Supporting Information

Synthesis and characterization of novel donor-acceptor type electrochromic polymers containing diketopyrrolopyrrole as acceptor and propylenedioxythiophene or indacenodithiophene as donor

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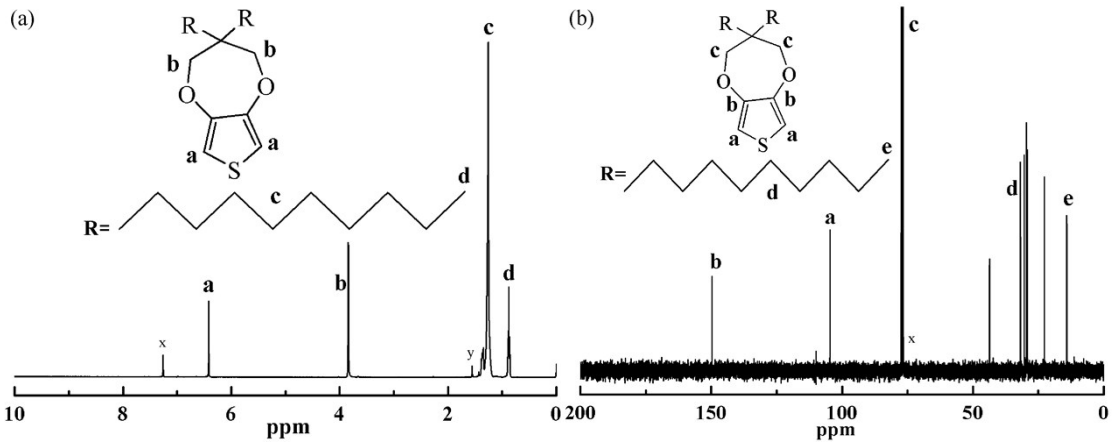


Fig. S1. ^{1}H NMR spectrum of 3,3-Bis-decyl-3,4-dihydro-2H-thieno[3,4-b][1,4]dioxepine (a), $CDCl_3$ Solvent peak and water speak were marked by 'x', 'y' respectively, ^{13}C NMR spectrum of 3,3-Bis-decyl-3,4-dihydro-2H-thieno[3,4-b][1,4]dioxepine (b), $CDCl_3$ Solvent peak were marked by 'x'.

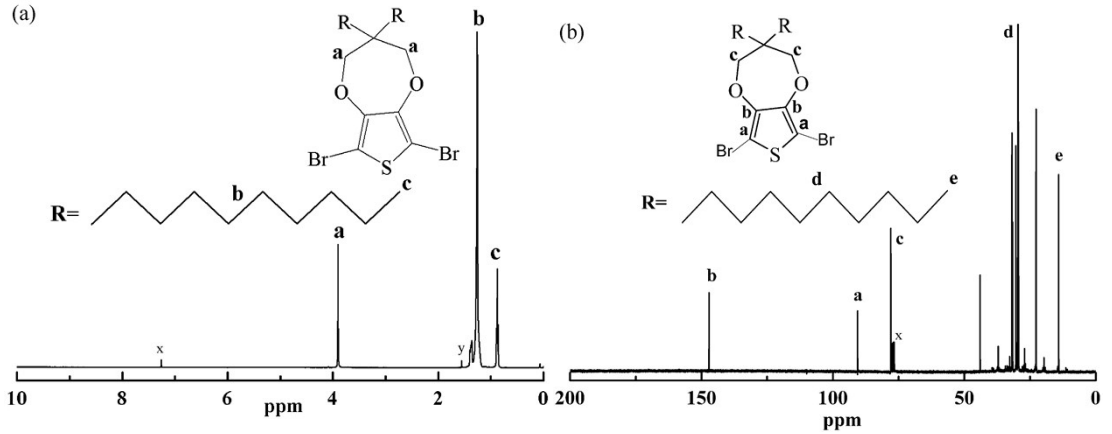


Fig. S2. ^{1}H NMR spectrum of 6,8-Dibromo-3,3-bis-decyl-3,4-dihydro-2H-thieno[3,4-b][1,4]dioxepine (a), $CDCl_3$ Solvent peak and water speak were marked by 'x', 'y' respectively, ^{13}C NMR spectrum of 6,8-Dibromo-3,3-bis-decyl-3,4-dihydro-2H-thieno[3,4-b][1,4]dioxepine (b), $CDCl_3$ Solvent peak were marked by 'x'.

