Supporting Information

Temperature-dependent conversion of magnesium citrate into nanoporous carbon materials for superior supercapacitor application *via* a multi-template carbonization method

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1. Structure characterization measurements employed in this work.

X-ray diffraction (XRD) patterns were obtained on a Rigaku D/MAX2500V with Cu Kα radiation. Raman spectra were recorded at ambient temperature on a Spex 1403 Raman spectrometer with an argon-ion laser at an excitation wavelength of 514.5 nm. Field emission scanning electron microscopy (FESEM) images were taken with a Hitachi S-4800 scanning electron microscope. High-resolution transmission electron microscope (HRTEM) images and selected area electron diffraction (SAED) patterns were performed with a JEM-2100F unit. The specific surface area and pore structure of the carbon samples were determined by N_2 adsorption-desorption isotherms at 77 K (Quantachrome Autosorb-iQ) after being vacuum-dried at 150 °C overnight. The specific surface areas were calculated by a BET (Brunauer-Emmett-Teller) method. Cumulative pore volume and pore size distribution were calculated by using a slit/cylindrical nonlocal density functional theory (NLDFT) model.

2. Electrochemical measurements employed in this work.

Measurements conducted in a three-electrode system using 6 mol L^{-1} KOH as electrolyte as followed. A mixture of 80 wt% the carbon sample (~ 4 mg), 15 wt% acetylene black and 5 wt% polytetrafluoroethylene (PTFE) binder was fabricated using ethanol as a solvent. Slurry of the above mixture was subsequently pressed onto nickel foam under a pressure of 20 MPa, serving as the current collector. The prepared electrode was placed in a vacuum drying oven at 120 ºC for 24 h. A three electrode experimental setup taking a 6 mol L^{-1} KOH aqueous solution as electrolyte was used in cyclic voltammetry and galvanostatic charge-discharge measurements on an electrochemical working station (CHI660D, ChenHua Instruments Co. Ltd., Shanghai). Here, the prepared electrode, platinum foil (6 cm^2) and saturated calomel electrode (SCE) were used as the working, counter and reference electrodes, respectively.

Specific capacitances derived from cyclic voltammetry tests can be calculated from the equation:

$$C = \frac{1}{mv(V_b - V_a)} \int_{V_a}^{V_b} IdV$$

where C (F g^{-1}) is the specific capacitance; m (g) is the mass of active materials loaded in working electrode; v (V s^{-1}) is the scan rate; I (A) is the discharge current; V_b and V_a (V) are high and low voltage limit of the CV tests.

Specific capacitances derived from galvanostatic tests can be calculated from the equation:

$$C = \frac{I\Delta t}{m\Delta V}$$

where C (F g^{-1}) is the specific capacitance; I (A) is the discharge current; Δt (s) is the discharge time; ΔV (V) is the voltage window; and m (g) is the mass of active materials loaded in working electrode.

Measurements conducted in a two-electrode system using [EMIm]BF$_4$/AN as electrolyte as followed. In a two-electrode cell, [EMIm]BF$_4$ and acetonitrile (AN) (weight ratio of 1:1) was adopted as electrolyte. A glassy paper separator was sandwiched between two electrodes, and each electrode contains a mixture of 80 wt% the carbon sample (~ 2 mg), 15 wt% acetylene black and 5 wt% polytetrafluoroethylene (PTFE) binder. Nickel foam serves as the current collector. The assembly of the test cell was done in a glove box filled with Ar.

Specific capacitances derived from cyclic voltammetry tests can be calculated from the equation:

$$C = \frac{2}{mv(V_b - V_a)} \int_{V_a}^{V_b} IdV$$

where C (F g^{-1}) is the specific capacitance; m (mg) is the mass of active materials loaded in working electrode; v (V s^{-1}) is the scan rate; I (A) is the discharge current; V_b and V_a (V) are high and low voltage limit of the CV tests.

