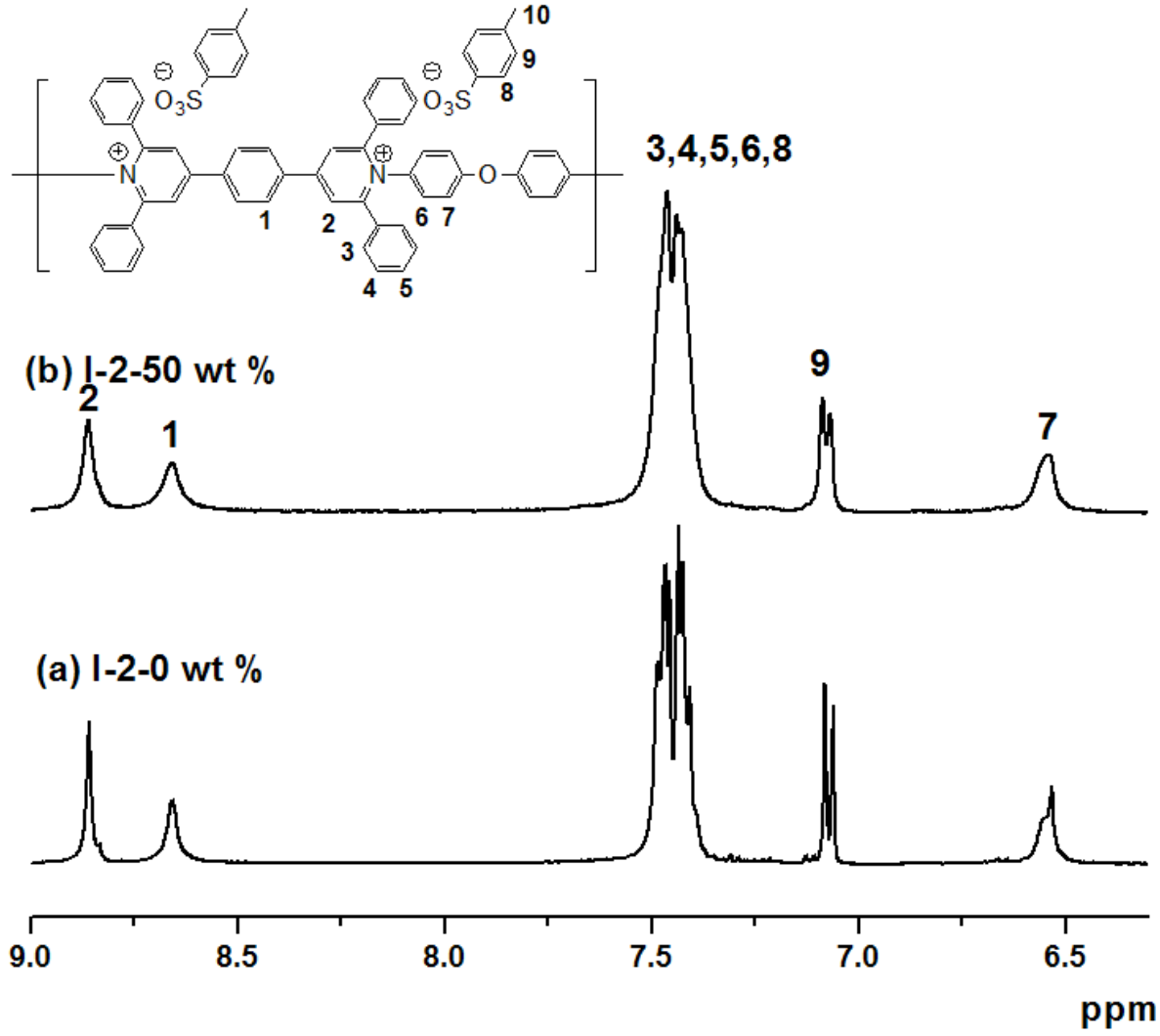


Figure S2. ^{1}H NMR spectra of **I-2**/SWNT composites (delay time = 1 s, number of scans = 16): (a) **I-2** (10 mg/mL in d_6-DMSO); and (b) **I-2**-50 wt % (10 mg/mL in d_6-DMSO).

