

*Supporting Information*

## **Synthesis, Structures, and Electrochromic Behaviors of Poly(triarylamine)s base on 3-substituted Thiophene Derivatives**

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Table S1. Optical and electrochemical data collected for coloration efficiency measurements of P3PAT and P3PTT

Cycling times <sup>a</sup>	$\delta OD_{780}^b$ P3PAT	$\delta OD_{350}^b$ P3PAT	$\delta OD_{512}^b$ P3PTT	$\delta OD_{780}^b$ P3PTT	Q(mC/cm <sup>2</sup> ) <sup>c</sup> P3PAT	Q(mC/cm <sup>2</sup> ) <sup>c</sup> P3PTT	$\eta$ (cm <sup>2</sup> /C) <sup>d</sup> P3PAT	$\eta$ (cm <sup>2</sup> /C) <sup>d</sup> P3PTT	decay(%) <sup>e</sup> P3PAT	decay(%) <sup>e</sup> P3PTT
5	0.220	0.066	0.149	0.080	1.095	1.053	201	142	0	0
10	0.220	0.063	0.133	0.082	1.095	0.988	201	135	0	4.93
15	0.225	0.061	0.130	0.080	1.119	0.983	201	132	0	7.05
20	0.225	0.058	0.130	0.079	1.119	0.981	201	132	0	7.05
25	0.218	0.058	0.128	0.078	1.118	0.969	195	132	2.99	7.05
30	0.215	0.056	0.127	0.078	1.114	0.962	193	132	3.99	7.05
35	0.208	0.054	0.127	0.077	1.095	0.960	190	132	5.47	7.05
40	0.197	0.053	0.125	0.076	1.042	0.951	189	131	5.47	7.75
45	0.183	0.052	0.123	0.075	0.984	0.937	186	131	7.46	7.75
50	0.165	0.051	0.122	0.074	0.932	0.931	177	131	9.95	7.75

<sup>a</sup> Switching between 0 and 1.35 V for P3PAT, 0 and 1.00 V for P3PTT (V vs Ag/AgCl).

<sup>b</sup> Optical density change at the given wavelength.

<sup>c</sup> Ejected charge, determined from the in situ experiments.

<sup>d</sup> Coloration efficiency is derived from the equation  $\eta = \delta OD/Q$ .

<sup>e</sup> Decay of coloration efficiency after cyclic scans.

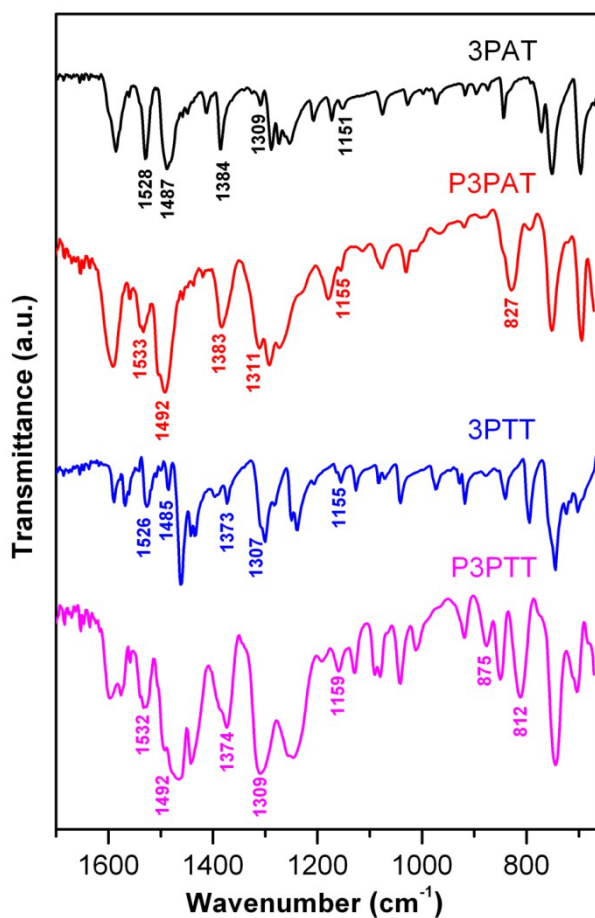


Figure S1. FTIR spectra of 3PAT, P3PAT, 3PTT and P3PTT.

