Electronic Supplementary Information

# Vis-to-NIR electrochromism and bright-to-dark electrofluorochromism in a triazine and thiophene based three-dimensional covalent polymer

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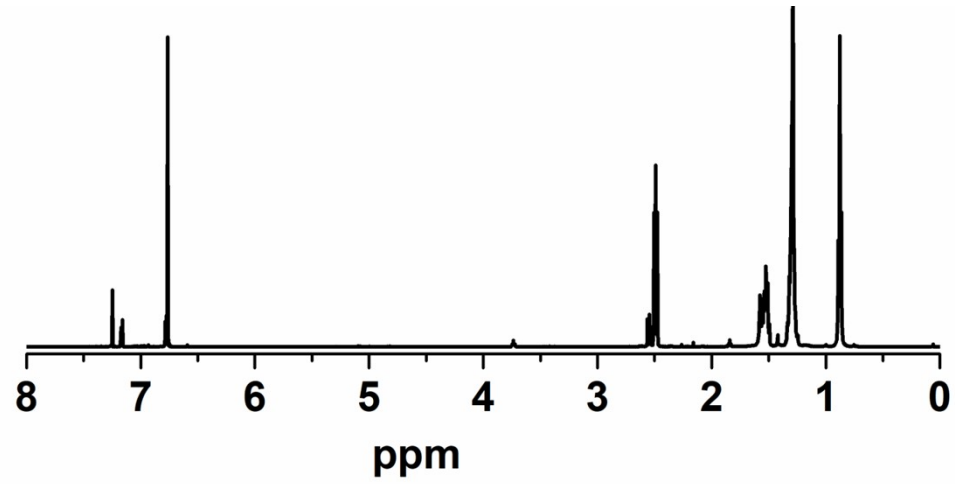



