Supplementary Material (ESI) for Chemical Communications

Supporting information

Solvent-Assisted, Accelerated Photobleaching, and Fluorescence Recovery of Conjugated Polymer Film

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Experimental Methods

1) Materials:

The PTMSDPA was donated from NOF Co. Ltd., Japan and used as received. The synthetic method was well described in previous papers (ref. 9 in the paper). The polymer used in this study has high weight-average molecular weights (M_w) of 5.23×10^6 and polydispersity index ($PDI = M_w/M_n$) of 3.2. The MEH-PPV (M_w: $1.5\sim2.5 \times 10^5$; *PDI*: 5.0) was purchased from Sigma-Aldrich and used as received. The all alcohols, hexane, 1,4-dioxane, and acrylonitrile used in this study were purchased as spectrophotometric grade with purity over 99% from Sigma-Aldrich or TCI.

2) Preparation of thin polymer film:

PTMSDPA polymer was dissolved in toluene (concentration 1.0 wt%) to prepare thin films on glass slides (Matsunami) with thickness of 500 nm by using spin-casting method (Mikasa 1H-D7 spin coater, 800 rpm).

3) Photobleaching:

The 500-nm-thick PTMSDPA films prepared by spin-casting method were used for photobleaching. The polymer films were swollen by immersing them in various solvents. The pristine or swelled films were exposed to 365-nm UV light condensed by

an object lens from a super-high-pressure 100-W Hg lamp (OSRAM, HBO103W/2). The irradiation power was controlled using several neutral-density (ND) filters and was monitored by UV-light meter (Lutron, YK-34UV).

4) Measurements:

The weight-average molecular weight (M_w) and number-average molecular weight (M_n) of PTMSDPA were evaluated using gel permeation chromatography (GPC, Shimadzu A10 instruments, Polymer Laboratories, PLgel Mixed-B (300 mm in length) as a column, and HPLC-grade tetrahydrofuran as eluent at 40 °C), based on a calibration with polystyrene standards. The time-resolved fluorescence emission spectra and the integral fluorescence intensity of PTMSDPA films were recorded with excitation wavelength of 365 nm at a scanning rate of 10 dots/sec at room temperature using Ocean Optics HR4000 UV-NIR high-resolution spectrofluorometer attached to a Nikon Eclipse E400 fluorescence microscope equipped with the super-high-pressure 100-W Hg lamp (OSRAM, HBO103W/2). The fluorescence intensities of the PTMSDPA film were collected at 520 nm. Fluorescence emission spectra of PTMSDPA were recorded on *JASCO* ETC-273 spectrofluorometer with excitation wavelength of 420 nm at a scanning rate of 500 nm/min at room temperature (excitation light source: Xenon lamp; excitation light power: 1.73 μW/cm^2). The FT-IR spectra were recorded on *JASCO* 620 spectrometer. The electrochemical study of PTMSDPA film was performed using by AC-2 photoelectron spectroscopy (Hitachi High Tech, Japan).

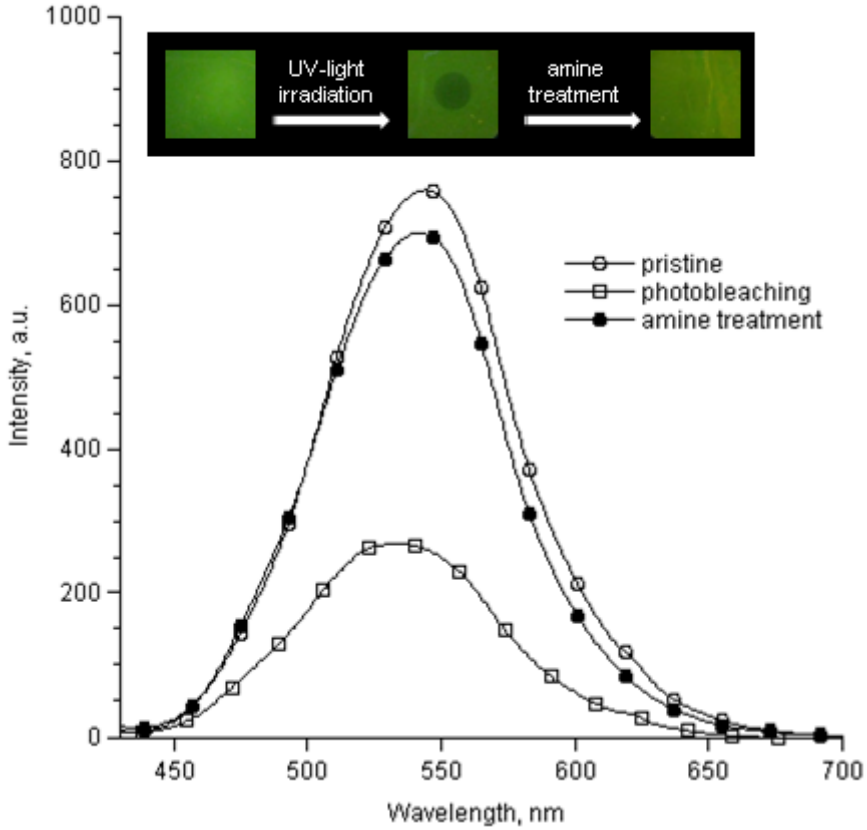

Figure S1. FL emission spectra of PTMSDPA film (film thickness ≈ 500 nm; excited at 420 nm). (○) in pristine film; (□) after UV light irradiation with a power of 1.73 mW/cm^2 at a swollen state in methanol and subsequent drying in air; (●) after contacting to triethylamine liquid and subsequent drying. Inset: digital photographs (the dark circle in the film is FL-quenched part; excited at 365 nm)