Supporting Information

Scalable Synthesis of Carbon stabilized SiO/Graphite Sheets Composite as Anode for High-Performance Li ion Batteries

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Structural characterization

The morphology and structure of these samples in this work were characterized by X-Ray diffraction (Philips X'Pert Super diffractometer with Cu Kα radiation (λ=1.54178Å)), Raman spectrometer (Lab; RAM HR UV/VIS/NIR), scanning electron microscopy (SEM) (JSM; 6700F), and transmission electron microscopy (TEM) (JEOL; 2010).

Electrochemical measurement

Half-cell tests were conducted using two electrode coin-type cells (CR2016) with pure Li metal foil as counter and reference electrode. For preparing working electrode, a slurry mixture of as-prepared active materials, super P, and carboxymethylcellulose sodium (CMC-Na) at a weight ratio of 70: 15: 15, was coated on copper foil (99.9%). A solution of 1 M LiPF6 in ethylene carbonate (EC) and diethyl carbonate (DEC) (1:1 in volume ratio) was served as electrolyte. The cells were assembled in an argon-filled glove box. It is noted that we adopted a copper foil with diameter size of 12 mm, the pasted mass on each electrode was 1.5 mg approximately. Galvanostatic charge/discharge measurements were carried out on a LAND-CT2001A instrument with a fixed voltage range of 0.01−1.5 V (vs. Li/Li^+). Noted, the charge/discharge rate and specific capacity were calculated based on the total mass of active materials.

Cyclic voltammetry (CV) was performed on electrochemical workstation (CHI660D), with a scanning rate of 0.1 mV s^{-1} at room temperature. Electrochemical impedance spectroscopy (EIS) was also measured with an electrochemical workstation (CHI660D) by applying an alternating current (AC) voltage of 5 mV in the frequency range from 100 kHz to 0.2 Hz. Noted, the pre-set current density 1C value of SGC-1, SGC-3, SGC-5, SiO, SC, GC, and graphite are 900, 700, 550, 1800, 1500, 400, and 372 mA g^{-1}, respectively. Noted that the reversible capacity and current density are calculated on basis of the weight of the composite.

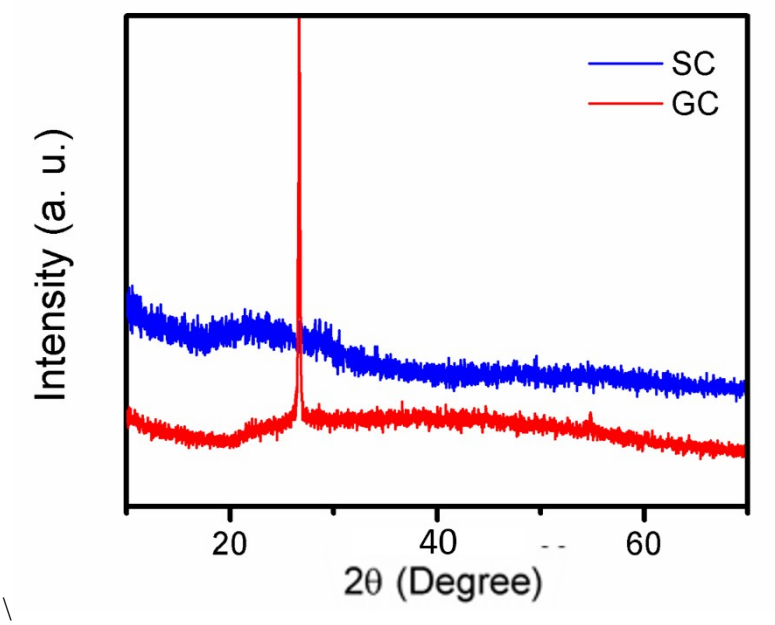

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Fig. S1 The XRD patterns of the SiO@C (SC) composite, and the graphite@C (GC) composites.

