

Electronic Supporting Information

Improved electro-grafting of nitropyrene onto onion-like carbon via *in situ* electrochemical reduction and polymerization: Tailoring redox energy density of the supercapacitor positive electrode

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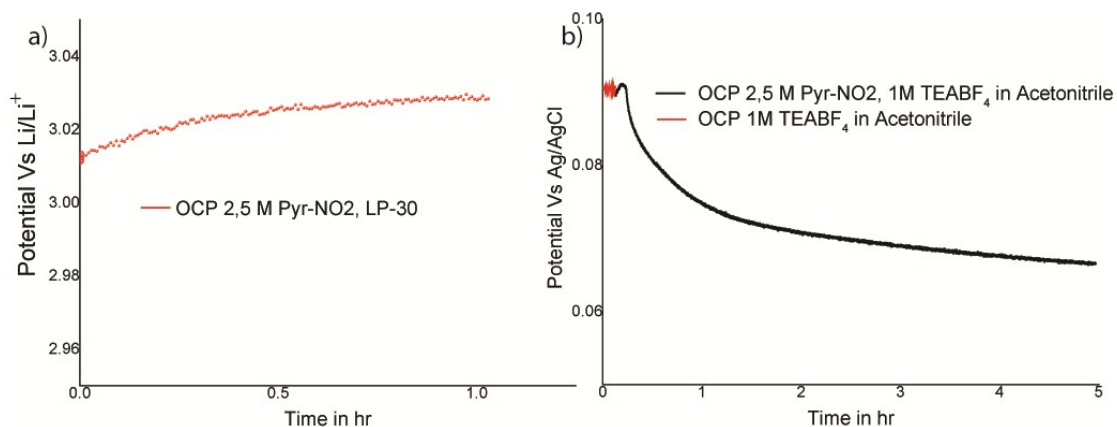


Figure S1: Open circuit potential (OCP) of YP-80 electrode in LP-30 and b) OCP of OLC electrode in 1M TEABF₄/Acetonitrile and further after the introduction of 2mM Pyr-NO₂.

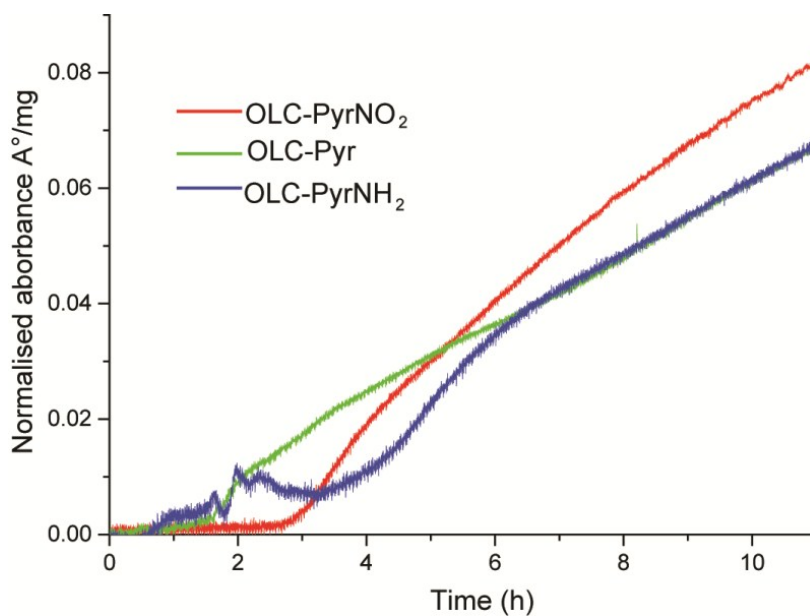


Figure S2: Adsorption of Pyrene and derivatives onto carbon onion; in all cases the concentration was 0.25 mM in LP-30