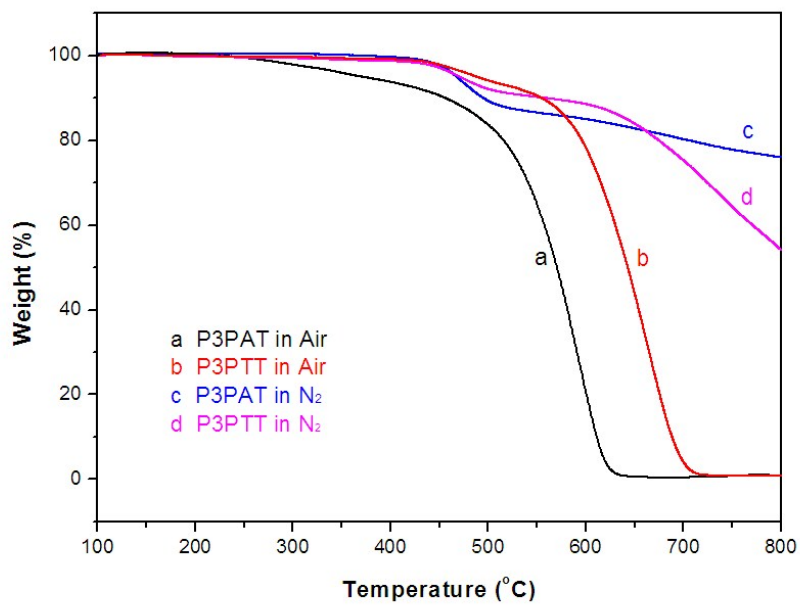


Figure S2. TGA curves of P3PAT and P3PTT.

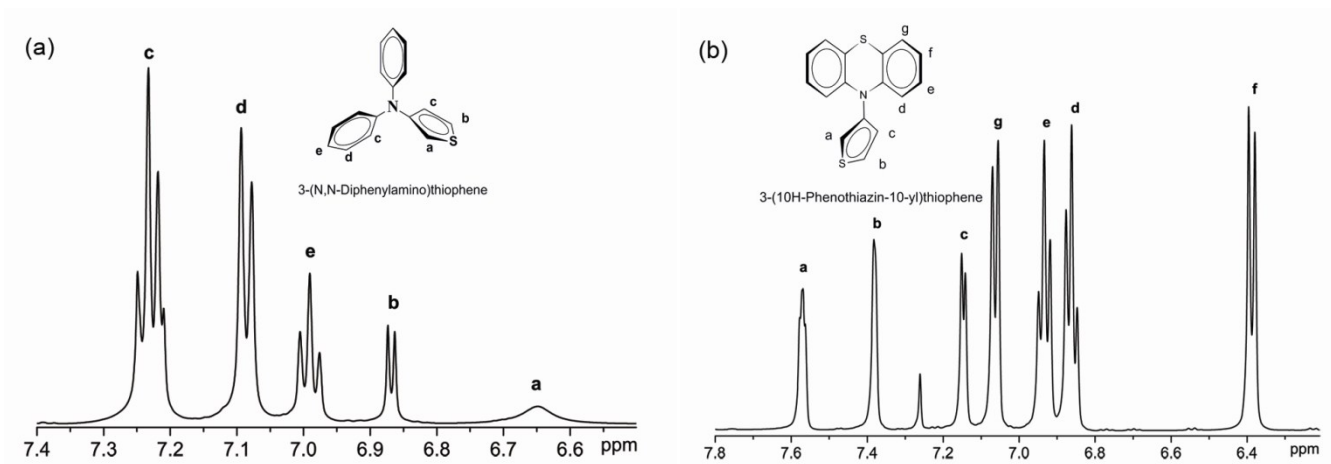


Figure S3. <sup>1</sup>H NMR spectrum of (a) 3PAT and (b) 3PTT in CDCl<sub>3</sub>.