## **Supporting Information**

## Co-assembly of Functionalized Donor-Acceptor Molecules within the Block Copolymer Microdomains via Supramolecular Assembly Approach with Improved Charge Carrier Mobility

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The fluorescence lifetime plots were generated by the time-correlated single photon counting (TCSPC) technique. Samples were excited with a model N-415 nm with the peak wavelength of 415  $\pm$  10 nm and pulse width of nano LED = <1.2 ns at the typical power of 8 pJ/pulse duration with a repetition rate of 1 MHz. The lifetime values were estimated using deconvolution of the response function with bi-exponential and tri-exponential decay using DAS6 decay analysis software. The aspect of the fit has been evaluated using the fitting parameters such as  $\chi^2$  (~1.0) as well as the visual inspection of the residuals. Fluorescence lifetime of PS-b-P4VP(PBA)<sub>0.5</sub> and PS-b-P4VP(PBA+FNDI) were measured by exciting at 330 nm and probed at 460 nm. It is found that there is decrease of fluorescence lifetime in PS-b-P4VP(PBA+FNDI) (8.48 ns) compared to the PS-b-P4VP(PBA)<sub>0.5</sub> (14.79 ns).



**Figure:** The fluorescence lifetime plot of block copolymer supramolecular assemblies in the solid-sate.

	Fluorescence			
Sample	lifetime	A, %	$\tau_{avg}$ , ns	$\chi^2$
	$(\boldsymbol{\tau}_{\mathrm{f}},\mathrm{ns})$		C	
PS-b-P4VP(PBA) <sub>0.5</sub>	$\tau_1 = 82.66$	48.51	14.79	1.2
	$\tau_2 = 8.34$	51.49		
PS-b-P4VP(PBA+FNDI)	$\tau_1 = 144.97$	25.17	8.48	1.07
	$\tau_2 = 6.44$	74.83		

**Table 1:** Fluorescence life time-decay of block copolymer supramolecular assemblies in the solid-state.