**Fig. S1.** $^{1}$H NMR spectra of 2,5-dibromo-3-hexyl thiophene (7)

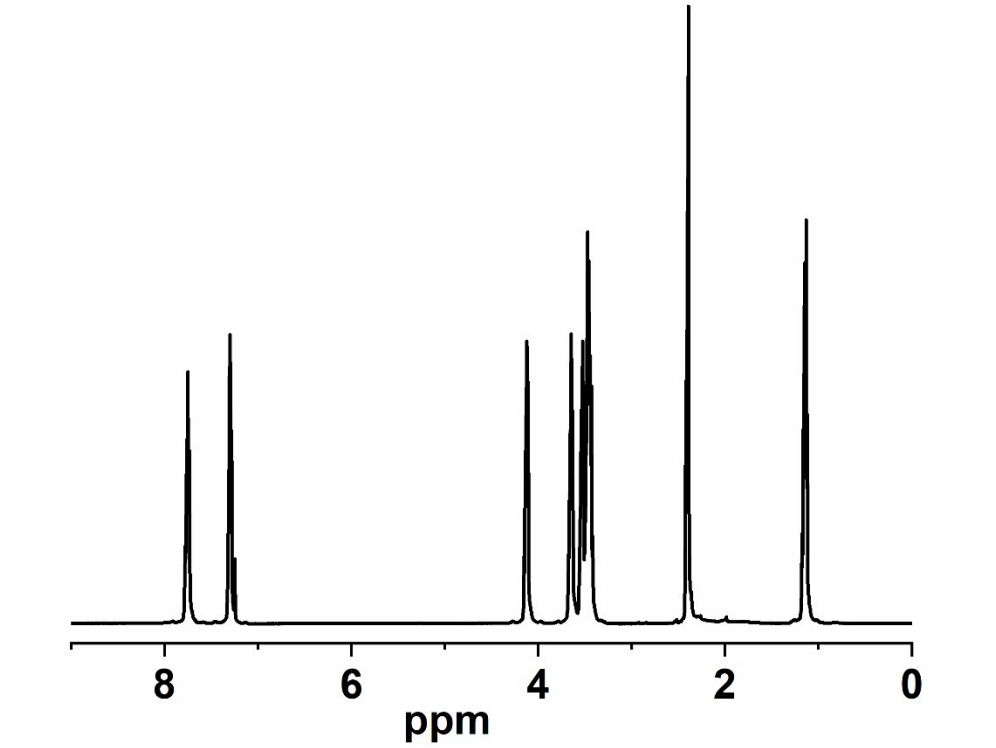



**Fig. S2.** $^{1}$H NMR spectra of 2-(2-ethoxyethoxy)ethyl 4-methylbenzenesulfonate (2).

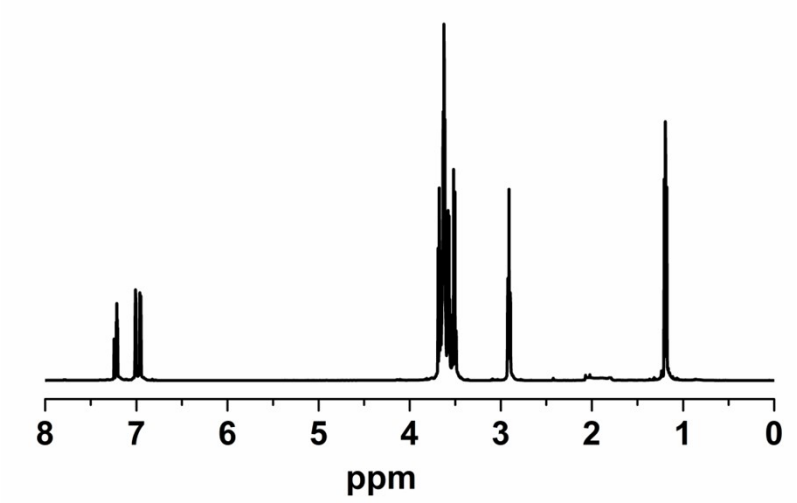



