Electronic Supplementary Information

Organic Multi-electron Redox Couples-induced Functionalization for Enabling Ultrahigh Rate and Cycling Performances of Supercapacitors

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Calculations of specific capacitance, energy density and power density based on the galvanostatic charge-discharge curves:

(1) In three-electrode system, specific capacitances derived from galvanostatic tests can be calculated from the equation:

$$C = I\Delta t/m\Delta V \quad (1)$$

where m (g) is the mass of active electrode material in the working electrode, ΔV (V) is the potential drop during discharge, Δt (s) is the discharge time and I (A) is the discharging current.

(2) In two-electrode system, specific capacitances of capacitor derived from galvanostatic tests can be calculated from the equation:

$$C = 4(I\Delta t/m\Delta V) \quad (2)$$

where m (g) is the total mass of active electrode material in two electrodes, ΔV (V) is the voltage drop upon discharging, Δt (s) is the discharge time and I (A) is the discharging current.

Energy density (E) and power density (P) derived from galvanostatic tests can be calculated from the following equations:

$$E = [C (\Delta V)^2]/8 \quad (3)$$

$$P = E/\Delta t \quad (4)$$

where E (Wh kg^{-1}), P (W kg^{-1}), Δt (s), ΔV (s) and C (F g^{-1}) are the specific energy, specific power, discharge time, potential window, specific capacitance, respectively.

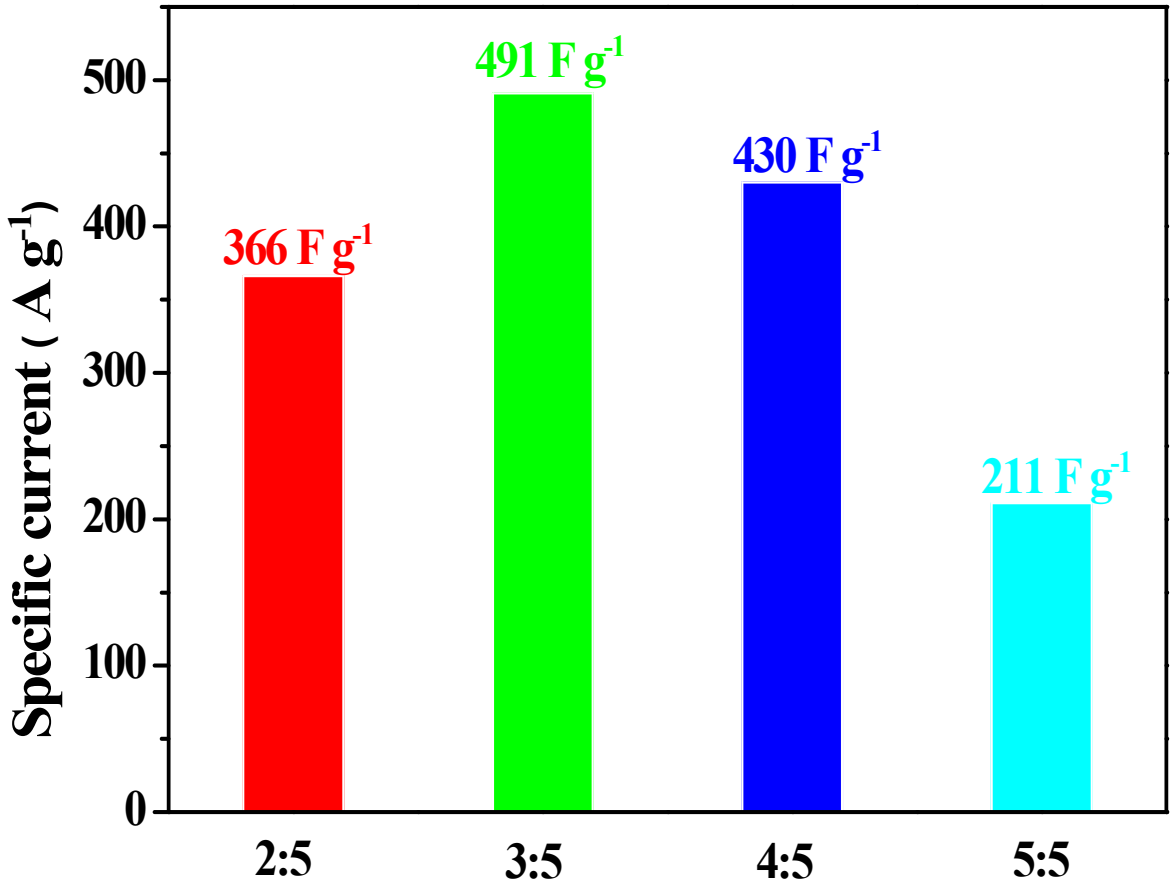
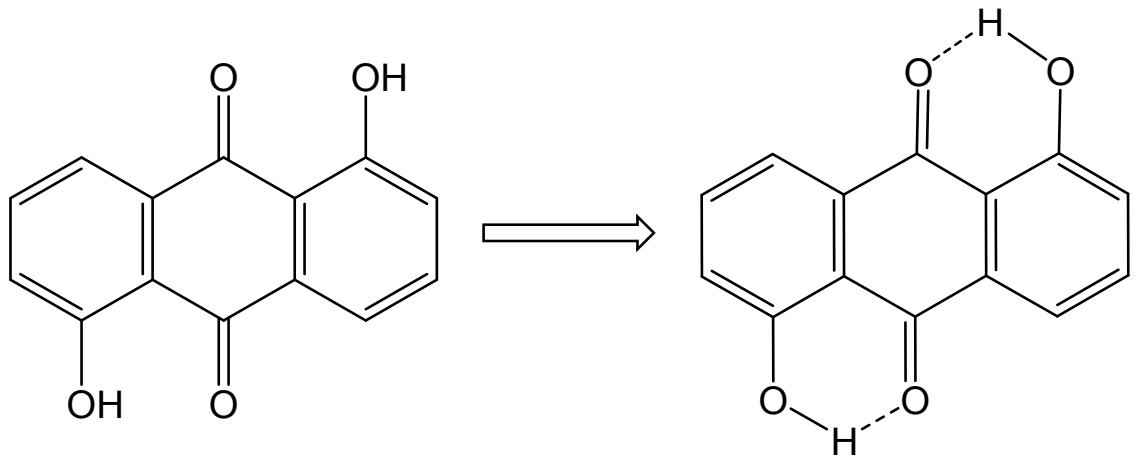