Specific capacitances derived from galvanostatic tests can be calculated from the equation:

$$C = \frac{4I\Delta t}{m\Delta V}$$

where C (F g^{-1}) is the specific capacitance; I (A) is the discharge current; Δt (s) is the discharge time; ΔV (V) is the voltage window; and m (g) is the total mass of two electrodes.

Specific energy density (E) and specific power density (P) derived from galvanostatic tests can be calculated from the equations:

$$E = \frac{1}{8}C\Delta V^2$$

$$P = \frac{E}{\Delta t}$$

where E (Wh kg^{-1}) is the average energy density; C (F g^{-1}) is the specific capacitance; ΔV (V) is the voltage window; P (W kg^{-1}) is the average power density and Δt (s) is the discharge time.
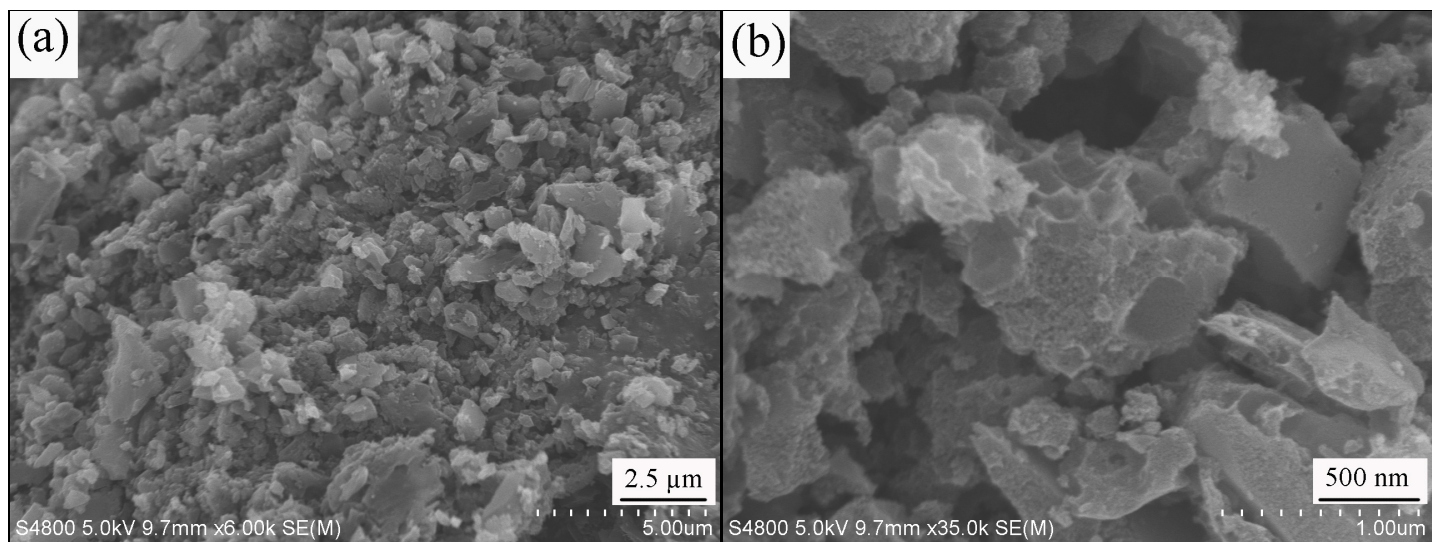