**Fig. S3.** $^{1}$H NMR spectra of 3-(2-(2-(2-ethoxyethoxy)ethoxy)ethyl)thiophene (4).

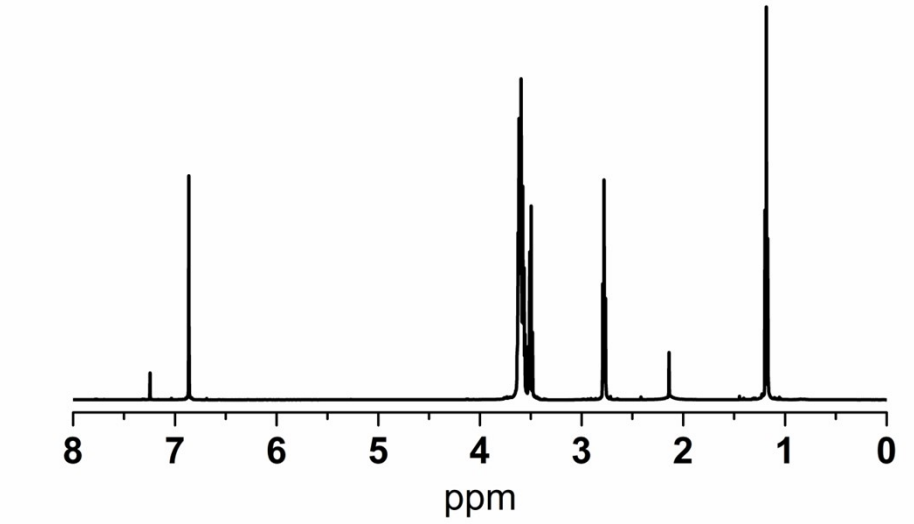



**Fig. S4.** $^{1}$H NMR spectra of 2,5-dibromo-3-(2-(2-(2-ethoxyethoxy)ethoxy)ethyl)thiophene (5).

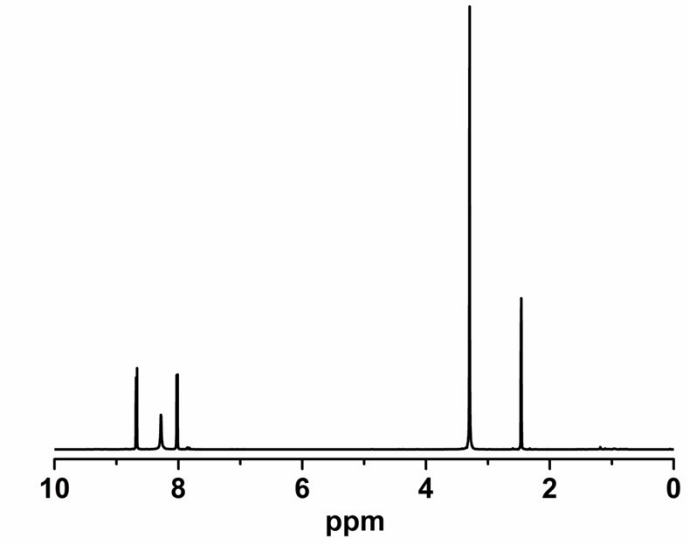


**Fig. S5.