Electronic Supplementary Information

2-Amino-3-chloro-1, 4-naphthoquinone-covalent modification of graphene nanosheets for efficient electrochemical energy storage

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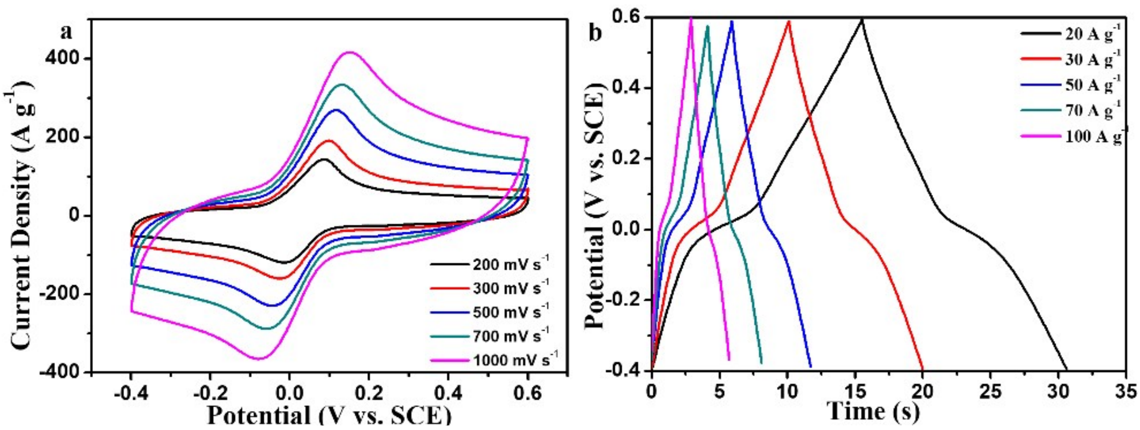

Fig. S1 (a) CV curves of CNQ-GNS-0.25 at different scan rates; (b) GCD curves of CNQ-GNS-0.25 at various current densities in 1 M H_2SO_4.

