

Supporting information

Microwave Irradiation Assisted Combustion towards Modified

Graphite as Lithium Ion Battery Anode

Kunfeng Chen^a, Hong Yang^b, Feng Liang^c and Dongfeng Xue^{*,a}

^a State Key Laboratory of Rare Earth Resource Utilization, Changchun Institute of Applied Chemistry, Chinese Academy of Sciences, Changchun 130022, China

^b School of Mechanical and Chemical Engineering, The University of Western Australia, WA 6009, Australia

^c Faculty of Metallurgical and Energy Engineering, Kunming University of Science and Technology, Kunming 650093, China

*E-mail: dongfeng@ciac.ac.cn

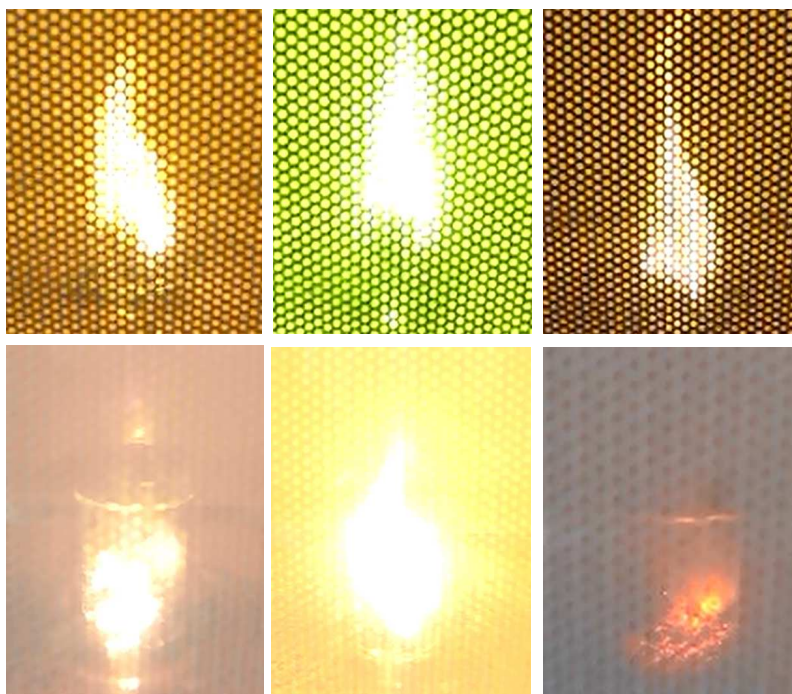


Figure S1 Photographs from different times show the reaction process of microwave assisted synthesis of expanded graphite. First, electrical arc induced flame from the reaction of H_2SO_4 and KMnO_4 was occurred. Then, expanding graphite process was occurred.



Figure S2 Photographs of graphite and modified graphite. After microwave treating, the volume of graphite increased.

Table S1. Structure characteristics of the graphite and expanded graphite obtained based on the (002) XRD diffraction peak and measured capacity of graphite anode in lithium ion battery. MG refers to modified graphite.

| Sample | KMnO ₄ (g) | H ₂ SO ₄ (g) | 2 θ (°) | d ₀₀₂ (nm) | Capacity at 100 mA/g (mAh/g) |
|----------|--------------------------|---------------------------------------|-------------------|--------------------------|---------------------------------|
| Graphite | 0 | 0.5 | 26.22 | 0.339 | 236 |
| MG-0.07 | 0.07 | 0.5 | 26.64 | 0.334 | 298 |
| MG-0.10 | 0.10 | 0.5 | 26.75 | 0.333 | 373 |
| MG-0.13 | 0.13 | 0.5 | 26.65 | 0.334 | 243 |
| MG-0.15 | 0.15 | 0.5 | 26.65 | 0.334 | 233 |