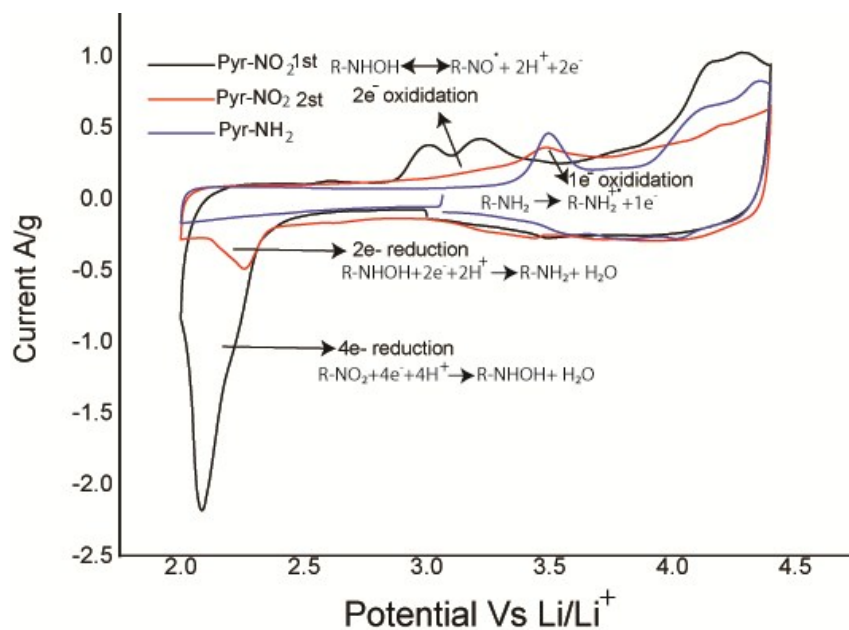


Figure S3: Initial CV profile at a scan rate of 5 mV/s in LP-30 containing 2 mM Pyr-NO₂ and Pyr-NH₂. Different electrochemical process and their corresponding peaks are indicated in the inset of figure.

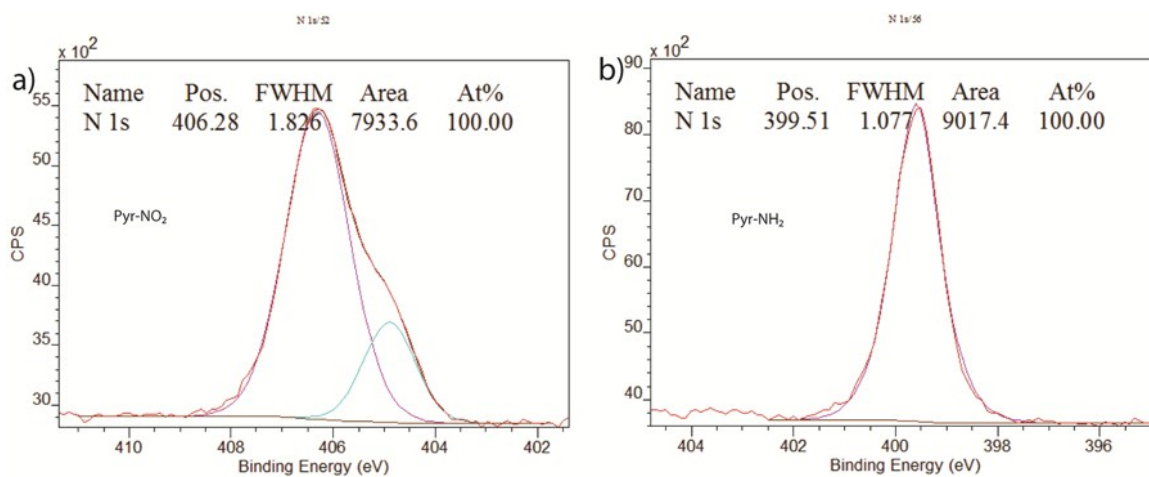


Figure S4: N1S XPS spectra of a) 1-nitropyrene and b) 1-aminopyrene

Table S1. N1S core level XPS details of OLC/PPyrNO2

Peak name	Position	Full width Half maximum (FWHM)	% area
-NH ₂	400.4	2.52	79.8
-NHOH	402.2	2.55	20.2