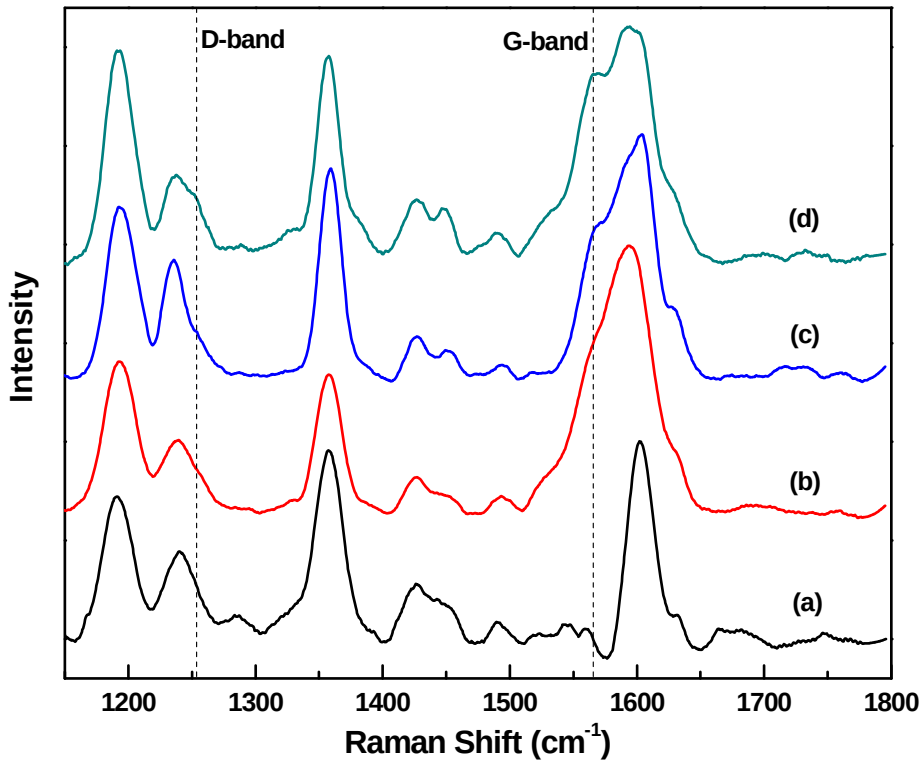


Figure S3. Raman spectra of (a) **I-1,** (b) **I-1**-20 wt %, (c) **I-1**-33 wt %, and (d) **I-1**-50 wt %.

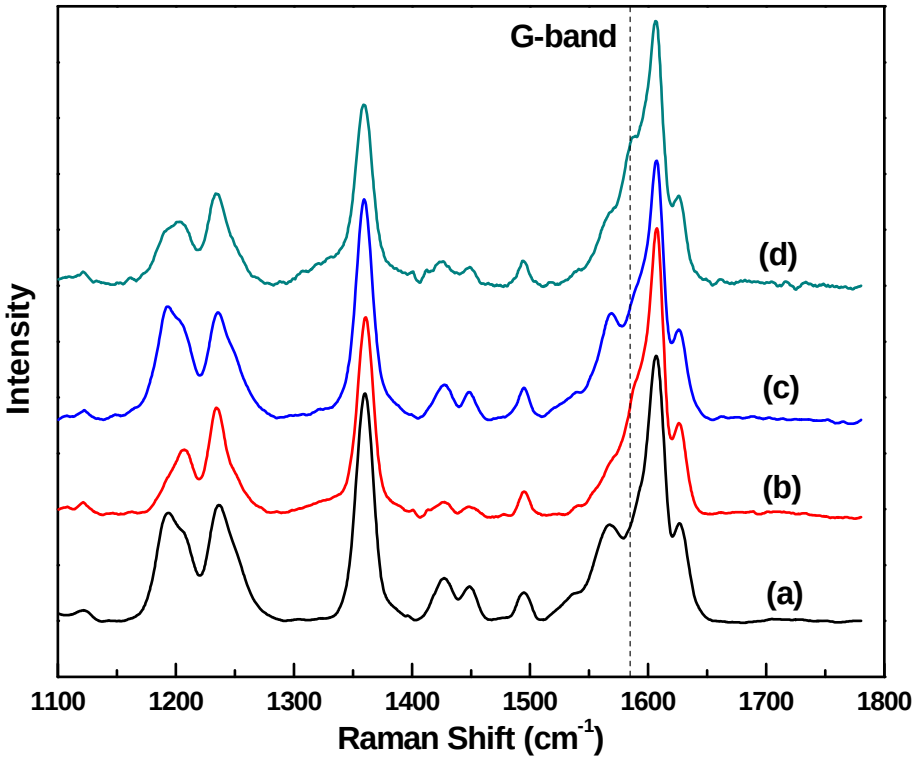


Figure S4. Raman spectra of (a) **I-2,** (b) **I-2**-20 wt %, (c) **I-2**-33 wt %, and (d) **I-2**-50 wt %.