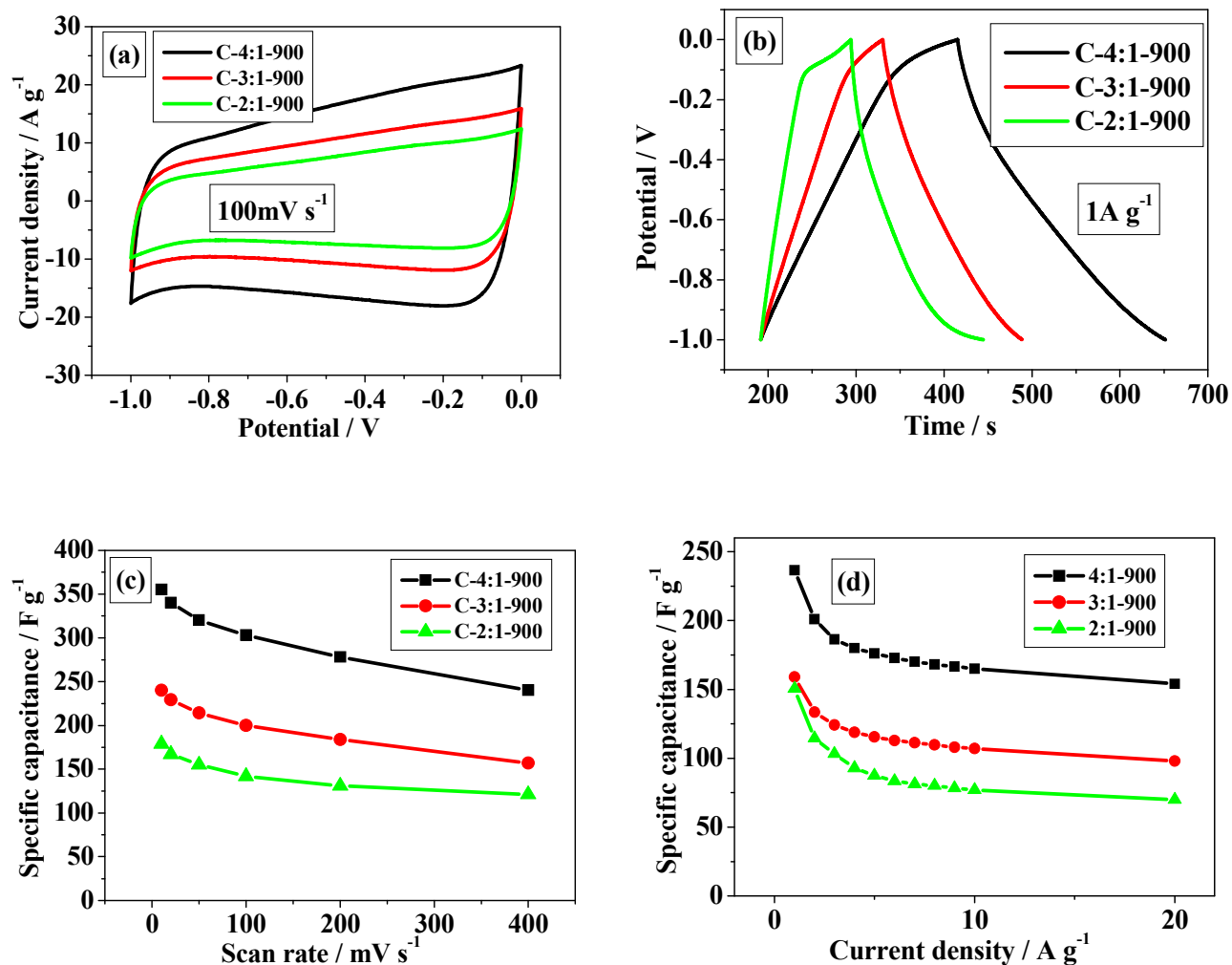**Figure S1.** (a) and (b): FESEM images of the **C-4:1-900** sample in different magnifications.