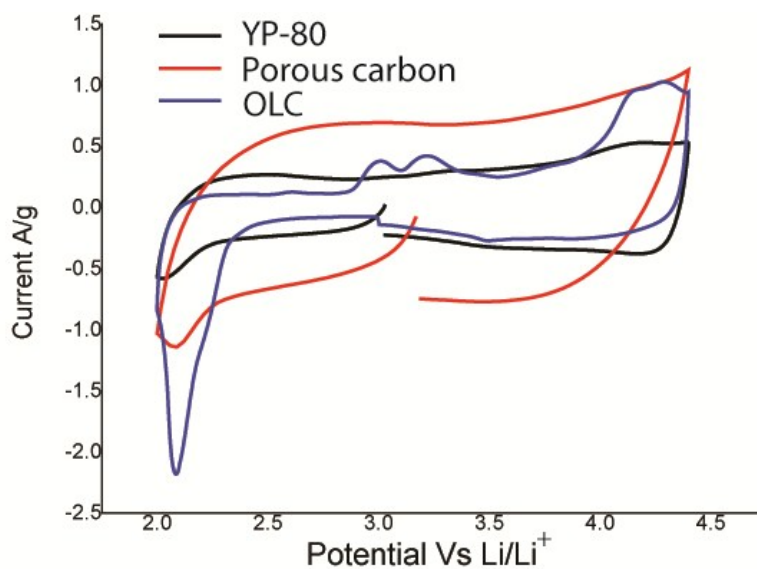


Figure S5: CV profile of OLC in comparison to two different commercial porous carbon electrode at a scan rate of 5 mV/s in LP-30 containing 2 mM Pyr-NO₂.

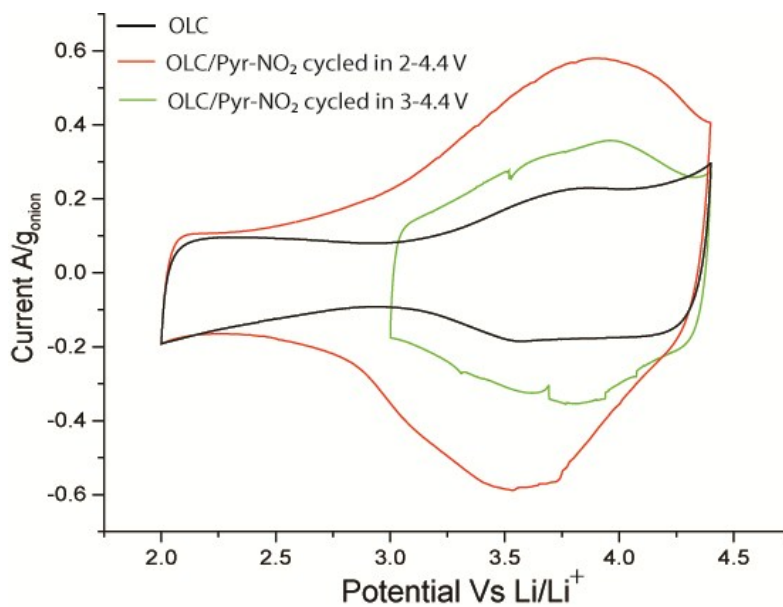


Figure S6: CV profile at a scan rate of 5 mV/s in LP-30 containing 2 mM Pyr-NO₂ derivative after electropolymerisation for 800 cycles in 2-4.4 V (red) and 3-4.4 V (green) window in comparison to bare carbon onion (black).