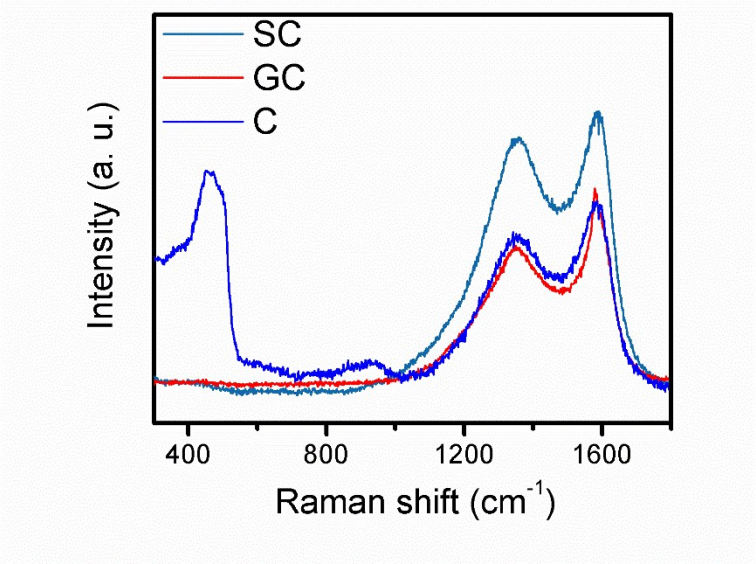

Fig. S2 The Raman spectrum of the SC, GC, and carbon samples.

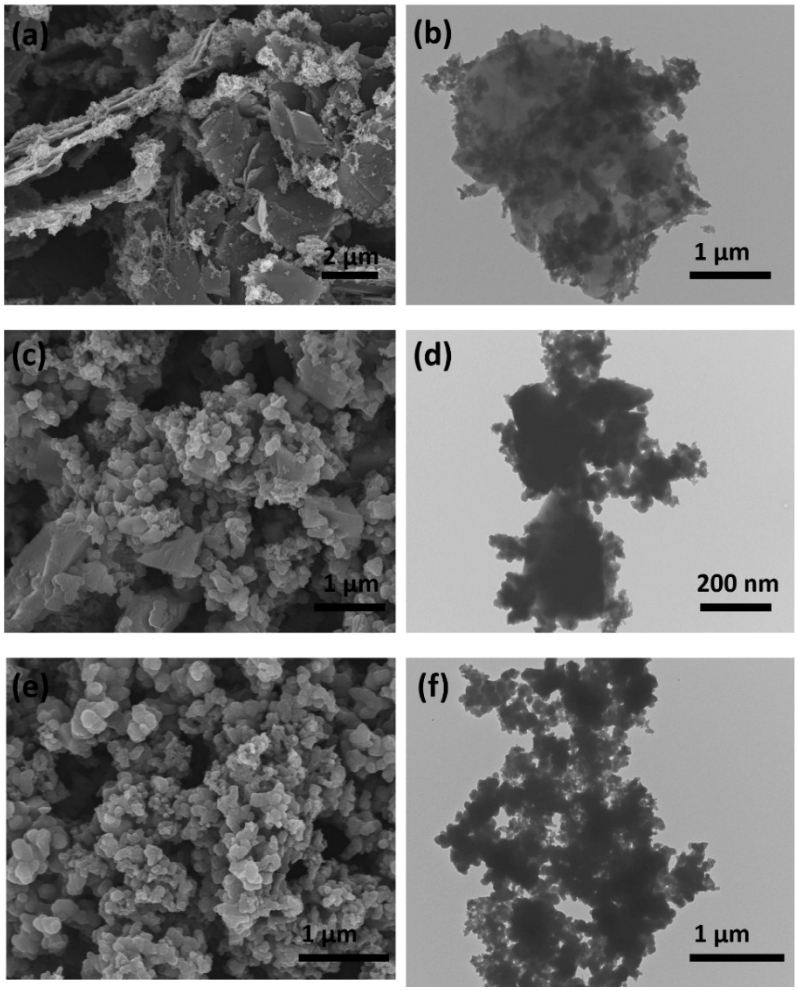

Fig. S3 The SEM and TEM images of the (a, b) GC, (c,d) SC, and (e, f) polyaniline-derived carbon.