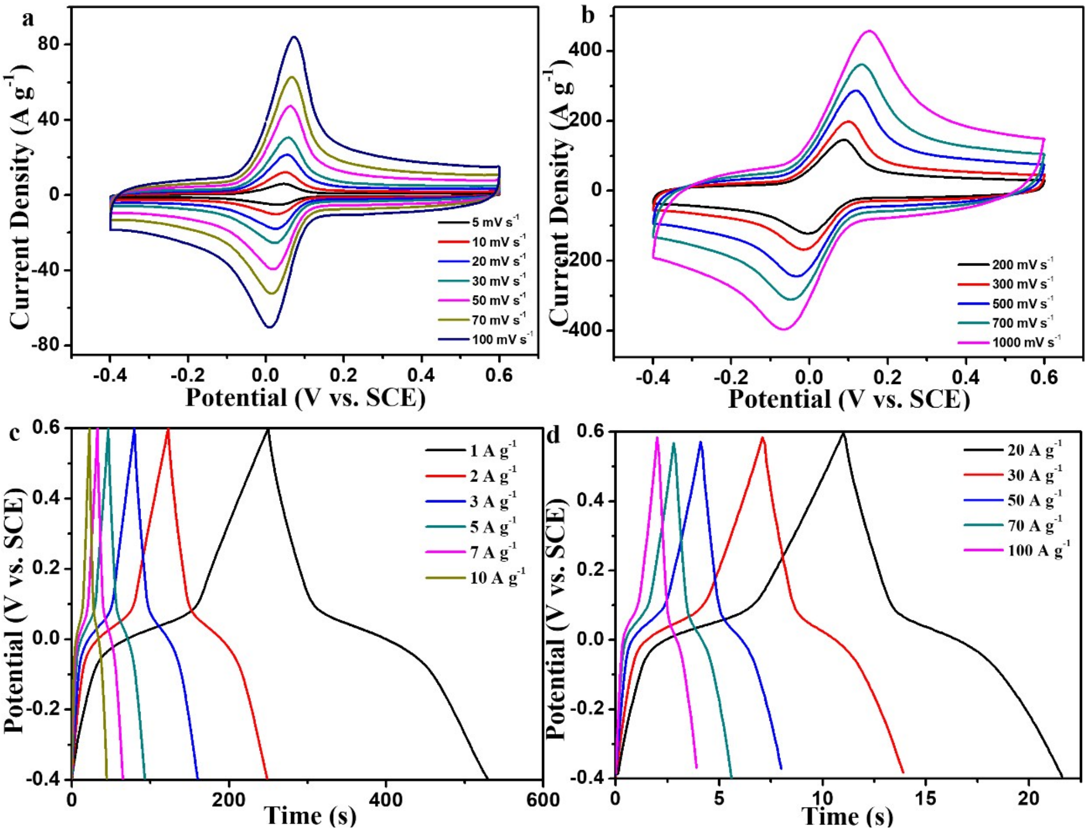

Fig. S2 (a) and (b) CV curves of ACNQ/GNS at different scan rates; (c) and (d) GCD curves of ACNQ/GNS at various current densities in 1 M H_2SO_4.

Table S1 Comparison physical parameters with capacitive performances of the electrode materials

electrode materials	I_D/I_G	S_{BET}^{a} [m^2 g^{-1}]	V_{total}^{b} [cm^3 g^{-1}]	C=O^{c} (%)	$^{d}C_S$ [F g^{-1}]	Rate capability (%)
GNS	1.274	450.86	0.83	4.5	190±6	57.9
CNQ-GNS-0.1	1.278	—	—	—	246.6±8	62.7
CNQ-GNS-0.25	1.280	393.80	0.86	5.5	364.2±10	76.8
CNQ-GNS-0.5	1.282	—	—	—	264.1±8	75.8
ACNQ/GNS	—	—	—	—	280±8	67.9

[a] *Specific surface area from multiple BET method;* [b] *Total pore volume;* [c] *the component of C=O;* [d]*Specific capacitance;*

Calculations of specific capacitance, energy density and power density based on the galvanostatic charge-discharge curves[1]:

(1) In three-electrode system, the specific capacitance *C* (F g^{-1}) was obtained from the GCD curves on the basis of following formula:

$$C = \frac{I \cdot t}{m \cdot \Delta V} \quad (1)$$

Herein, *I* (A g^{-1}) refers to the discharge current, *t* (s) represents the discharge time, *m* is the mass of active material and *ΔV* (V) is the voltage interval of discharge.

(2) In two-electrode system, Formula (3) and (4) were employed to calculate the energy density (*E*, Wh kg^{-1}) and power density (*P*, W kg^{-1})

$$C = \frac{I \cdot t}{m \cdot \Delta V} \quad (2)$$

$$E = \frac{0.5C \cdot (\Delta V)^2}{3.6} \quad (3)$$

$$P = \frac{E}{t} \quad (4)$$

where *C* (F g^{-1}) represents the specific capacitance of a two electrode device, *I* (A) is the discharge current, *t* (s) is discharging time and *ΔV* (V) refers to voltage window.

The calculation formula for the mass of ACNQ[2]:

$$Q = \int Idt = \int_{Va}^{Vb} \frac{I}{\frac{dV}{dt}} dV = \frac{1}{v} \int_{Va}^{Vb} IdV \quad (1)$$

$$m_A = n_A \cdot M_A = \frac{\Delta Q}{z \cdot F} M_A \quad (2)$$

where Q (C), I (A), t (s), V (V), m_A (g), n_A (mol), M_A (mol g^{-1}), F and z are voltammetric charge, instantaneous anodic (cathodic) current at a given potential range, sampling time, potential range, material mass taking part in redox reaction, amount of substance of active materials, molar mass of active materials, Faraday constant and stoichiometric coefficient of electron transport in electrochemical processes while V_a and V_b (V) are the selected boundary of potential range, respectively. ΔQ (C) is defined as a charge contributed by cathodic or anodic reaction of ACNQ, which is numerically equal to the integral area of the region (S1 or S2).

References

1. L. Hou, Z. Hu, X. Wang, L. Qiang, Y. Zhou, L. Lv and S. Li, *Journal of colloid and interface science*, 2018, **540**, 88-96.
2. N. An, F. Zhang, Z. Hu, Z. Li, L. Li, Y. Yang, B. Guo and Z. Lei, *RSC Advances*, 2015, **5**, 23942-23951.