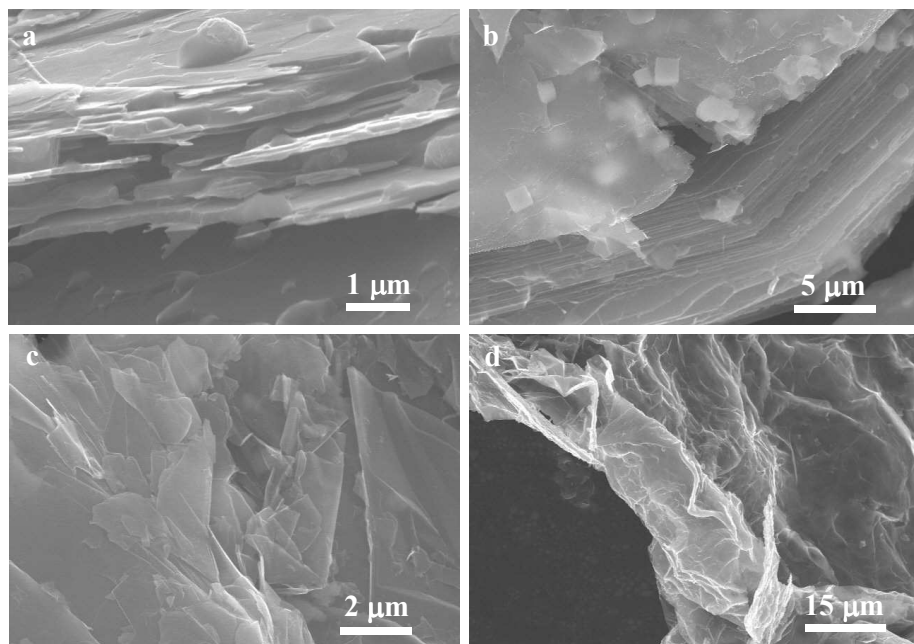


Figure S3. SEM images of MG-0.07 (a), MG-0.1 (b), MG-0.13 (c), MG-0.15 (d).

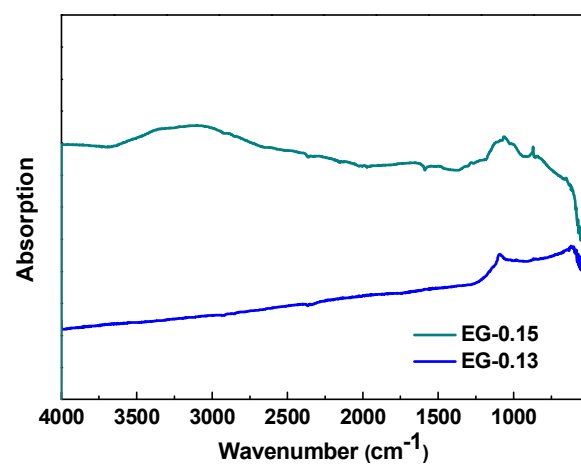


Figure S4 IR spectra of MG-0.13 and MG-0.15.

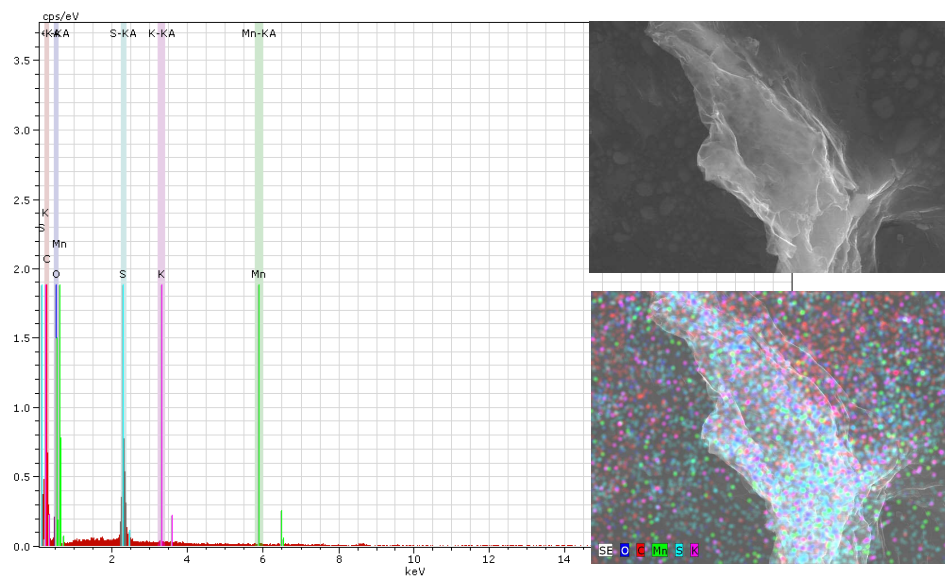


Figure S5. SEM, EDS mapping image and EDS spectrum of MG-0.15.