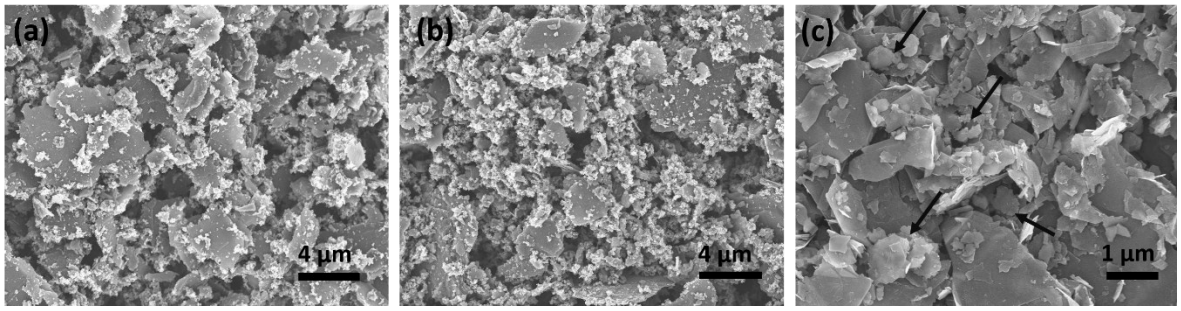

Fig. S4 The SEM images of the SGC-1, SGC-3, and SG composite.

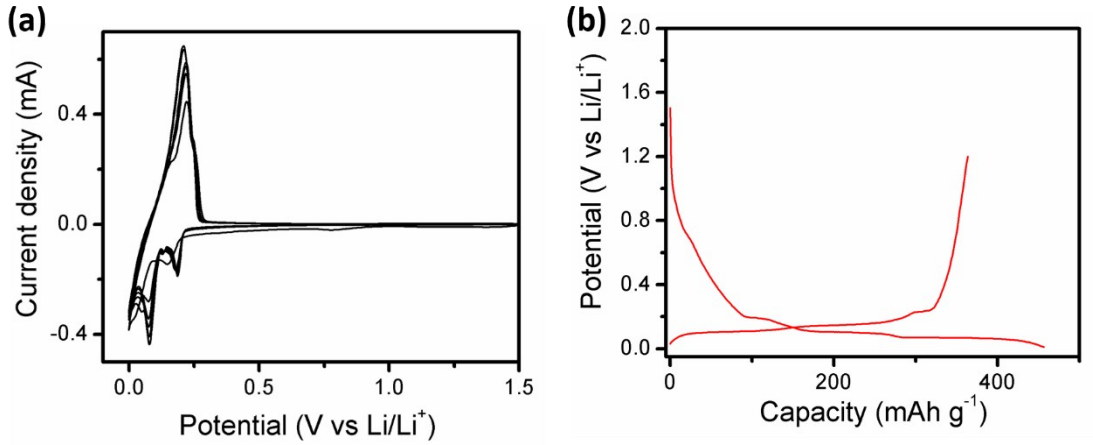

Fig. S5 The (a) CV curves and (b) potential plateau of the graphite based electrode.

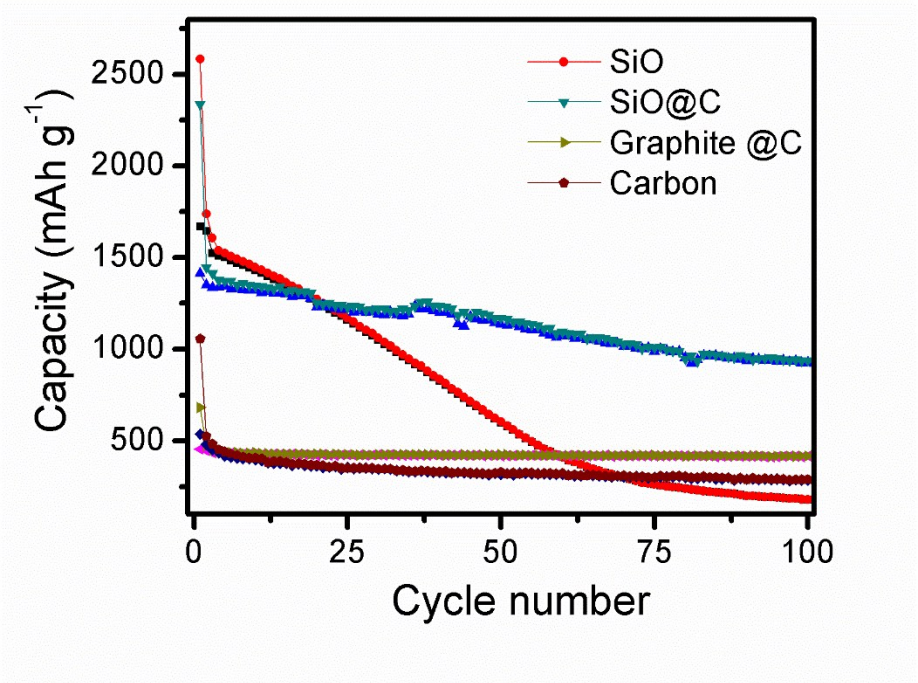

Fig. S6 The cycling performance of the SiO, SC, GC, and carbon electrodes.