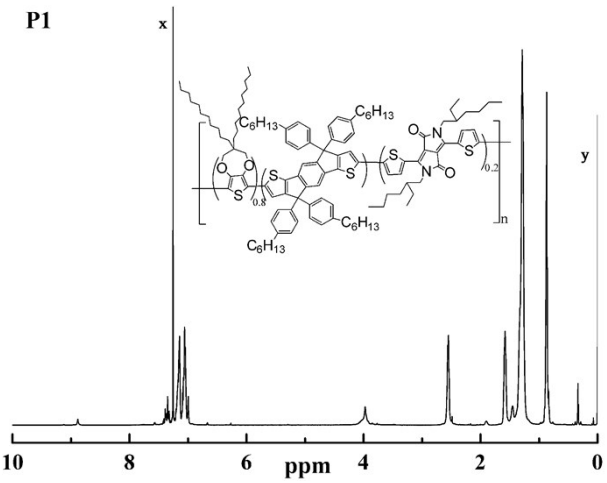


Fig. S3. ^{1}H NMR spectrum of **P1,** $CHCl_3$ Solvent and tetramethylsilane peaks were marked by ‘x’, ‘y’, respectively.

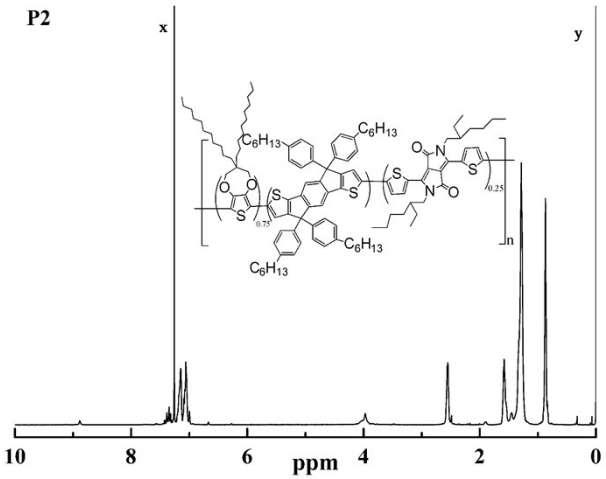


Fig. S4. ^{1}H NMR spectrum of **P2,** $CHCl_3$ Solvent and tetramethylsilane peaks were marked by ‘x’, ‘y’, respectively.

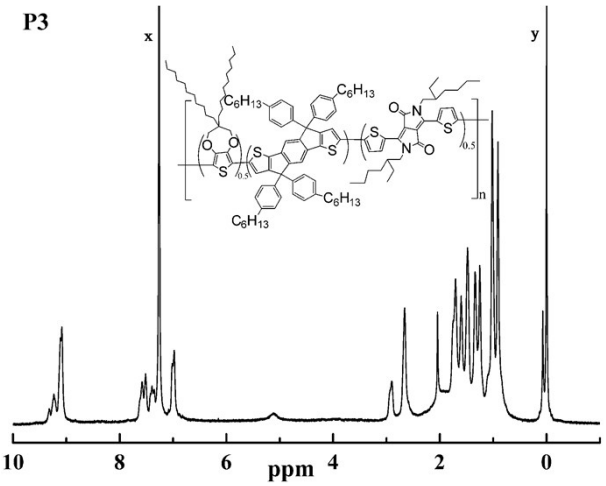


Fig. S5. ^{1}H NMR spectrum of **P3,** $CHCl_3$ Solvent and tetramethylsilane peaks were marked by ‘x’, ‘y’, respectively.