Fig. S1 The specific capacitance of DT-RGNs electrode materials at 1 A g^{-1} with different mass ratios of DT (x) to RGNs (y).



Formula S2 The formation process of intramolecular hydrogen bond in 1, 5-dihydroxyanthraquinone molecule.

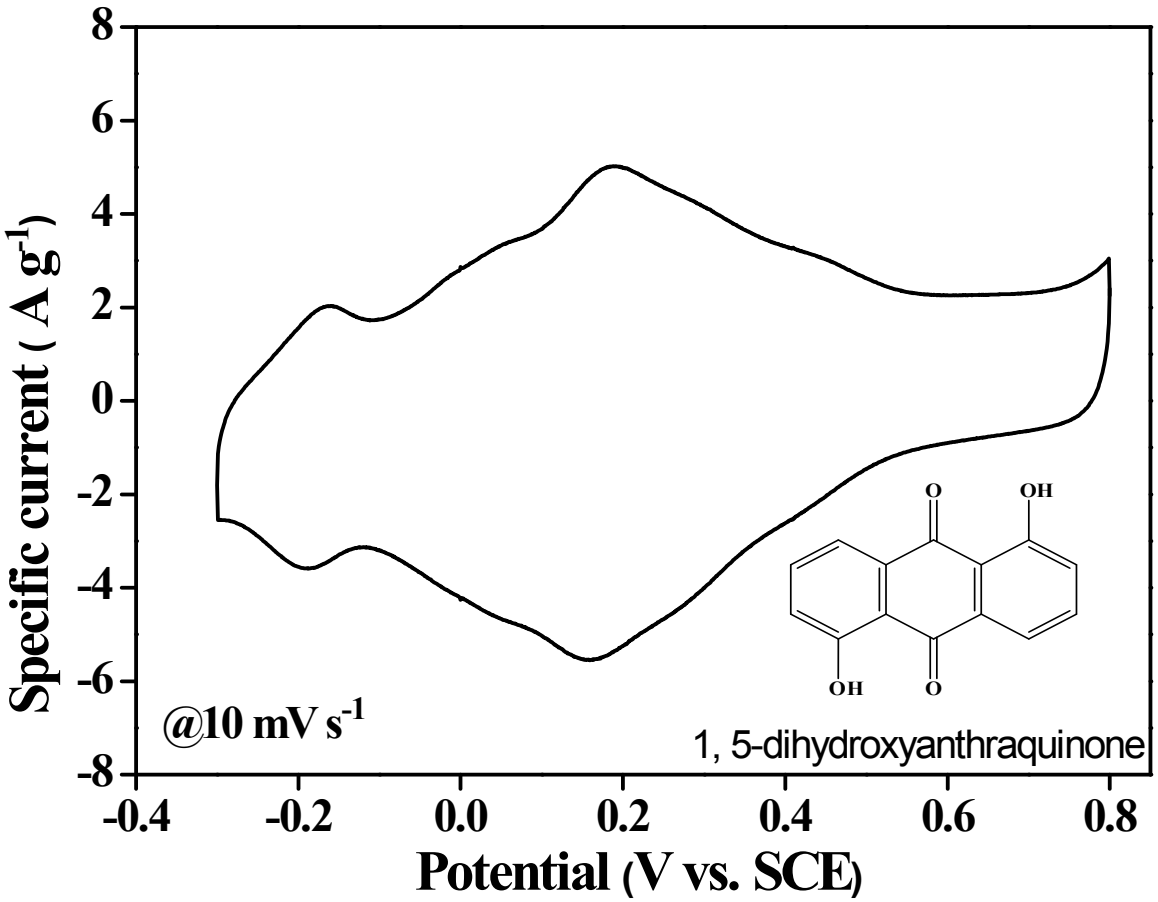


