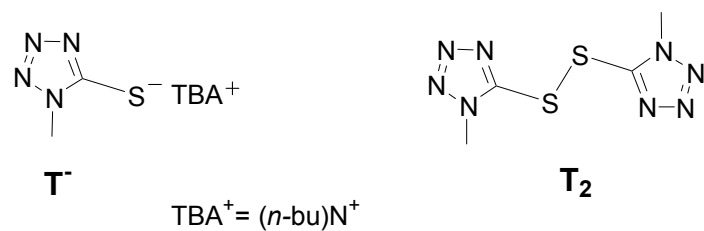


A Universal Low Temperature MWCNT-COOH Based Counter Electrode and a New Thiolate/Disulfide Electrolyte System for Dye Sensitized Solar Cells

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Scheme S1: Structures of the thiolate/disulfide electrolyte T⁻/T₂.

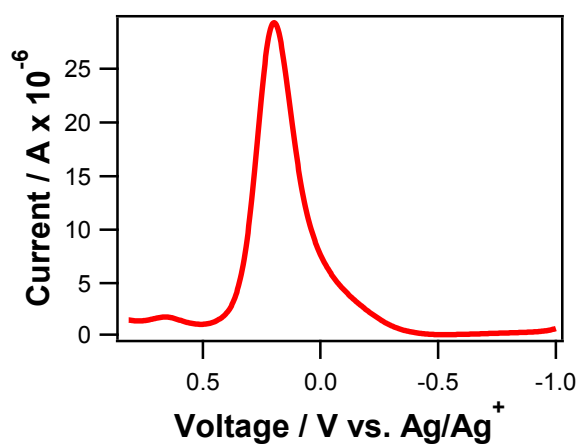
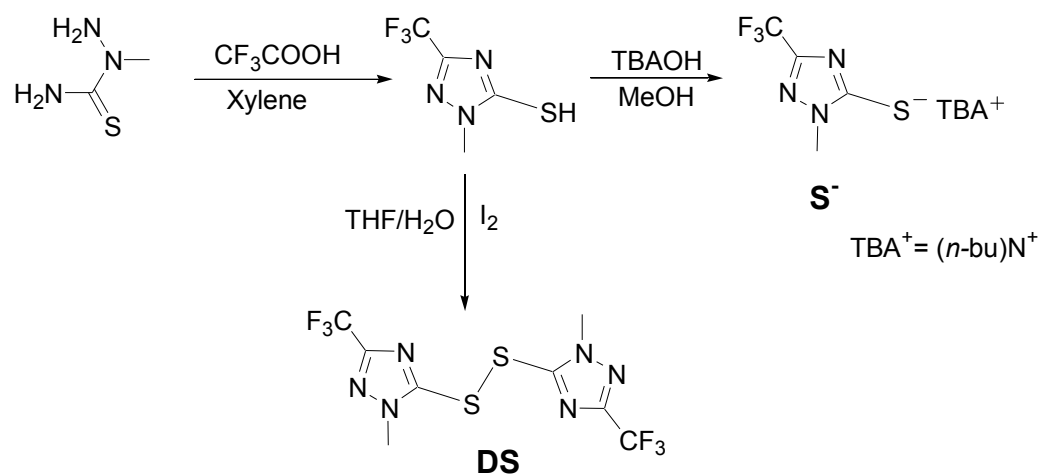
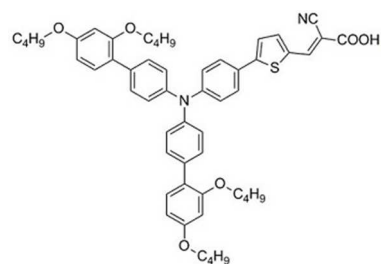


Figure S1: Differential pulse voltammogram (0.1 M LiClO₄, ACN) scan for S⁻/DS.



Scheme S2: Synthetic scheme of S^- and DS.



Scheme S3: Structure of (E)-3-(5-(4-(Bis(20,40-dibutoxybiphenyl-4-yl)amino)phenyl)thiophen-2-yl)-2-cyanoacrylic acid (D35).^{1,2}

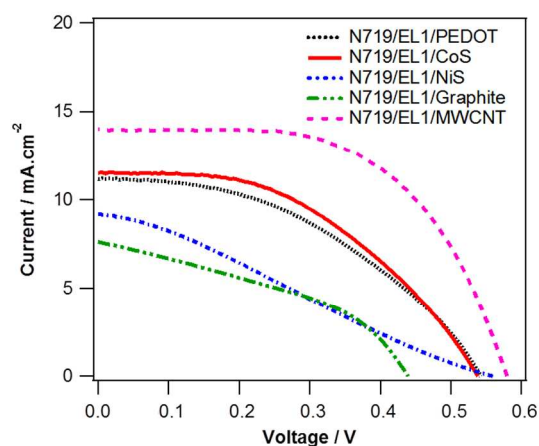


Figure S2: Photocurrent-voltage (J - V) curves of N719 and EL1 with (dotted-black) PEDOT CE, (solid-red) CoS CE, (dotted-dashed-blue) NiS CE, (dashed-violet) MWCNT and (dashed-dotted-dotted-green) Graphite CE. Measured under 100 mW.cm^{-2} simulated AM1.5 spectrum with an active area = 0.126 cm^2 .