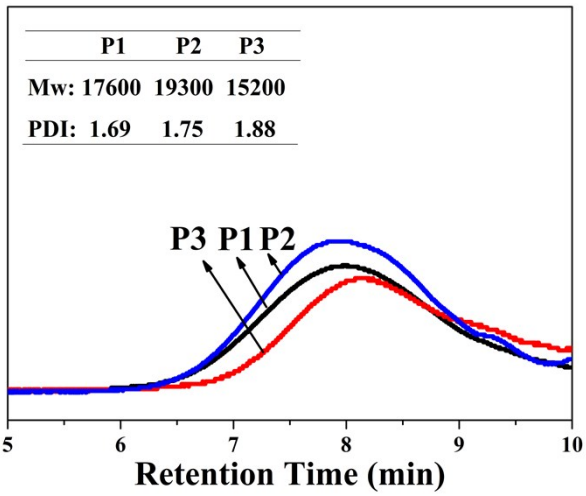
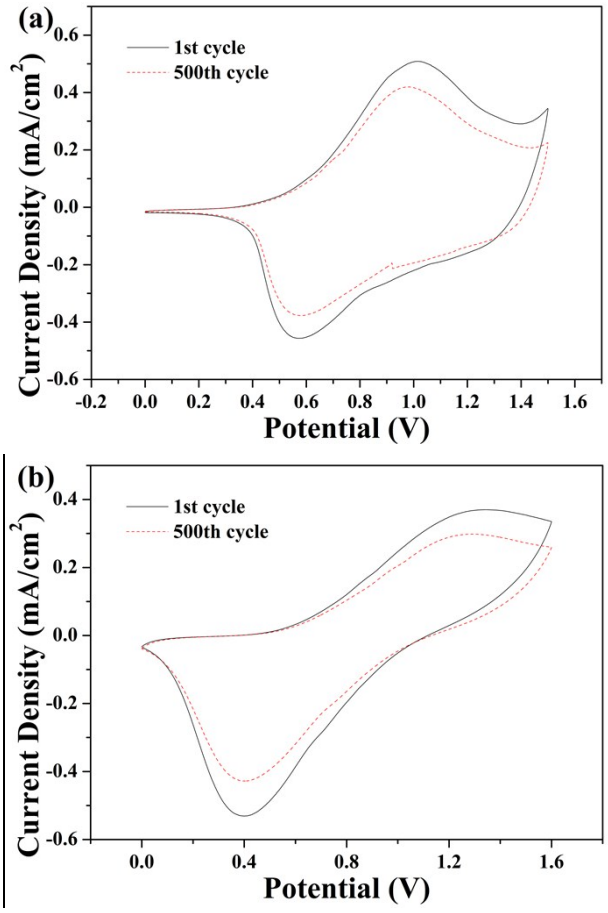


Fig. S6 GPC trace of the polymers **P1**, **P2** and **P3**.



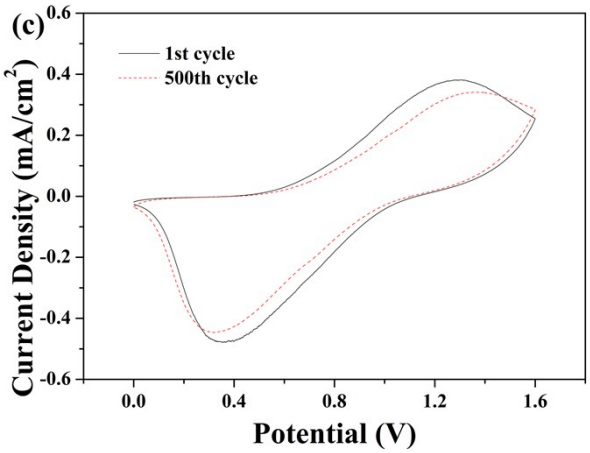


Fig. S7 CVs of the polymers **P1** (a), **P2** (b) and **P3** (c).

After 500 cycles, these polymers could retain 84%, 82% and 87% of their original electroactivity for P1, P2 and P3, respectively.

