Electronic Supporting Information (ESI)

Construction of an advanced Co-doped V_2O_3 electrode material with significantly enhanced conductivity and structural stability for supercapacitors using asparagic acid-functionalized graphene quantum dot

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1. Experimental

1.1. Electrochemical measurements

Cyclic voltammogram (CV), electrochemical impedance spectroscopy (EIS) and galvanostatic charge/discharge curves of three-electrode testing system and flexible supercapacitor were measured on the CHI 660D electrochemical workstation. The potential amplitude of ±5 mV and frequency of 0.01-10^5 Hz were adopted in the EIS measurements.

For the three-electrode system, the specific capacitance (C_g, based on a single electrode) were calculated according to the equation (1):

$$C_g = \frac{It}{m\Delta V} \quad (1)$$

Where, C_g is the gravimetric capacitance (F g^{-1}), I is the current (A), m is the active mass on the electrode (g), ΔV is the potential range, and t is the discharging time.

For the symmetric supercapacitor, the specific capacitance (C_{g2}), energy density and power density were calculated according to the equations (2, 3 and 4):

$$C_{g2} = \frac{2It}{m\Delta V} \quad (2)$$

$$E_g = \frac{C_{g2}\Delta V^2}{8 \times 3600} \quad (3)$$

$$P_g = \frac{E_{g2} \times 3600}{t_{discharge}} \quad (4)$$

Where C_g is the gravimetric capacitance (F g^{-1}) of a single electrode in two-electrode cell. Furthermore, E_g (W h g^{-1}) and P_g (W g^{-1}) are the gravimetric energy density and gravimetric power density, respectively, based on the total active material in the cell. I is the current (A), m is the active mass of active material in a single electrode (g), ΔV is the potential range, and t is the discharging time.

2. Figures

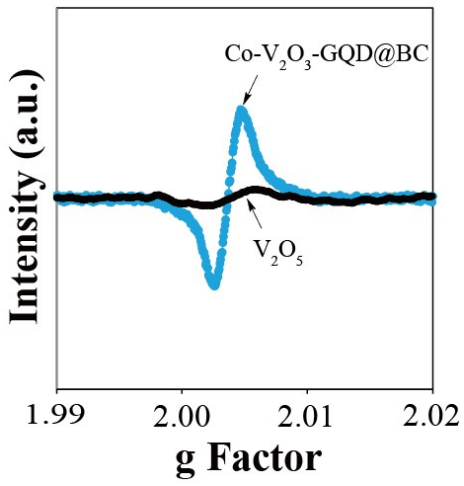

Fig. s1 EPR spectra of V_2O_5 and Co-V_2O_3-GQD@BC

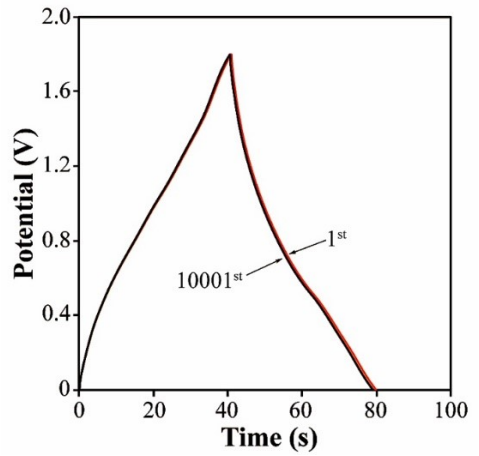

Fig. s2 The charge-discharge cures at the current density of 10 A g^{-1} for 1st and 10001st cycle measurements

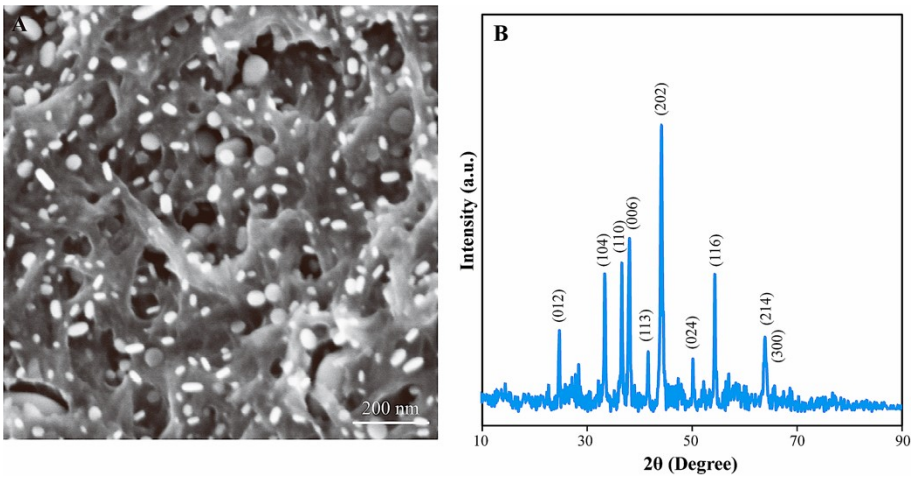

Fig. s3 SEM image and XRD pattern of Co-V_2O_3-GQD@BC after 10000-cycle

3. Tables

Table s1 EIS parameters of different electrodes

Electrode	R_S (Ω)	R_{ct} (Ω)	Ci (F)	Z_w (Ω)
V_2O_3	6.084	133.9	1.04×10^{-4}	0.002994
V_2O_3-GQD	5.619	14.1	9.388×10^{-5}	0.04668
V_2O_3-GQD@BC	12.56	1.59	1.239×10^{-4}	0.06678
Co-V_2O_3-GQD@BC	6.193	1.234	1.382×10^{-4}	0.04463