** [1]H NMR spectra of((1,3,5-triazine-2,4,6-triyl)tris(benzene-4,1-diyl))triboronic acid (9)

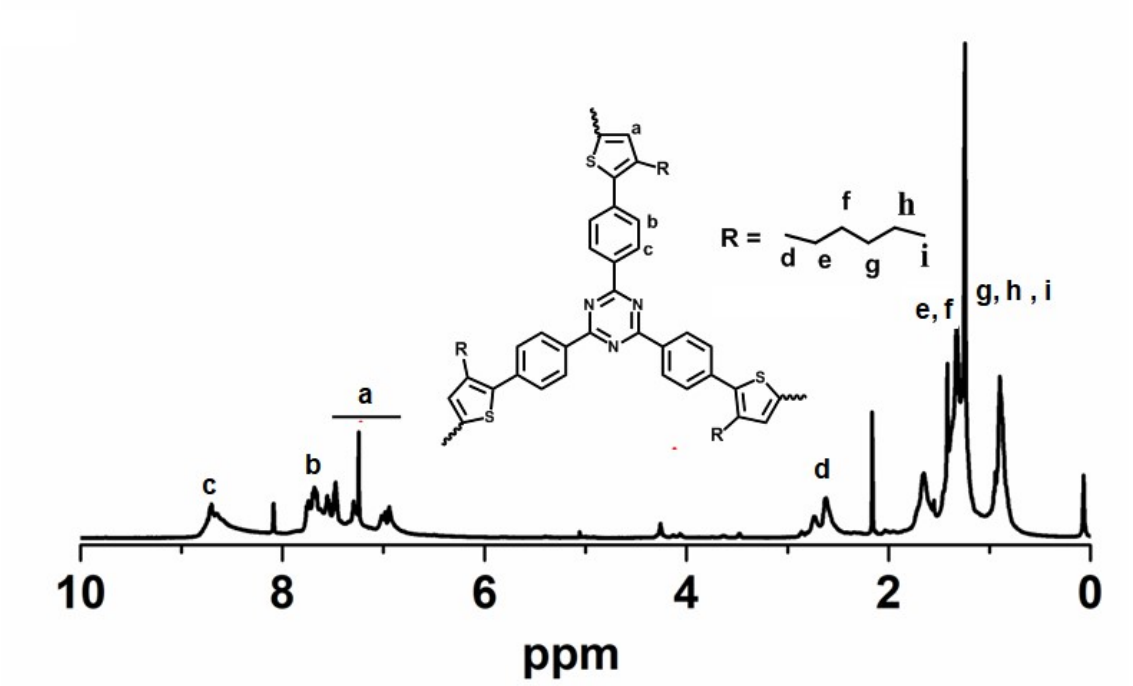



**Fig. S6.** [1]H NMR spectra of polymer CPF1 with peak assigned

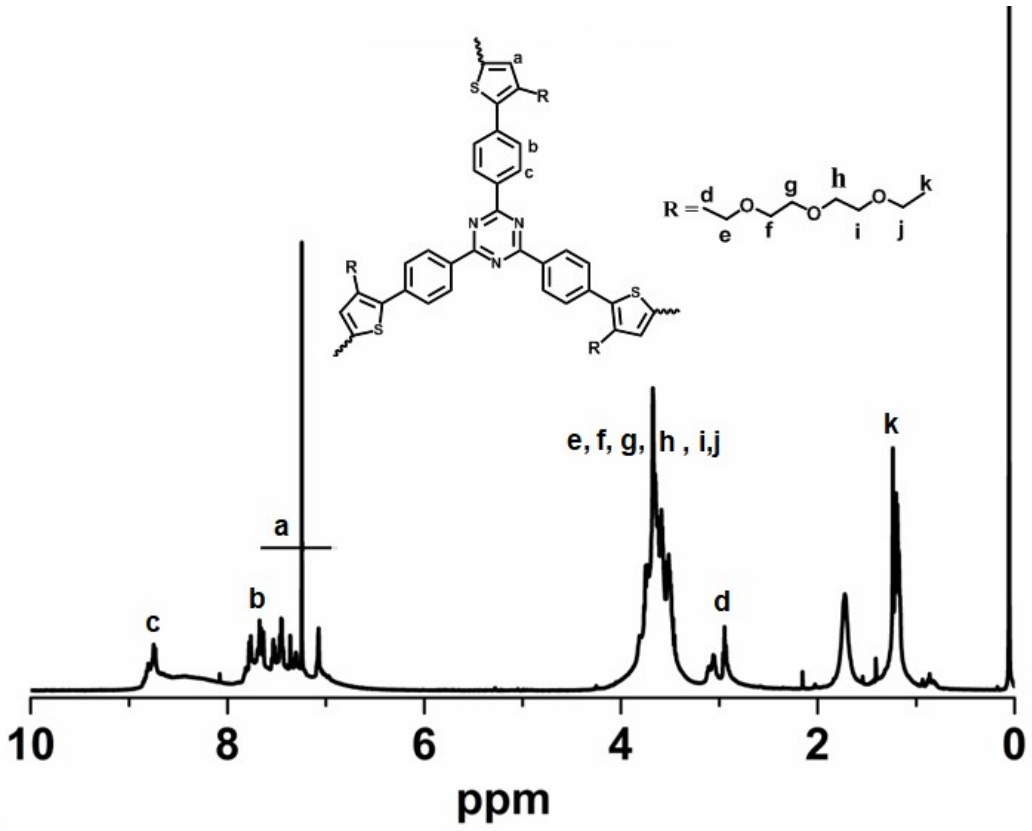



**Fig. S7.** $^{1}$H NMR spectra of polymer CPF2 with peak assigned.

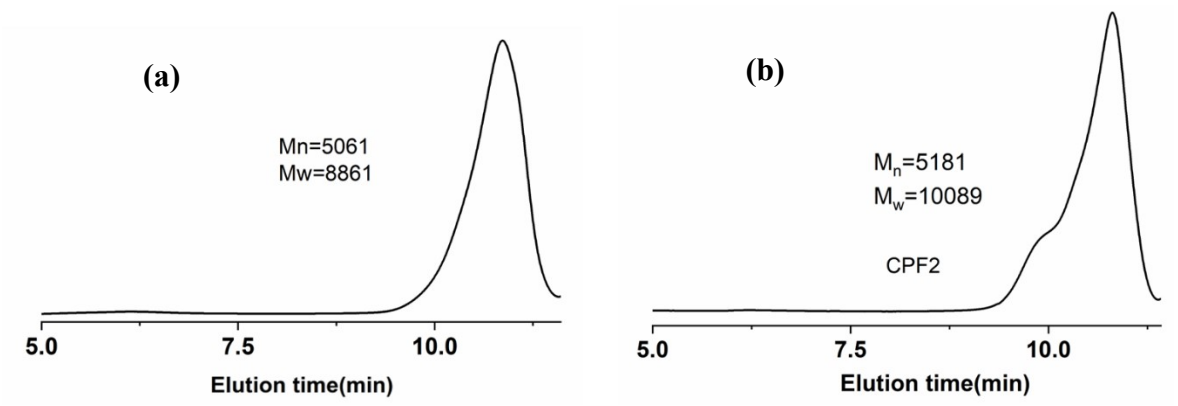



