

Supplementary Information

Gradient composition distribution of poly(2,6-dimethylphenylene oxide)/polystyrene blend nanorods

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Determination of PPO content in PPO/PS blends by FTIR. To obtain a calibration for FTIR data of PPO/PS blends, PPO and PS powder blends with PPO content of 8.7%, 15.7%, 30.0%, 40.2%, 49.4%, 59.9%, and 69.5% respectively were each mixed with potassium bromide (KBr) powder in the agate mortar and pressed into a transparent disk for FTIR measurement. The PPO and PS are dispersed uniformly within KBr matrix. Each FTIR spectrum was collected at 2 cm⁻¹ resolution with 128 scans. We are interested in the bands at 990 and 880 cm⁻¹ (Figure S1) because the peak at 959 cm⁻¹ is caused by the in-plane CH wagging of PPO¹ and the peak at 906 cm⁻¹ is the characteristic of out-of-plane vibration of benzene ring of PS².

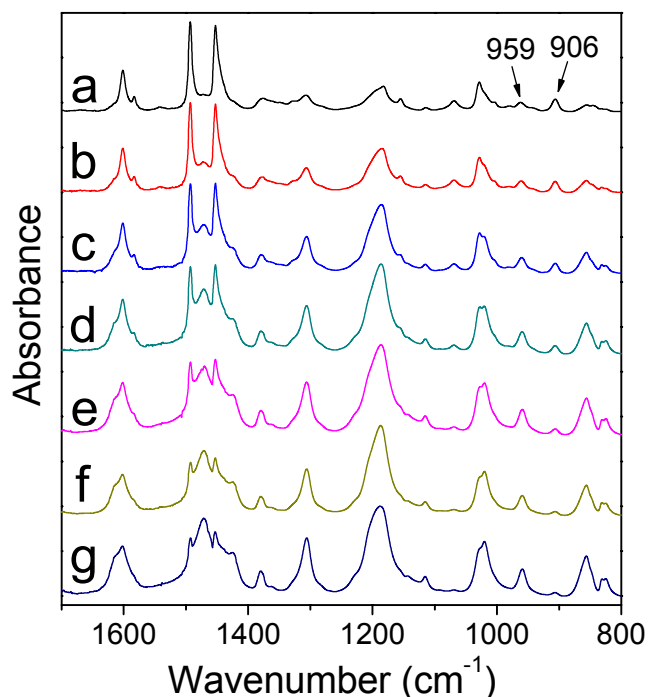


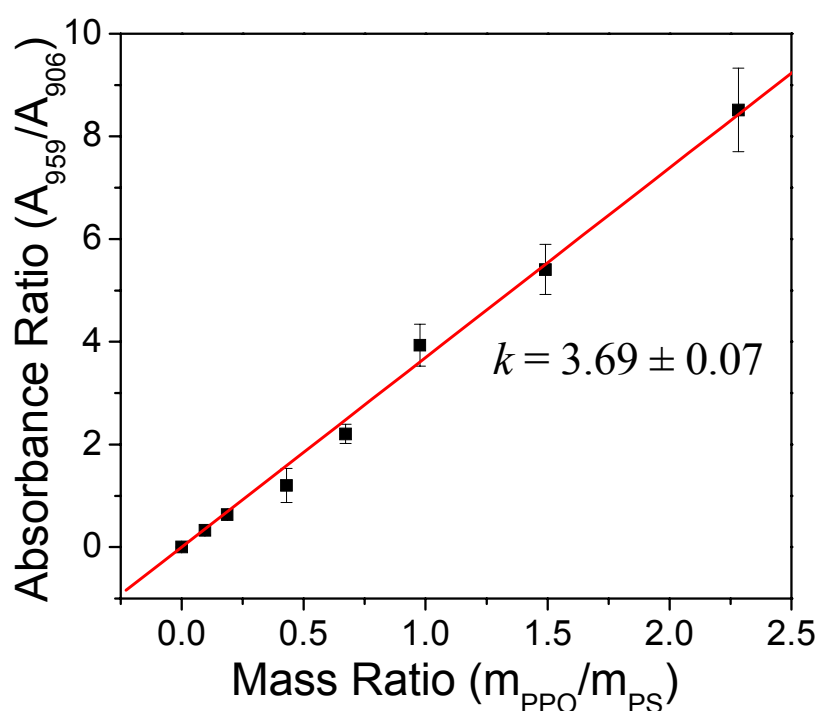
Fig. S1 (A) Infrared spectra of PPO/PS blends with known PPO content of: (a) 8.7%; (b) 15.7%; (c) 30.0%; (d) 40.2%; (e) 49.4%; (f) 59.9%; and (g) 69.5%.

