Electronic Supplementary Material (ESI) for RSC Advances.

Synthesis of different CuO nanostructures by new catalytic template method as anode materials for lithium-ion batteries

Xiao-Hang Ma,[a] Shuang-Shuang Zeng,[a] Bang-Kun Zou,[a] Xin Liang, [a,b]Jia-Ying Liao, [a]

Chun-Hua Chen*[a]

[a] *CAS Key Laboratory of Materials for Energy Conversions, Department of Materials Science and Engineering & Collaborative Innovation Center of Suzhou Nano Science and Technology, University of Science and Technology of China, Anhui Hefei 230026, China*

[b]*Institute for Superconducting and Electronic Materials, University of Wollongong, NSW 2519, Australia*

Corresponding authors. E-mail: cchchen@ustc.edu.cn.; Phone: +86-551-63606971; Fax: (+86)551-63601592.

Supporting Information

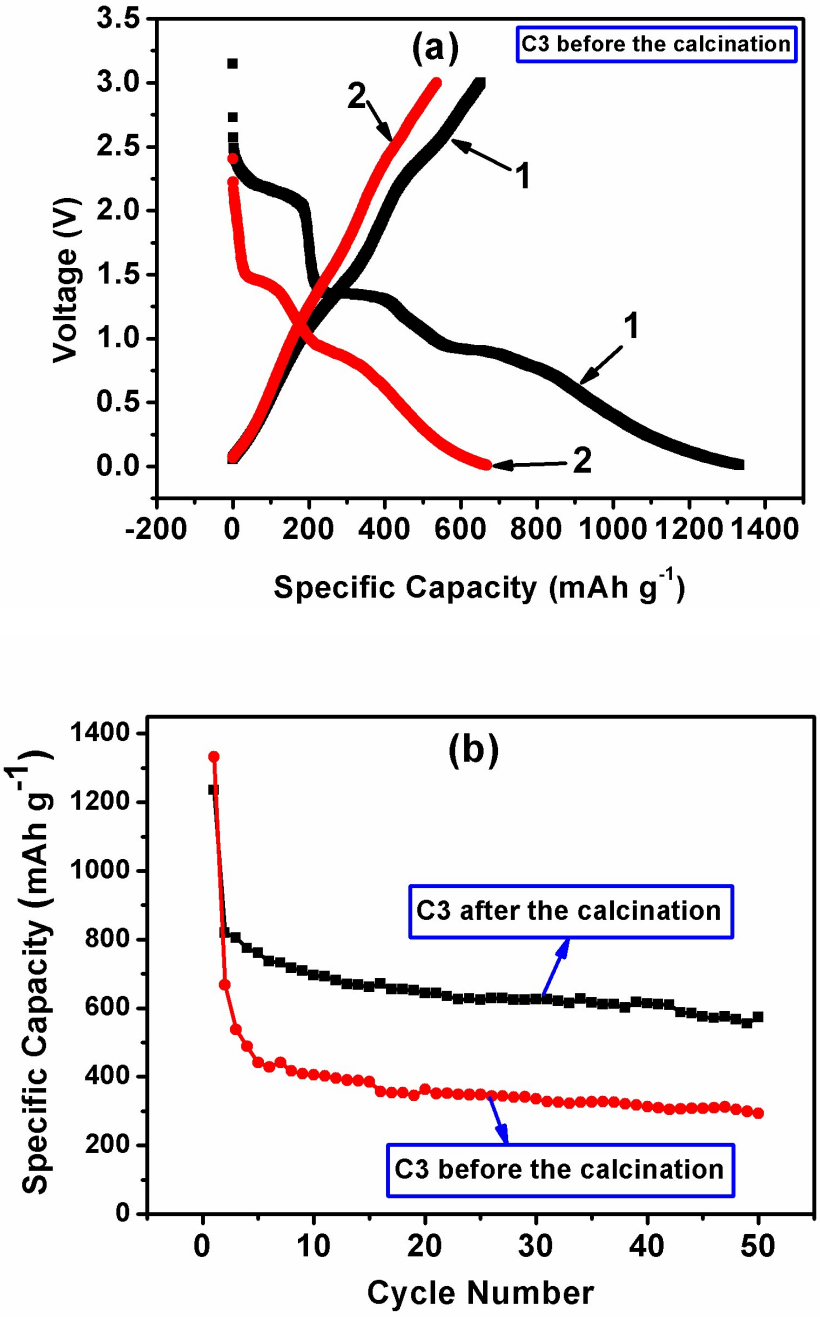
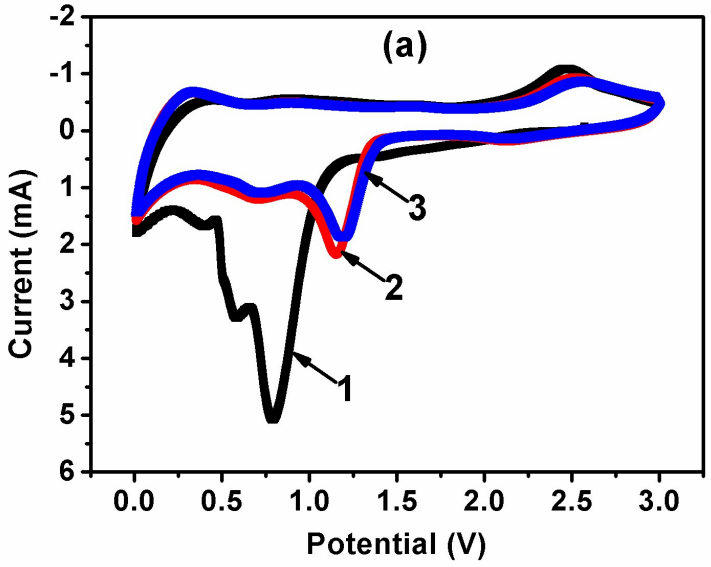


Fig. S1 The discharge and charge profiles of C3 before the calcination in the voltage range of 0.01-3.0 V at 0.2 C (1 C = 670 mA g^{-1}). The cycle numbers are indicated in the graphs. (b) cycling performance of the C3 before and after the calcination at 0.2 C.