Figure S2. C-2:1/3:1/4:1-900 samples in a three-electrode system using 6 mol L^{-1} KOH as the electrolytes: (a) CV curves at 100 mV s^{-1}; (b) GCD curves of at 1 A g^{-1}; (c) specific capacitances calculated from CV curves; (d) specific capacitances calculated from GCD curves.
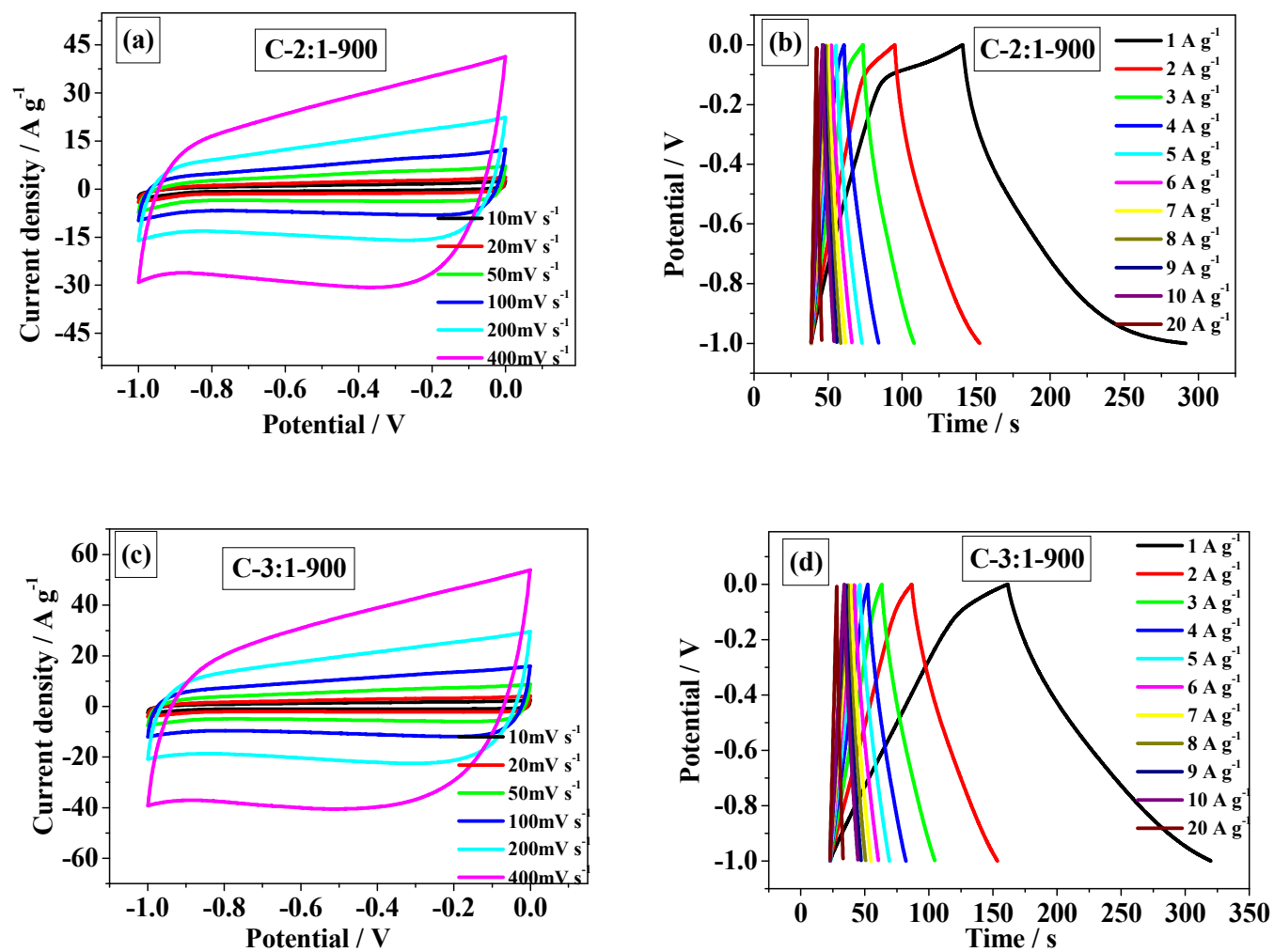
Figure S3. C-2:1/3:1-900 samples in a three-electrode system using 6 mol L^{-1} KOH as the electrolytes: (a, c) CV curves; (b, d) GCD curves.