**Fig. S8.** GPC traces for the (a) CPF1 and (b) CPF2.

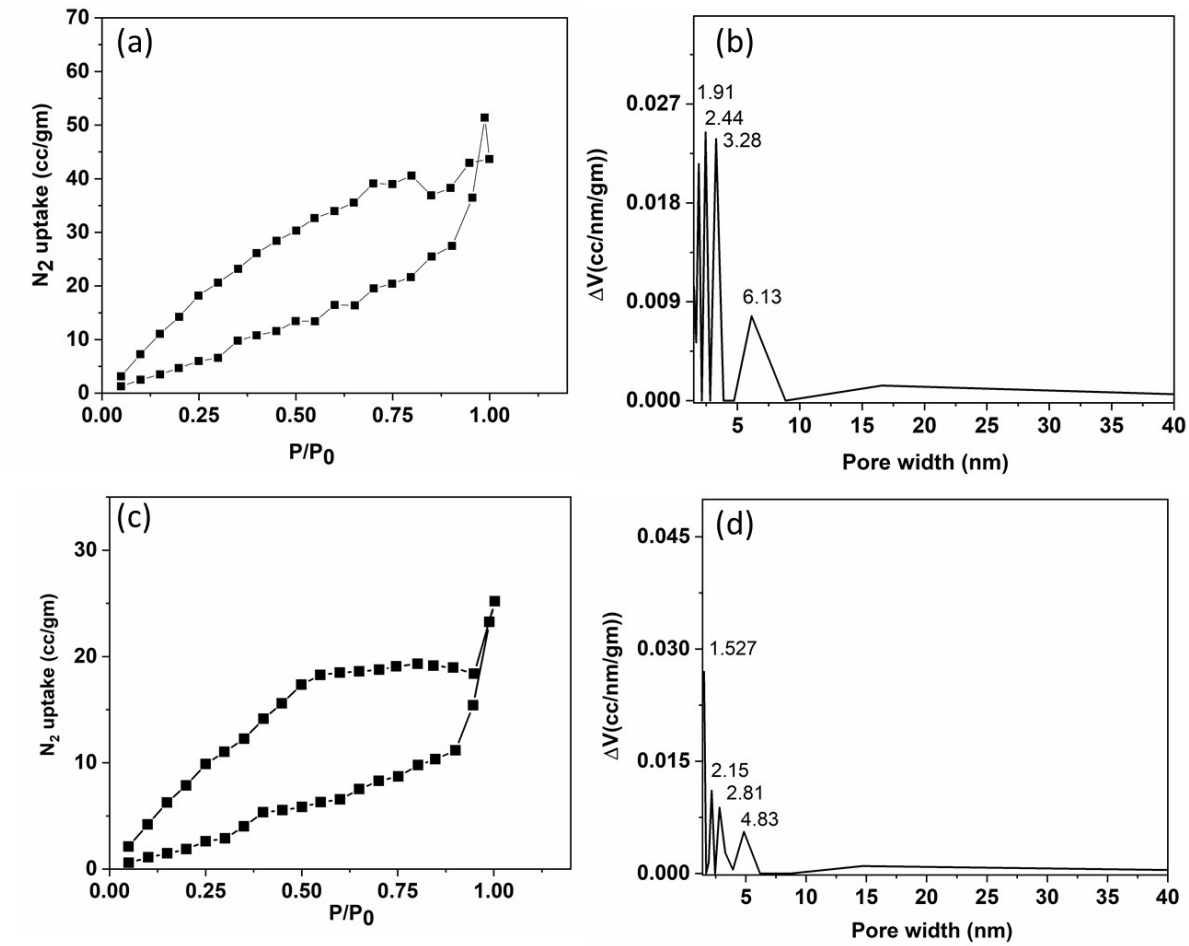



**Fig. S9.** (a) and (c) Nitrogen sorption isotherms of CPF1 and CPF2 measured at 77 K. (b) and (d) the pore size distribution of CPF1 and CPF2, respectively.