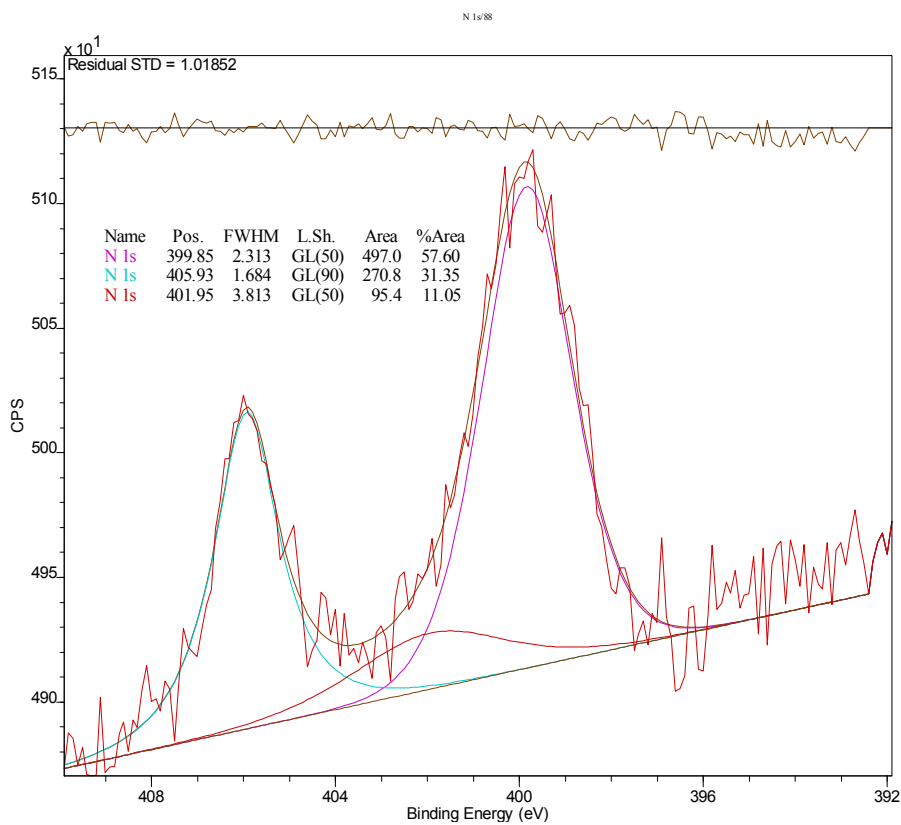


Figure S7: N1s core XPS spectra of PPy-NO₂-coated OLC after cycling in a potential window of 2-4.4 V.