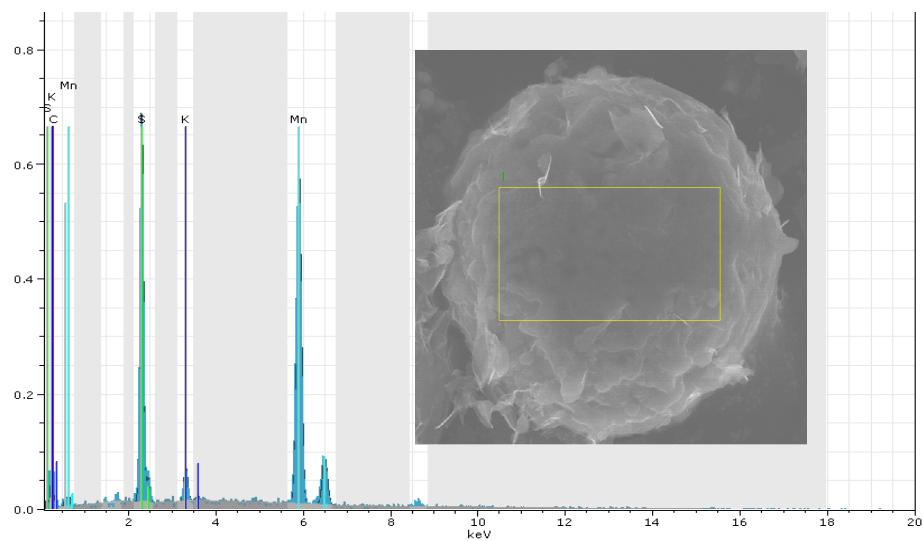


Figure S6. SEM image and EDS spectrum of MG-0.20 (addition of 1.0 g H₂SO₄).

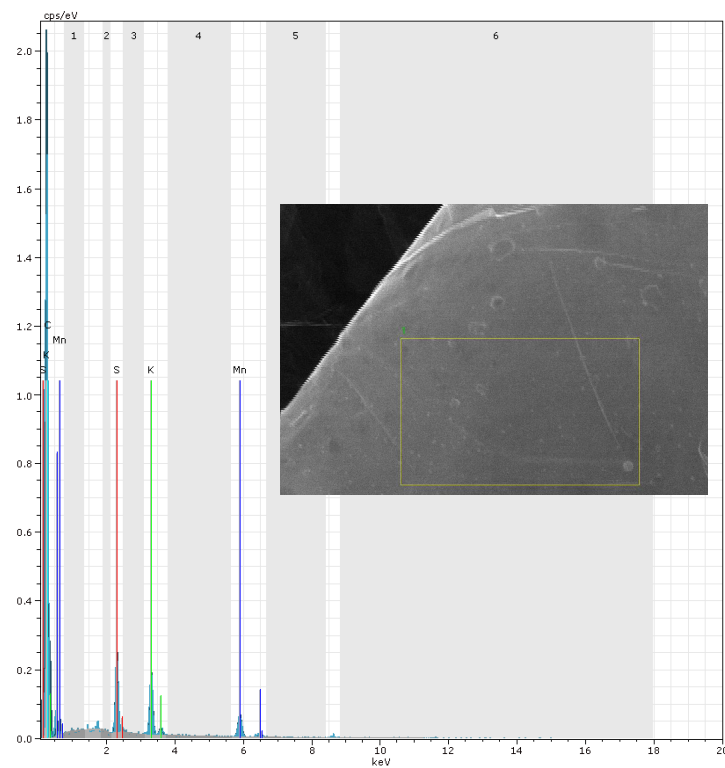


Figure S7. SEM image and EDS spectrum of MG-0.40 (addition of 1.5 g H₂SO₄).