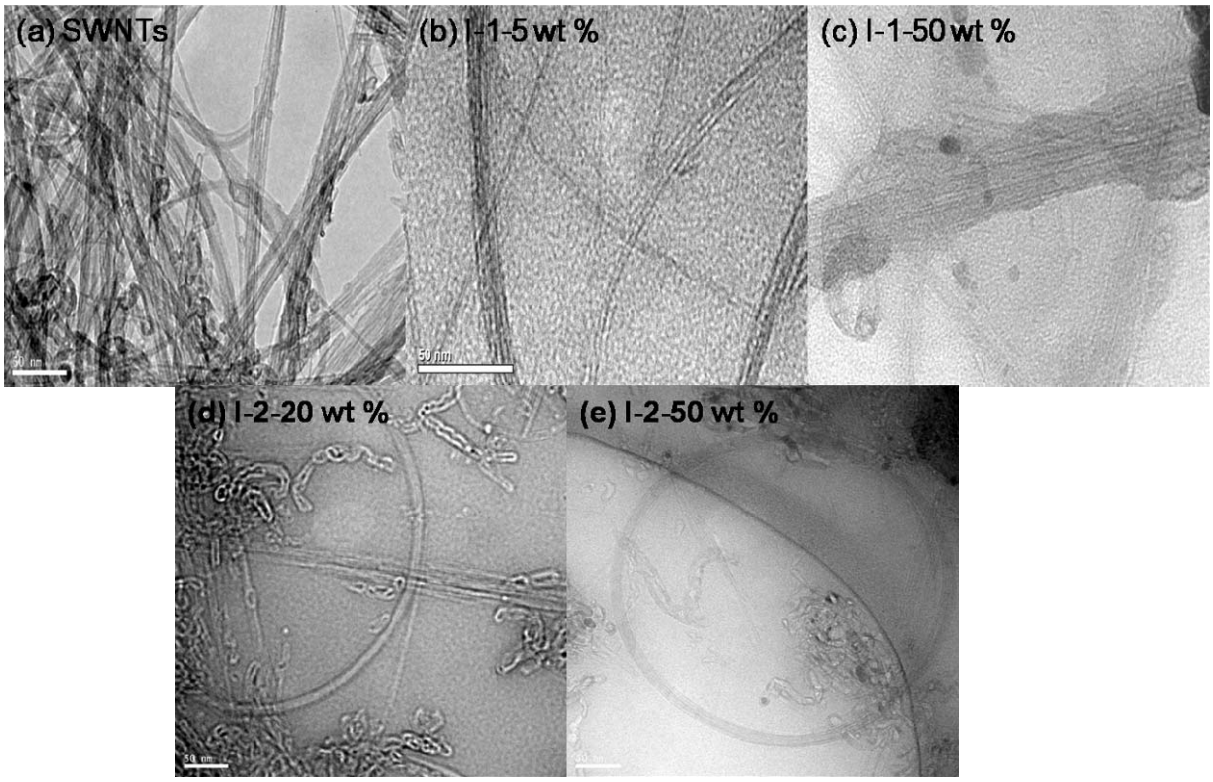


Figure S5. TEM images of (a) SWNTs, (b) **I-1**-20 wt %, (c) **I-1**-50 wt %, (d) **I-2**-20 wt % and (e) **I-2**-50 wt %.