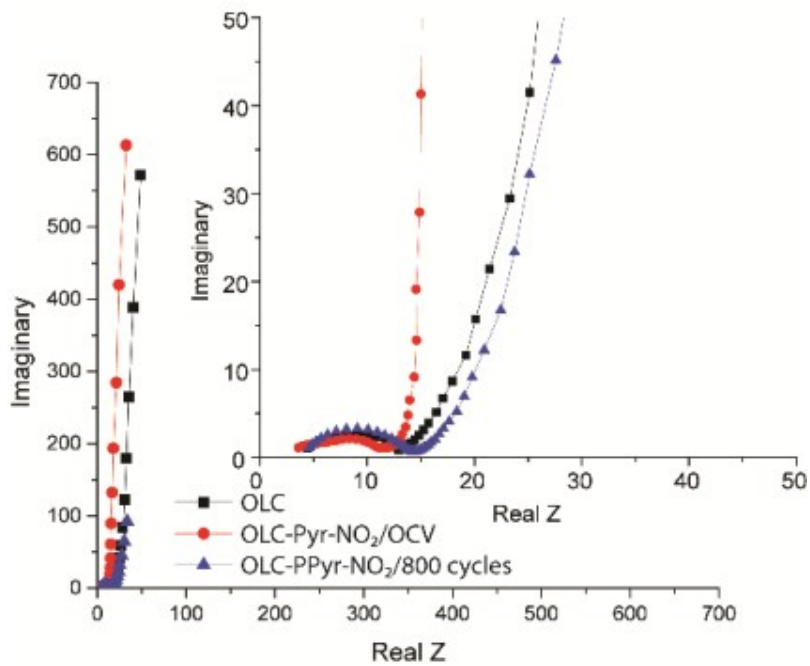


Figure S8: Nyquist plot from the EIS spectra

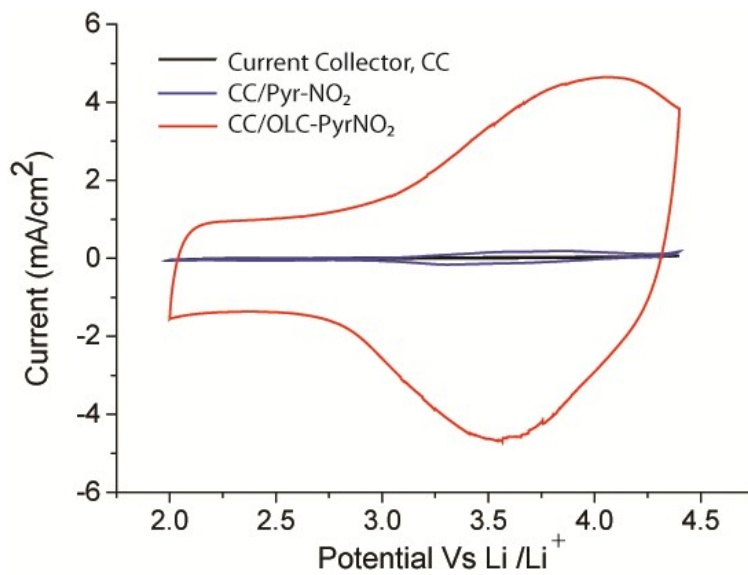


Figure S9: Areal current Vs voltage profile of OLC-PyrNO₂ in comparison to PyrNO₂ deposited onto current collector and pure current collector.

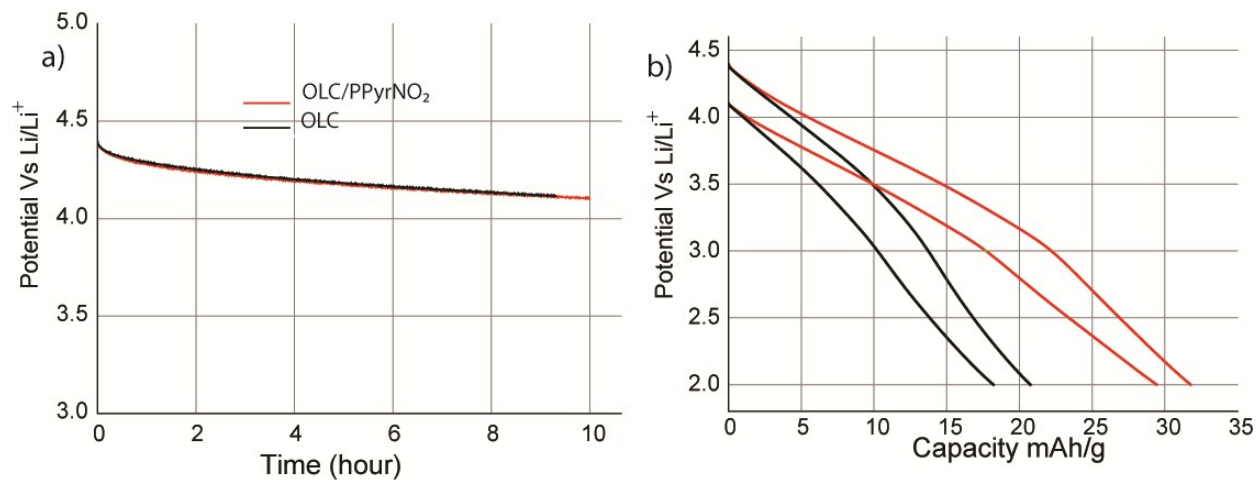


Figure S10: a) Plot of cell potential vs. relaxation time after charging to 4.4 V vs. Li⁺/Li and b) change in the capacity due to the leakage loss during the relaxation time for 10 hour.