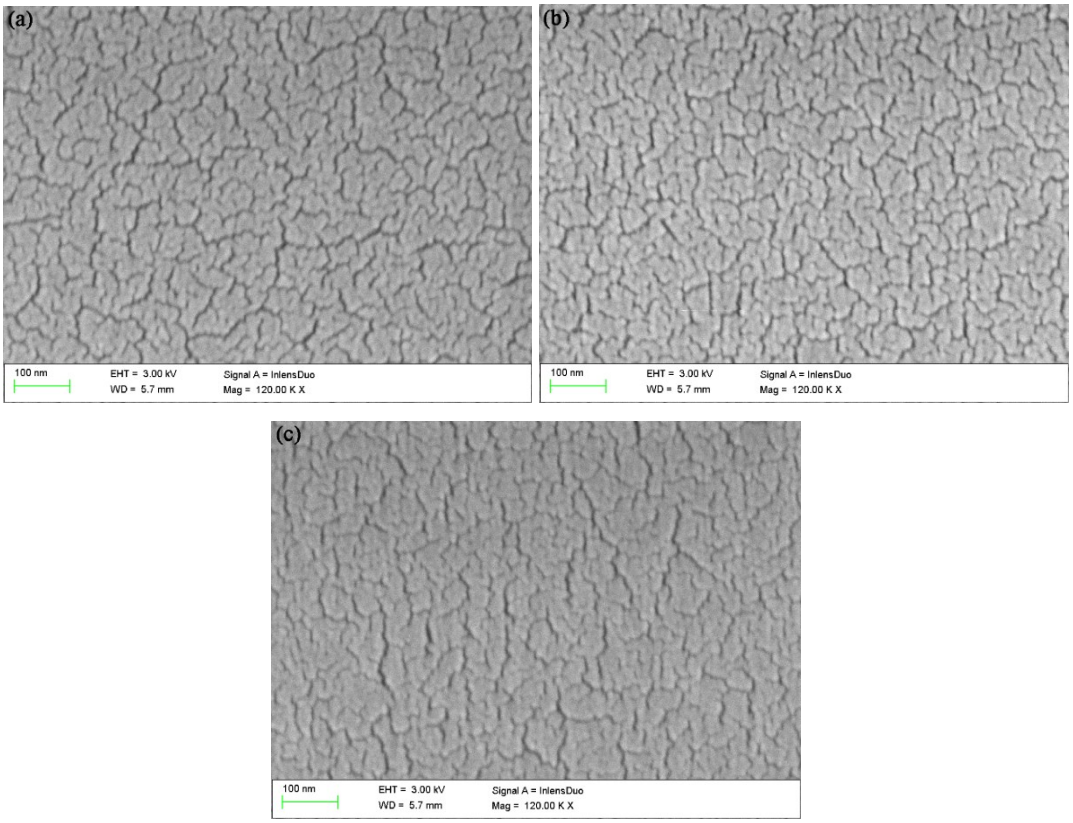


Fig. S8. SEM images of polymeric films **P1** (a), **P2** (b) and **P3** (c).

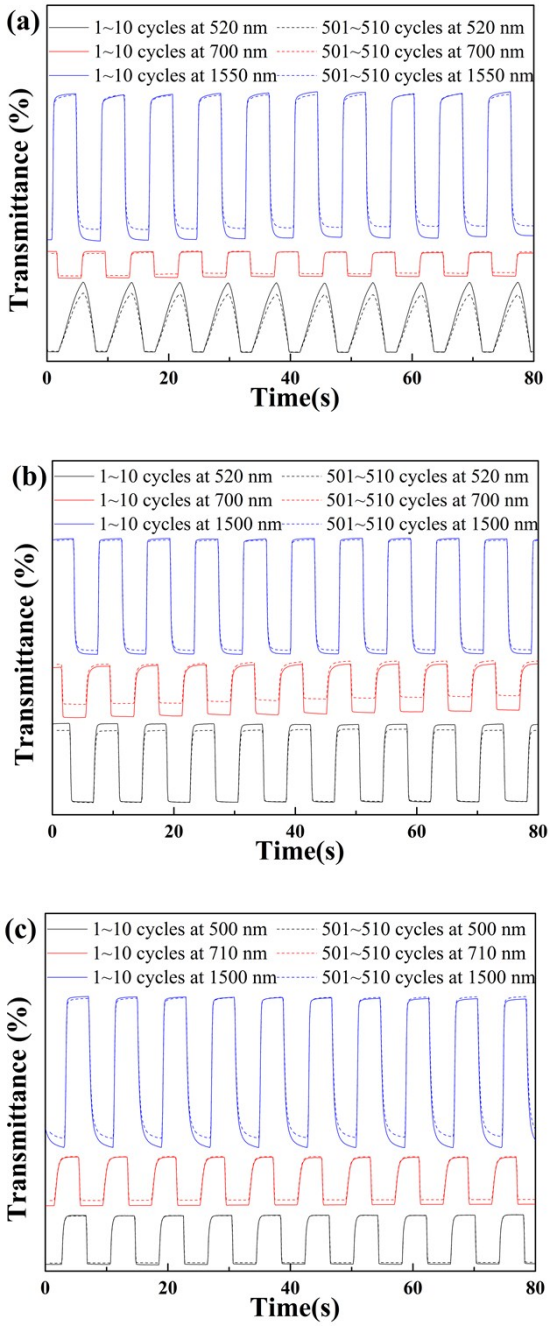


Fig. S9 Optical transmittance change of **P1**(a), **P2**(b), **P3**(c) at different wavelengths and cycle numbers.

After 500 cycles, for **P1** film, the optical contrast remained 87% at 520 nm, 88% at 700 nm and 92% at 1550 nm, respectively. For **P2** film, the optical contrast remained 91% at 520 nm, 78% at 700 nm and 95% at 1500 nm after 500 cycles, respectively. While for **P3** film, the optical contrast remained 96% at 500 nm, 91% at 710 nm and 93% at 1500 nm after 500 cycles, respectively.