Fig. S3 The CV curves of 1, 5-dihydroxyanthraquinone functionalized RGNs (1, 5-AQ-RGNs 3:5) electrode material at 10 mV s^{-1} in 1 mol L^{-1} H_2SO_4 aqueous solution.

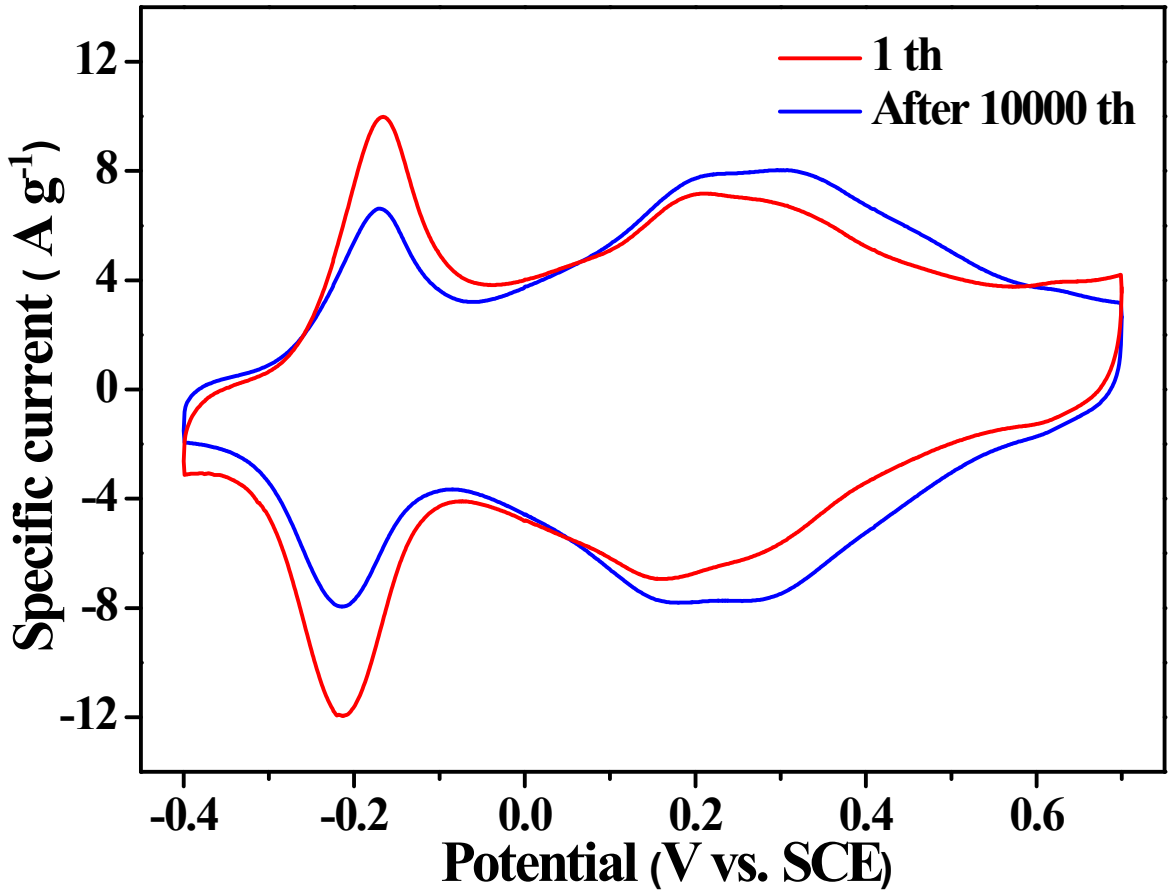


Fig. S4 The CV curves of DT-RGNs 3:5 electrode before and after 10, 000 cycles.