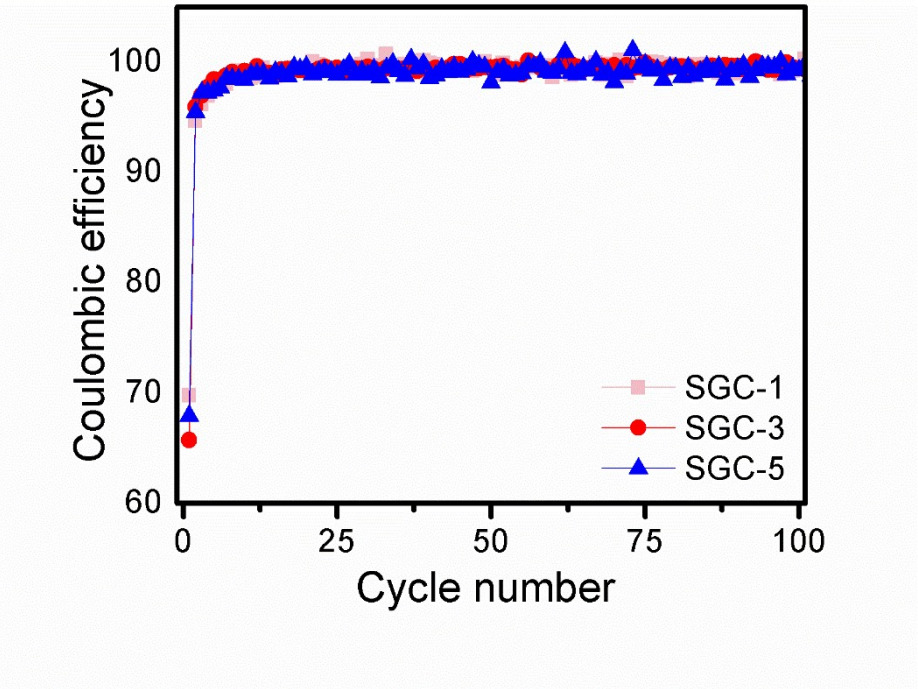

Fig. S7 The coulombic efficiency of the SGCs electrodes at the current density of 0.2 C.

Table S1. The comparison of electrochemical performance between this work and previous similar report.

Sample	Preparation method	Initial discharge/charge capacity	Capacity retention after 100 cycles	Long-term cycling performance	References
SiO/Graphite	Direct blend	1394/1068 mAh/g	500 mAh/g at 0.12 A/g, 72% capacity retention	none	J. Power Sources, 2008, 185, 542-548
SiO@CNFs/G	Ball milling and spray-drying	1030/550 mAh/g	615.1 mAh/g at 0.1 A/g, with gradually improved capacity	none	RSC Adv., 2014, 4, 34615-34622
SiO/G	ball milling	855/571 mAh/g	390mAh/g only after 50 cycles at 0. 23 A/g,68% capacity retention	none	J Solid State Electrochem, 2012, 16, 1453-1460
SiO/G/CNT	ball milling and chemical vapor deposition	790/513 mAh/g	495mAh/g at 0.23 A/g,96.5% capacity retention	none	J Solid State Electrochem, 2012, 16, 1453-1460
Carbon coated SiO/Graphite	ball milling and chemical vapor deposition (full cell)	523/840 mAh/g	409 mAh/g at 0.2 A/g,78.2% capacity retention	none	J. Electrochem. Soc., 2013, 160, A1348-A1352
SGC-1	In situ polymerization and annealing	1280/893 mAh/g	774mAh/g at 0.18 A/g, 86.7% capacity retention	592mAh/g at 0.72A/g, 77.4% capacity retention after 500 cycles	This work
SGC-3		1072/734 mAh/g	640mAh/g at 0.14 A/g, 87.2% capacity retention	489mAh/g at 0.56A/g,80% capacity retention after 500 cycles	This work
SGC-5		793/545 mAh/g	508mAh/g at 0.11 A/g, 93.2% capacity retention	432mAh/g at 0.44A/g 84.8% capacity retention after 500 cycles	This work