**Summary of BET Data**

**CPF1**
(i) BET summary
Surface Area = 34.68 m²/g
(ii) BJH adsorption summary
Surface Area = 29.49 m²/g
Pore Volume = 0.072 cc/g
Pore Radius Dv(r) = 24.467 Å

**CPF2**
(i) BET summary
Surface Area = 15.54 m²/g
(ii) BJH adsorption summary
Surface Area = 16.71 m²/g
Pore Volume = 0.042 cc/g
Pore Radius Dv(r) = 15.272 Å

**Band gap study**

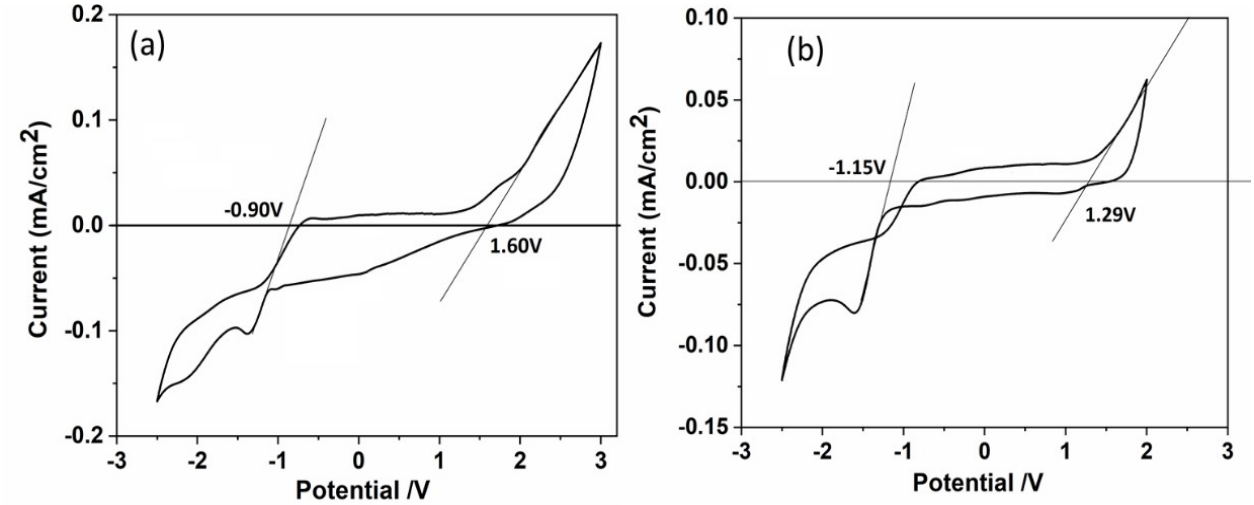
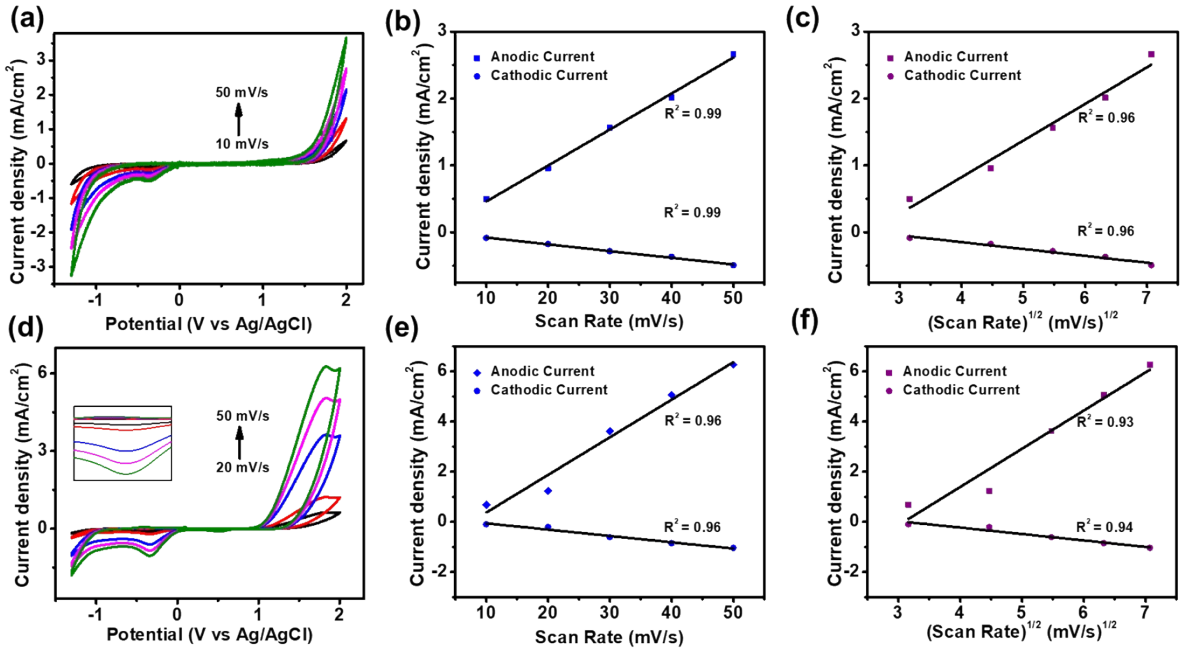