According to Beer's law, the intensities of absorption bands are linearly proportional to the concentration of each component in a homogeneous mixture. Thus, the intensity ratio of peak at 959 cm⁻¹ (PPO) to peak at 906 cm⁻¹ (PS) is related to the concentration (mass) ratio because of the identical path length of source beam in the same mixed disk samples. Therefore, the intensity ratio of 959 to 906 cm⁻¹ band and the PPO content in PPO/PS blend films can be written by

$$\frac{A_{\text{PPO}}}{A_{\text{PS}}} = \frac{a_{\text{PPO}} b_{\text{PPO}} c_{\text{PPO}}}{a_{\text{PS}} b_{\text{PS}} c_{\text{PS}}} = \frac{a_{\text{PPO}}}{a_{\text{PS}}} \cdot \frac{m_{\text{PPO}}}{m_{\text{PS}}} = k \frac{m_{\text{PPO}}}{m_{\text{PS}}} \quad (1)$$

$$C_{\text{PPO}} = \frac{m_{\text{PPO}}}{m_{\text{PPO}} + m_{\text{PS}}} = \frac{A_{\text{PPO}}}{A_{\text{PPO}} + k A_{\text{PS}}} \quad (2)$$

1 where A_{PPO} and A_{PS} are the intensity (band area) of PPO at 959 cm^{-1} and PS at 906 cm^{-1} (Looks
2 for the highest intensity in the wavenumber range and for the minima left and right from this
3 maximum. The baseline in this region is then defined by the local minima to obtain the band
4 area under the FTIR curve.), m_{PPO} and m_{PS} are the mass of PPO and PS in the blends, k is the
5 ratio of absorptive coefficients of $a_{\text{PPO}}/a_{\text{PS}}$, C_{PPO} is the content of PPO components in the
6 PPO/PS blends.



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8 **Fig. S2** Calibration curve of the ratio of the absorbances of peak at 959 cm^{-1} to peak at 906
9 cm^{-1} in PPO/PS blends.

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11 On the basis of various known compositions of the PPO/PS blends, the calibration curve can
12 be obtained by the specified frequency at 959 and 906 cm^{-1} . The calibration curves of PPO/PS
13 blends in Figure S2 which was fitted using linear regression, yields the k value of 3.69 ± 0.07 .

Therefore, using the absorbance measurements of 959 and 906 cm^{-1} in the FTIR spectra, the following relationship is obtained to calculate the absolute PPO content in PPO/PS blend nanorods/film

$$C_{\text{PPO}} = \frac{A_{959}}{A_{959} + 3.69 A_{906}} \quad (3)$$

$$C_{\text{PS}} = 100\% - C_{\text{PPO}} \quad (4)$$

where C_{PPO} and C_{PS} represent the content of PPO and PS in the PPO/PS blends, A_{959} and A_{906} are the respective band area for peaks at 959 and 906 cm^{-1} , 3.69 is the ratio of absorptive coefficients of the peak at 959 cm^{-1} to the peak at 906 cm^{-1} .

References

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2. C. Y. Liang and S. Krimm, *J. Polym. Sci.*, 1958, **27**, 241.