Regarding the comparison of the electrochemical performance of CuO samples before and after the calcination, we can look at a representative example here. Apparently, the shape of the voltage profiles have no difference between C3 samples before (Fig. S1a) and after (Fig. 7c) the calcination. But the initial coulombic efficiency of C3 electrode before the calcination is about 48.9%, far less than 62.8% of the C3 electrode after the calcination. This result may be attributed to the combined effects of the differences in the crystallinity (Fig. 5a vs. Fig. 5b), the content of water and organic residues (Fig. 2). Also, the cycling performance of the CuO electrodes before and after the calcination is shown in Fig. S1b. The C3 electrode after the calcination shows markedly higher reversible capacity than that before the calcination. After 50 cycles, the discharge capacity of two samples is 587 and 293 mAh g^{-1}, respectively. Therefore, the calcination process is necessary for improving the electrochemical performance of CuO samples in this paper.



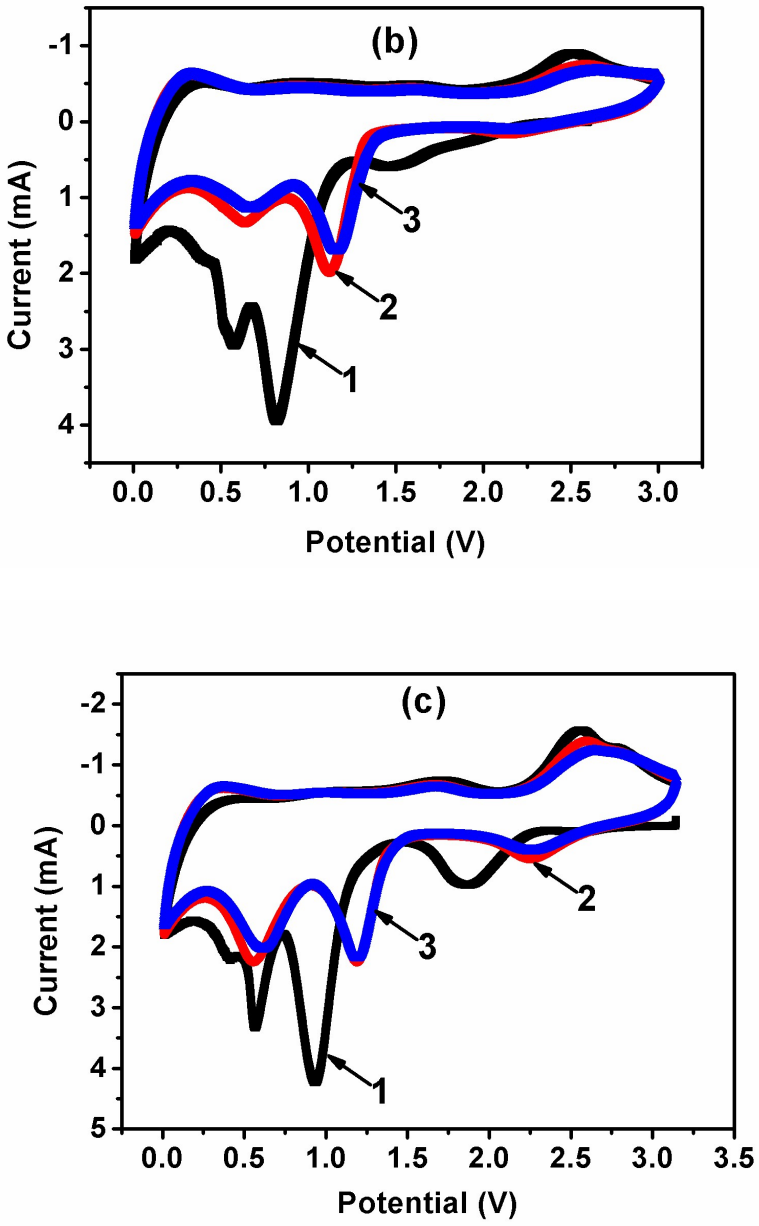


Fig. S2 The cyclic voltammograms of CuO/Li cells with the scan rate of 1 mV s^{-1}: (a) C1; (b) C2; (c) C3; The cycle numbers are indicated in the graph.

For CV, taking C3 as an example, in the first discharge process, four reduction peaks are observed at about 1.88 V, 0.93 V, 0.58 V and 0.42 V, these reduction peaks correspond to a multi-step electrochemical reaction that corresponds to the voltage profiles (Fig. 7c).The reduction peak at 0.42 V is probably due to the lithiation of the carbon black component in the CuO electrodes. During the first charge process, only two oxidation peaks are found at 1.64 V and 2.53 V. In the subsequent cycles, the CV

curves show very good reproducibility, suggesting a high degree of reversibility of the cell cycling. According to the cyclic voltammograms, the initial capacity loss of these electrodes is 42.9%, 42.3%, and 36.4%, respectively.