**Fig. S10.** Cyclic voltammetry of (a) CPF1 and (b) CPF 2 for the determination of HOMO, LUMO energy level and electronic band gap. CV was performed by taking the drop casted film of CPFs on glassy carbon electrode as working electrode, Pt as counter electrode and Ag/AgCl as reference electrode.

Band gap measured by following equation
HOMO = -e ($E_{ox}$ + 4.4) (V)
LUMO = -e ($E_{red}$ + 4.4) (V)
$E_g$ = e ($E_{ox}$ –$E_{red}$) (V)

Table S1. Summary of bandgap studies of the CPFs.

| CPF | HOMO (eV) | LUMO (eV) | $E_g$ (eV) |
|---|---|---|---|
| CPF1 | -6.00 | -3.50 | 2.50 |
| CPF2 | -5.69 | -3.25 | 2.44 |




**Electrochemical characterization**

**Fig. S11.** (a) CV plot in different scan rates (0.1M TBAP/ ACN vs. Ag/AgCl, satd. KCl), (b) peak current density vs. scan rate plot, and (c) peak current vs. square root of scan rate for CPF1. (d) CV plot in different scan rates (0.1M TBAP/ ACN vs. Ag/AgCl, satd. KCl), (e) peak current density vs. scan rate plot, and (f) peak current vs. square root of scan rate for CPF2.

**Table S2.** EC and EFC colour changes of previously reported EC-EFC systems.

| Derivatives | EC changes | EFC changes | Ref. |
|---|---|---|---|
| Tetraphenylethene containg triphenyl amine | colourless-to-black | Yellow to quenched | 1 |
| thiazolothiazole based viologen type molecule | Yellow to blue | Bright blueish to quenched | 2,3 |
| Fe-MSP with dye | Purple to pale red | Black to red | 4 |
| Thiophene based polymer | Yellow to NIR | Yellow to transparent | 5 |
| Arylamine-Fluorenre based polymer | --- | Bright to quenched | 6 |
| Dibenzofulvene derivative small molecules | Colorless to black | ---- | 7 |
| Terpyridine based gel | Transparent to black | Bright to quenched | 8 |
| Thiophene –triazine based COF | Yellow to brown | bluish-green to dark | **This work** |

**References:**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