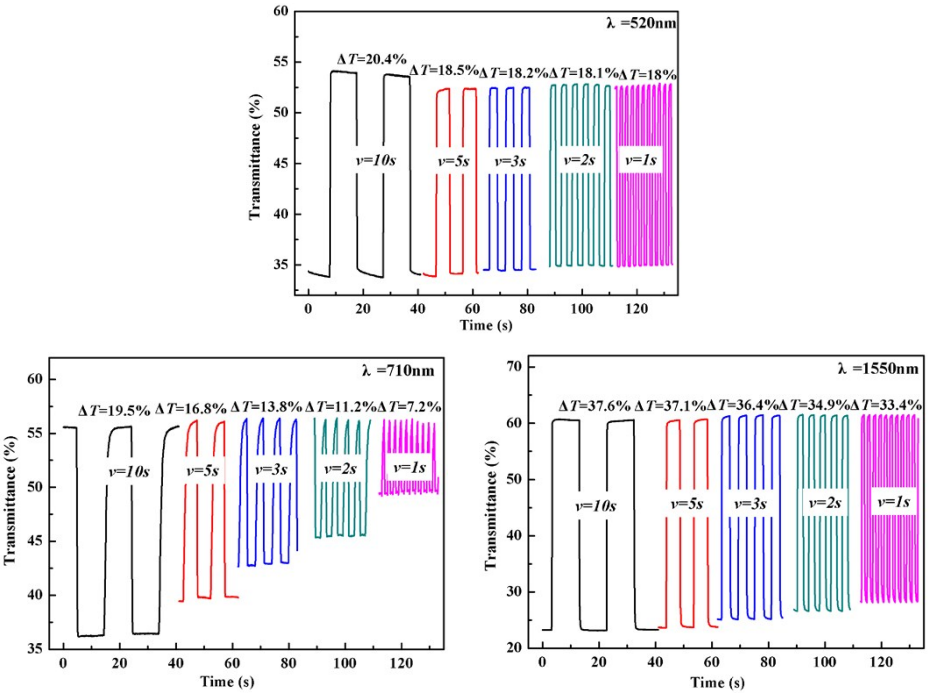


Fig. S10. Electrochromic switching of **P2** at 520 nm, 710 nm and 1550 nm with an interval of 10 s, 5 s, 3 s, 2 s, 1s, respectively.

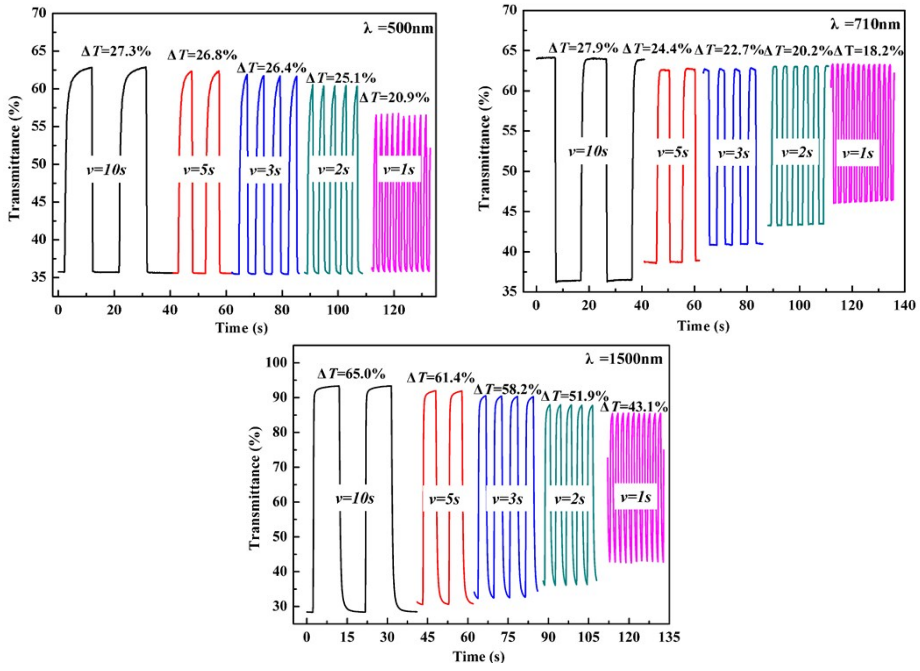


Fig. S11. Electrochromic switching of **P3** at 500 nm, 710 nm and 1550 nm with an interval of 10 s, 5 s, 3 s, 2 s, 1s, respectively.