Electronic Supplementary Information

Two-step ball-milling synthesis of Si/SiO_x/C composite electrode for lithium ion batteries with excellent long-term cycling stability

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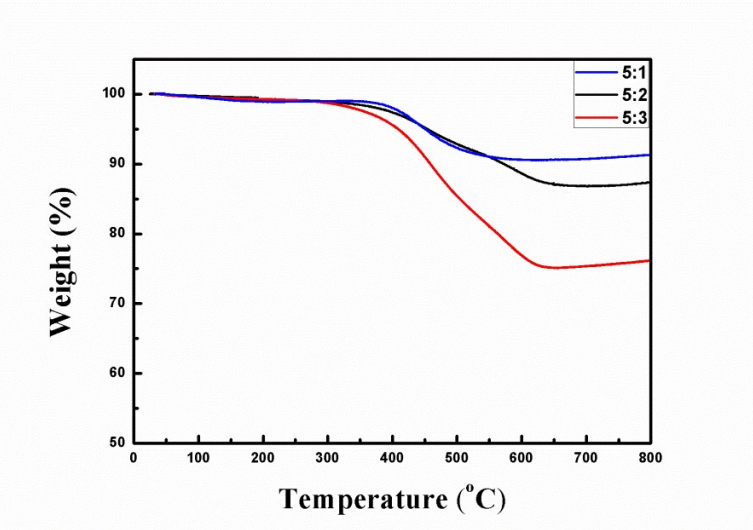

Fig. S1. TGA curve of Si/SiO_x/C at different weight ratios of Si/SiO_x to graphite

Thermogravimetric analysis (TGA) of the Si/SiO_x/C samples was carried out in air atmosphere from 40°C to 800°C. The weight ratios of Si/SiO_x to graphite for Si/SiO_x/C samples are 5:1, 5:2 and 5:3, corresponding to the weight content of carbon of about

10, 15 and 25%, respectively. It seemed a little different with the initial proportion of Si/SiO_x and graphite, because part of graphite materials may be adhered to the wall of stainless steel vessel during ball milling. The curves start to upward slightly at the end of the curves due to the oxidation of silicon, which further confirm the existence of silicon.

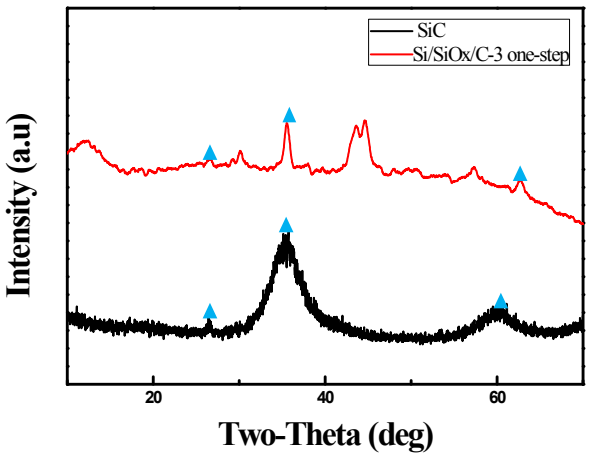

Fig. S2. XRD patterns of pure SiC and Si/SiO_x/C-3 composite fabricated by one-step ball-milling

Compared with the XRD patterns of pure SiC and Si/SiOx/C-3 composite fabricated by one-step ball-milling, we found the peak at 26.4° ,35.6° and 72.3° corresponding to the pure SiC which could prove the presence of SiC. The PXRD peak at 35.6 deg is the most obvious peak of SiC.

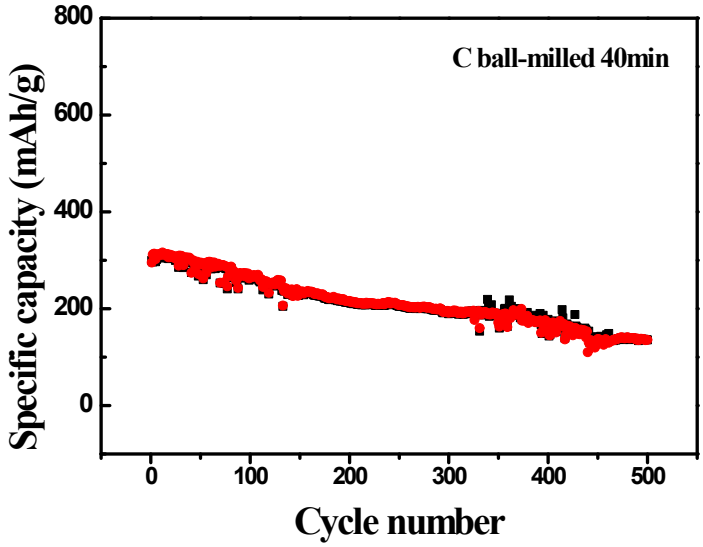

Fig.S3. Cycle performance of C ball-milled 40 min at a current density of 0.1 A g^{-1}

The electrochemical performance of C ball-milled 40 min under the same conditions as $Si/SiO_x/C$ composite (two-step) is shown in Fig. S3. The first charge/discharge capacity of C electrode were about 299.5 and 295.3 mAh g^{-1}. It displayed a reversible charge capacity and discharge capacity of 135.4 and 135.2 mAh g^{-1} after 500 cycles at a current density of 0.1 A g^{-1}.

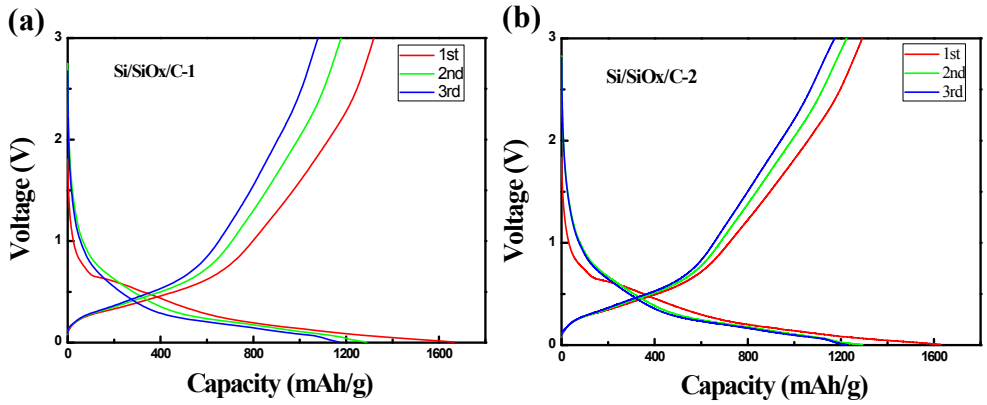

Fig.S4. Charge and discharge voltage profiles of $Si/SiO_x/C$-1 and $Si/SiO_x/C$-2 at a current density of 0.1 A g^{-1}