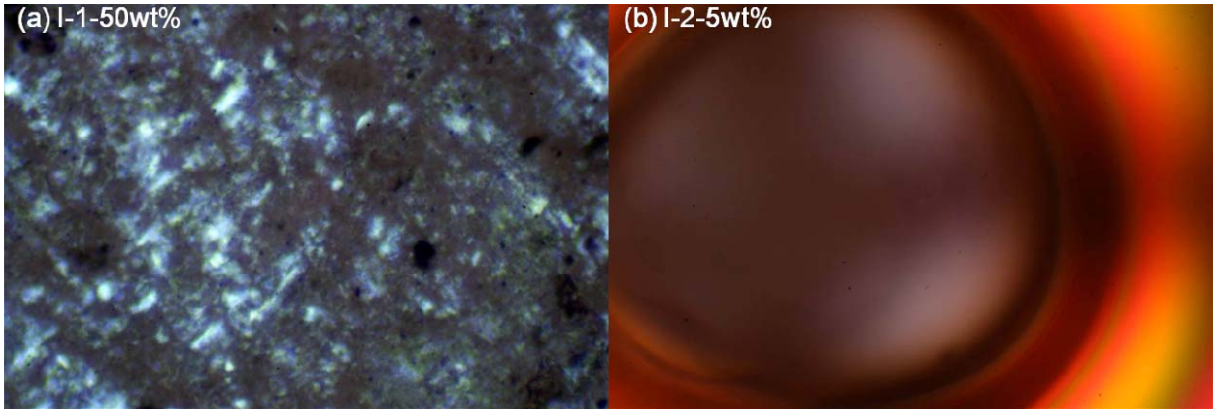


Figure S6. Photomicrographs of (a) **I-1**-50 wt %, and (b) **I-2**-5 wt % taken under crossed polarizers at room temperature exhibiting lyotropic solutions (magnification 400×).

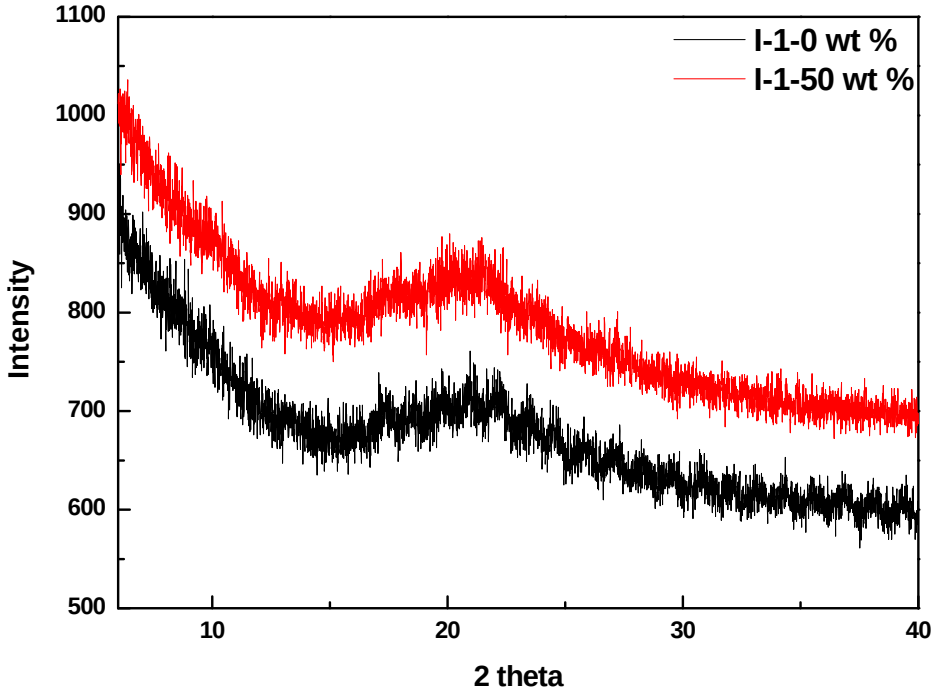


Figure S7. XRD plots of **I-1**-0 wt % and (b) **I-1**-50 wt % in 30 wt % DMSO taken at room temperature.

References

(1) Harris, F. W.; Chuang, K. C.; Huang, S. A. X.; Janimak, J. J.; Cheng, S. Z. D. *Polymer* **1994**, *35*, 4940–4948.

(2) Bhowmik, P. K.; Burchett, R. A.; Han, H.; Cebe, J. J. *Polymer* **2002**, *43*, 1953–1958.

(3) Bhowmik, P. K.; Burchett, R. A.; Han, H.; Cebe, J. J. *Macromolecules* **2001**, *34*, 7579–7581.