## Supporting Information

# Formation of Nitrogen-doped Mesoporous Graphitic Carbon with the Help of Melamine

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### Experimental

#### Synthesis of nitrogen-enriched mesoporous carbonaceous materials

The molar ratio of melamine and citric acid used in the experimental is 3:1, and the concentration of melamine is 10 mM. Since melamine has a good solubility in hot water, melamine and citric acid in Milli-Q water (18.2 M $\Omega$  cm<sup>-1</sup>) were heated (lower 90 °C) and stirred to obtain a transparent solution. Subsequently, the clear solution was stirred in low temperature environment (lower 15 °C, such as 4 °C freezer) for 2 h, a lot of white flocculus precipitate appeared in the cold solution. This suspension

was collected by filtration and washed many times with Milli-Q water. The product was dried to get white crystal, which was then heated to 900 °C in Ar at a ramp rate of 3 °C min<sup>-1</sup> and kept at 900 °C for 2 h. After the carbonization procedure, nitrogen-enriched mesoporous carbon materials were acquired. For comparison, citric acid only as the N-free sample was also prepared by using the same carbonization process.

#### Characterization

The morphology of the samples was determined by JEM-2100F high resolution transmission electron microscopy (HR-TEM) at an acceleration voltage of 200 kV. Field-emission scanning electron microscope (FE-SEM) images of the samples were taken on a JEOL-6701F SEM unit. X-Ray diffraction (XRD) patterns were collected on a Rigaku D/max 2500 diffractometer with a Cu K $\alpha$  radiation ( $\lambda = 0.1542$  nm) at 40 kV and 100 mA. Measurements of Raman spectra were performed on a Renishaw InVia Raman Spectrometer under a backscattering geometry ( $\lambda = 532$  nm). VG Scientific ESCALab220i-XL X-ray photoelectron spectroscopy (XPS) was utilized to analyze the chemical composition for the nitrogen-enriched mesoporous carbon materials and the valence states of various elements with Mg K $\alpha$  X ray. The binding energies were referenced to the C1s line at 284.8 eV from adventitious surface surface carbon. The area of the products was measured bv the Brunauer–Emmet–Teller (BET) method using N<sub>2</sub> adsorption and desorption isotherms on an Autosorb-1 analyzer. Pore size distribution and specific surface area were obtained through the density functional theory (DFT) model. The composition of samples was also determined by an elemental analyzer (Perkin-Elmer 2400 II).

#### **Electrochemical measurements**

For lithium ion battery (LIB) application, electrochemical performance was tested by coin-type cells (CR2016) assembled in an argon-filled glove box. For the anode working electrodes preparation, a mixture of active material, super-P acetylene black (AC), and poly (vinyl difluoride) (PVDF) at a weight ratio of 80 : 10 : 10 was dispersed in N-methylpyrrolidone (NMP) solution. Then, the complex was equably pasted on a Cu foil current collector. The typical electrode was dried at 80 °C for 24 h under vacuum before assembled into coin cell in an argon-filled glove box. Lithium foil was used as the counter electrode. A glass fiber (GF/D) from Whatman was used as a separator. The electrolyte was 1M LiPF<sub>6</sub> dissolved in a mixture of ethylene carbonate (EC), dimethyl carbonate (DMC), and diethyl carbonate (DEC) (1:1:1 wt %) plus 2 wt % vinylene carbonate (VC) obtained from Tianjin jinniu Power Sources Material. The diameter of coin cells for both NMGC and CA-based carbon is 1 cm, and the mass loading for both NMGC and CA-based carbon is about 1.5 mg. Galvanostatic cycling of the assembled cells was carried out by using an Arbin BT 2000 system in the voltage range of 0.01-3.0 V (vs. Li<sup>+</sup>/Li) under a current density of 100 mA g<sup>-1</sup> at room temperature.



**Fig. S1** SEM image of the as-obtained precursor of melamine and citric acid (a) and its magnification of red square area corresponding to SEM mapping images with the elements of carbon (b), nitrogen (c), and oxygen (d), respectively.



Fig. S2 XRD patterns (a) and Raman spectra (b) of the NMGC-based carbon materials.



Fig. S3 XPS survey spectra (a), XPS N 1s spectra (b) and XPS C 1s spectra (c) of the

NMGC-based carbon materials.



Fig. S4 Nitrogen adsorption-desorption isotherm of the CA-based carbon materials



Fig. S5 Charge and discharge profiles of the NMGC-based carbonaceous materials (a) and the

CA-based carbonaceous materials at 100 mA  $g^{-1}$  in the voltage range of 0.01-3V vs. Li<sup>+</sup>/Li for the

1st, 2nd and 200th cycles.



Fig. S6 Cycling performances for the electrodes of the CA-based carbonaceous materials in the voltage range of 0.01–3.0 V (versus  $\text{Li}^+/\text{Li}$ ) at a current density of 100 mA g<sup>-1</sup>. (• = Discharge capacity,  $\blacktriangle$  = Charge capacity,  $\blacksquare$  = Coulombic efficiency).

Table S1 The carbon, hydrogen and nitrogen elemental analysis of the precursors

Products						
С	Н	Ν				
Elemental analysis (wt %)						
28.09	5.41	39.06				

Table S2 The carbon	1. hvdrogen an	d nitrogen elementa	l analysis of the	NMGC-based carbon
	,			

materials					
NMGC-based carbon materials					
С	Н	Ν			
Elemental analysis (wt %)					
82.91	< 0.30	10.02			