Table S2 EDS data of C/Mn and C/S ratios

| Sample | C/Mn | C/S |
|---------|----------|----------|
| MG-0.15 | 149.2302 | 8.484126 |
| MG-0.40 | 63.93987 | 46.32782 |

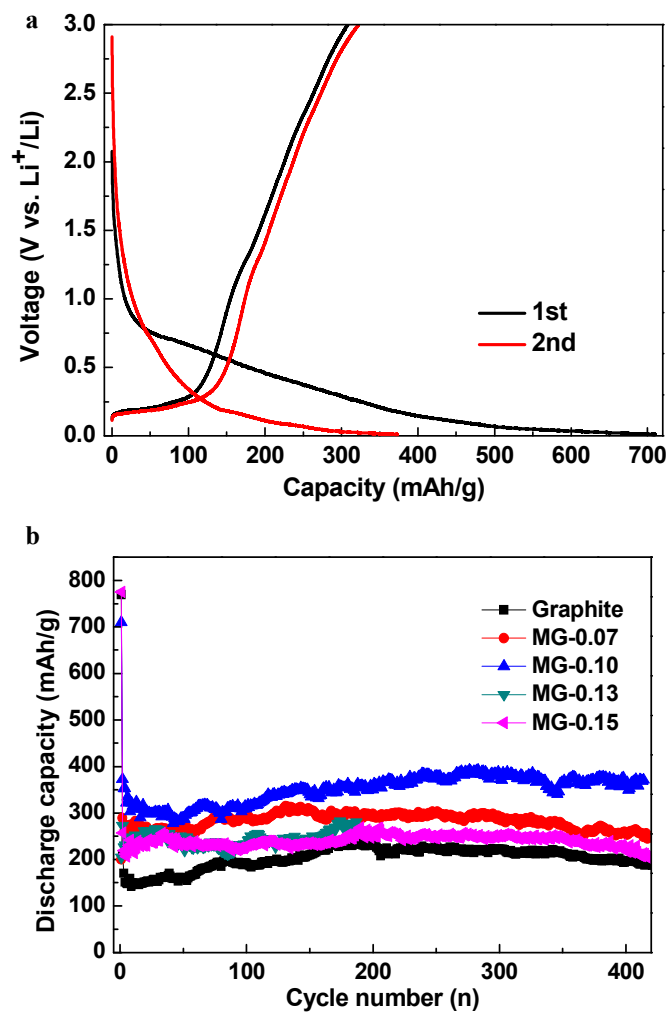


Figure S8. (a) Charge-discharge curves of MG-0.10 and (b) cycling performance of the original graphite and expanded graphite samples at a current density of 100 mA/g.

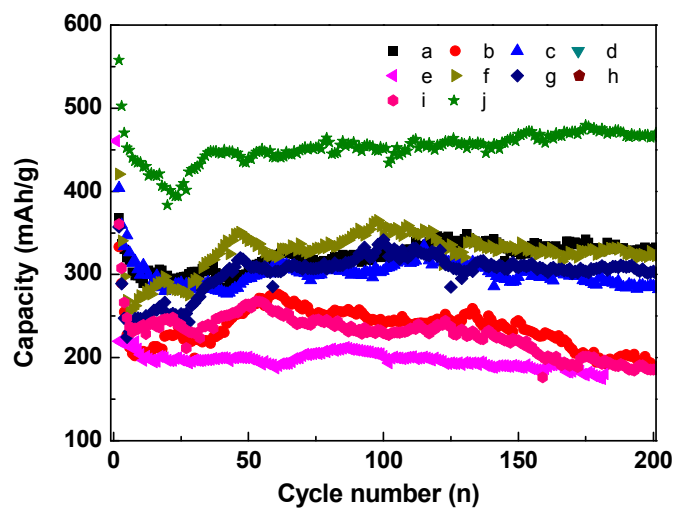


Figure S9. Cycling performance of the MG samples obtained at a current density of 100 mA/g. MG-0.07 (a), MG-0.10 (b), MG-0.20 (c), MG-0.30 (d) and MG-0.40 (addition of 1.0 g H₂SO₄) (e). Cycling performance of the MG samples of MG-0.07 (f), MG-0.10 (g), MG-0.20 (h), MG-0.30 (i), MG-0.40 (j) (addition of 1.5 g H₂SO₄).