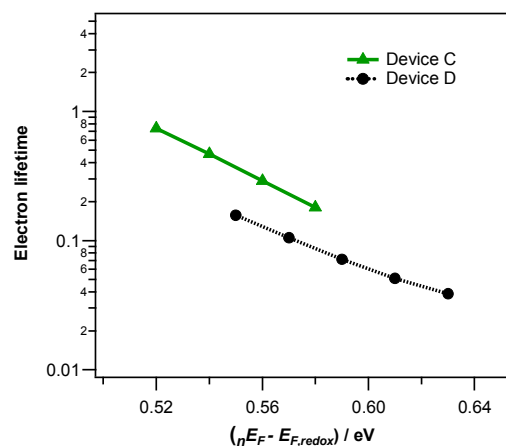


Figure S3: Electron lifetime (τ_n) in devices C and D calculated using $\tau_n = R_{ct} \cdot C_{\mu}$.

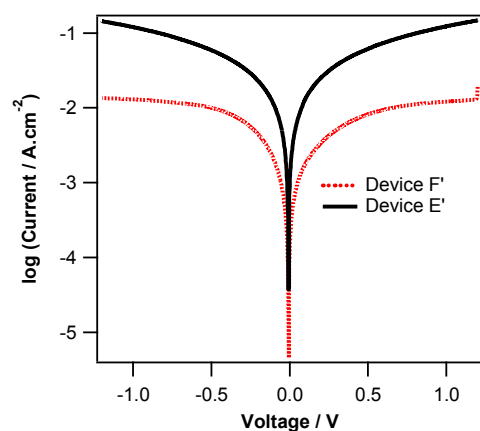


Figure S4: Tafel plots of dummy devices E' (solid-black) and F' (dashed-red).

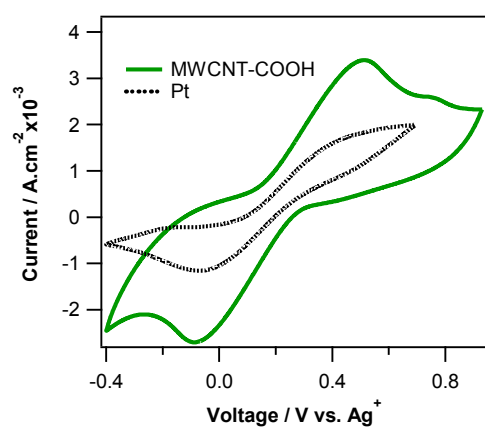


Figure S5: Cyclic voltammograms obtained at a scan rate of $50 \text{ mV} \cdot \text{s}^{-1}$ for the oxidation and reduction of the Co(II)/(III) (10 mM/ 1 mM and 0.1 M LiClO_4 in acetonitrile) using Pt on FTO (dashed-black) and MWCNT-COOH film on FTO (solid-green) electrodes.

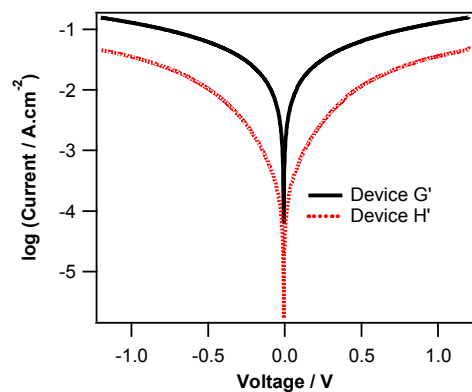


Figure S6: Tafel plots of dummy devices G' (solid-black) and H' dashed-red).

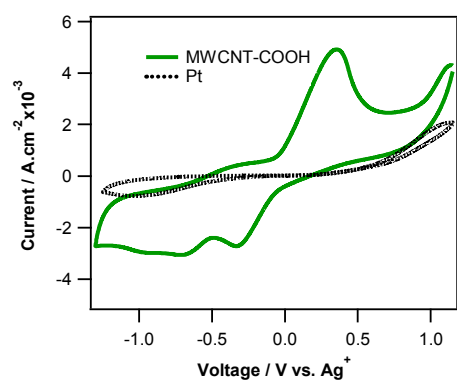


Figure S7: Cyclic voltammograms obtained at a scan rate of 50 mV.s^{-1} for the oxidation and reduction of the T/T₂ (10 mM/ 1 mM and 0.1 M LiClO₄ in acetonitrile) using Pt on FTO (dashed-black) and MWCNT-COOH film on FTO (solid-green) electrodes.

References

- (1) Feldt, S. M.; Gibson, E. A.; Gabrielsson, E.; Sun, L.; Boschloo, G.; Hagfeldt, A. Design of Organic Dyes and Cobalt Polypyridine Redox Mediators for High-Efficiency Dye-Sensitized Solar Cells *J. Amer. Chem. Soc.* **2010**, *132*, 16714-16724.
- (2) Hagberg, D. P.; Jiang, X.; Gabrielsson, E.; Linder, M.; Marinado, T.; Brinck, T.; Hagfeldt, A.; Sun, L. Symmetric and Unsymmetric Donor Functionalization. Comparing Structural and Spectral Benefits of Chromophores for Dye-Sensitized Solar Cells *J. Mater. Chem.* **2009**, *19*, 7232-7238.