Supporting Information for

Mesoporous soft carbon as an anode material for sodium ion batteries with superior rate and cycling performance

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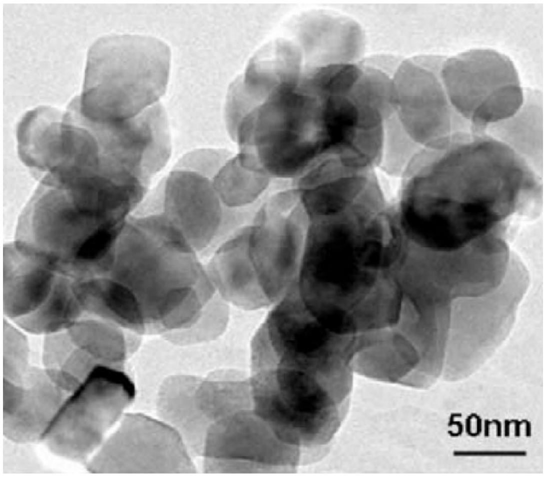

Figure S1. TEM image of nano-$CaCO_3$.

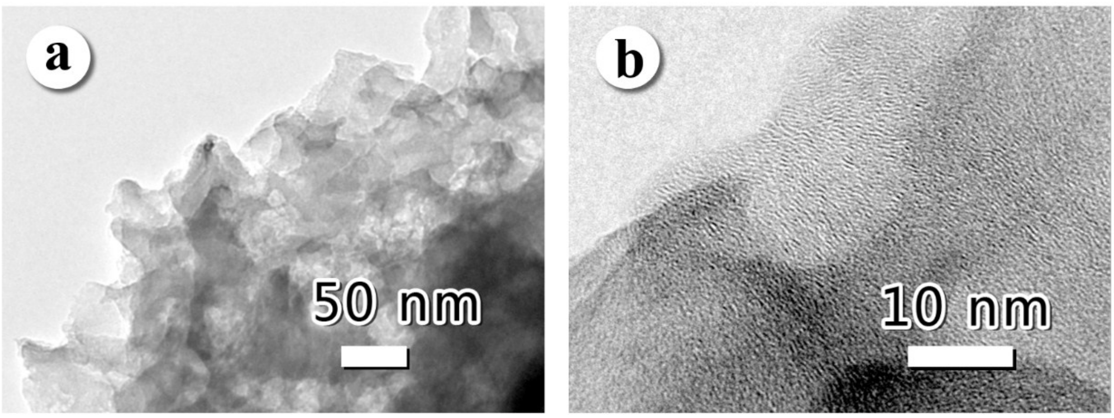

Figure S2 TEM image (a) and HR-TEM image (b) of MSC after 3000 cycles at 500 mAg^{-1}.

The Na^+ diffusion properties were evaluated by calculating the sodium-ion diffusion coefficient with following equation:[1,2]

$$D = \frac{R^2T^2}{2A^2n^4F^4C^2\sigma^2} \tag{S1}$$

where R is the gas constant, T is the absolute temperature, A is the electrode surface area, n is the number of electrons involved in the electrochemical reaction, F is Faraday's constant, C is the concentration of Na^+ and σ is the Warburg coefficient that is associated with Z' at low frequency.

$$Z' = R_s + R_{ct} + \sigma\omega^{-1/2} \tag{S2}$$

Herein, Z' is the real part of Nyquist plot (Figure S3a) at low-frequency region. R_s is bulk resistance of the cell, which reflects a combined resistance of the electrolyte, separator and electrodes. R_{ct} is the charge transfer resistance and ω is angular frequency. σ can be obtained from the slope of Randles plot, a plot of the real part of impedance against $\omega^{-1/2}$ as shown in Figure S3b.

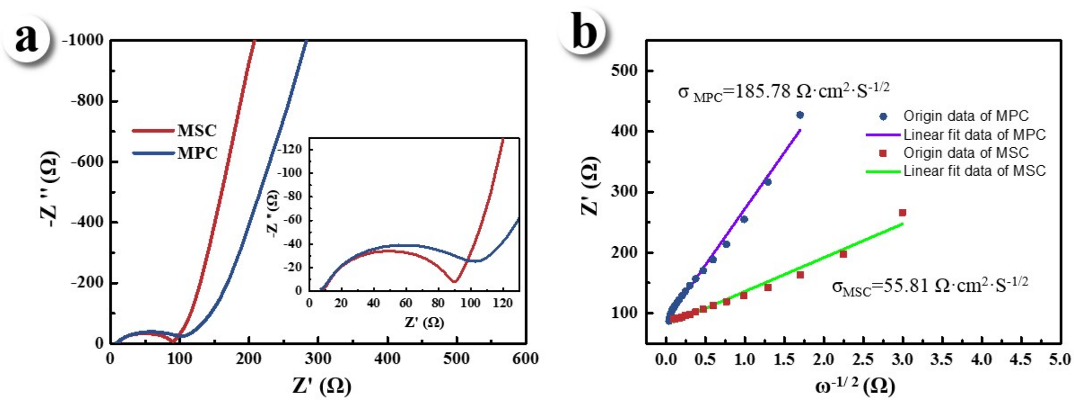

Figure S3 (a) Nyquist plots of MSC and MPC for the fresh cells. (b) The relationship plot between Z' and $\omega^{-1/2}$ at low-frequency region.

The D (sodium-ion diffusion coefficient) of MSC and MPC were calculated by equation (S1), and are 1.85×10^{-11} and 1.67×10^{-12} cm^2/S, respectively.

References:

1 B. Jin, E. M. Jin, K. Park and H. Gu, Electrochem. Commun., 2008, **10**, 1537.

2 M. Shi, Z. Chen and J. Sun, Cement Concrete Res., 1999, **29**, 1111.