Supplementary Information

A Novel Facile and Fast Hydrothermal-assisted Method to Synthesize Sulfur/Carbon Composite for High-Performance Lithium-Sulfur Batteries

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Calculation of theoretical sulfur content

The theoretical weight of sulfur for per gram of KB (W) can be calculated by the formula as follow:

$$W = \frac{V_0 \cdot d_S}{1 + \alpha_S} \qquad (1)$$

Where V_0 stands for total pore volume of KB (2.56 cm^3 g^{-1}, obtained from Table 1), d_s is the density of sulfur (1.96 g cm^3), α_s is the coefficient of sulfur volumetric expansion (~ 0.8). Therefore, the theoretical weight of sulfur for per gram of KB was 2.8 g, corresponding to the theoretical sulfur content of 73.6 wt. %.

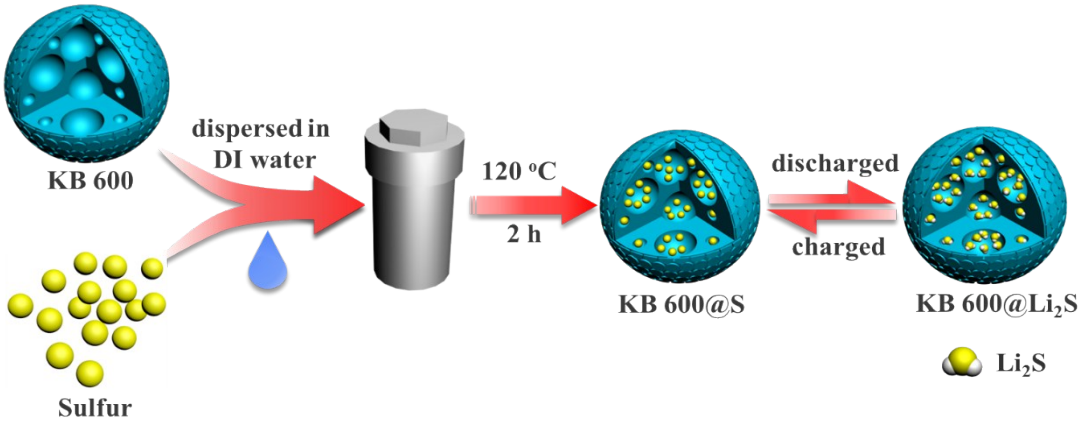

Figure S1. Schematic of the synthesis process of the H-S@C composite.

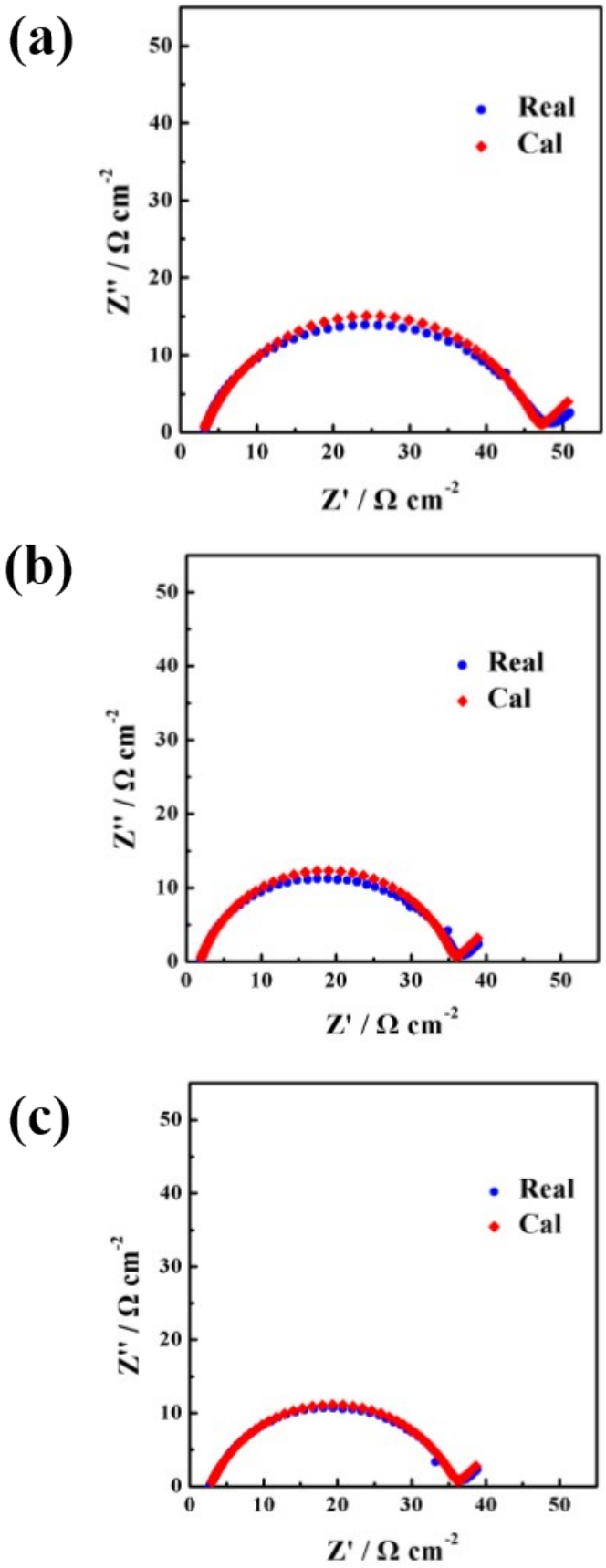

Figure S2. Fitted EIS curves of the G-S@C (a), M-S@C (b) and H-S@C (c) electrodes before cycling.

Table S1. The cell performance comparison of this work with recent publications

Carbon materials	Preparation method	Sulfur content	C-rate	Initial discharge capacity (mAh g^{-1})	Cycling capacity (mAh g^{-1})		ref
acetylene black	Ball milling	60%	0.1C	1077	10^{th}	606	1
Super P	Melting method	60%	0.1C	900	100^{th}	500	2
hierarchical porous-structured carbon	Melting method	70%	0.2C	~1200	120^{th}	~500	3
Graphene	chemical synthesis	70%	0.1C	~1100	100^{th}	~600	4
MWCNT/ KB	Directly mixing	50%	0.2C	~1200	100^{th}	~580	5
KB	Melting method	70%	0.5C	~800	100^{th}	~400	6
KB	Melting method	75%	0.1C	~800	100^{th}	~600	7
KB	Melting method	79.3%	0.1C	~1200	100^{th}	500	8
KB	Melting method	80%	0.2C	1217	100^{th}	802	9
KB	Hydrothermal method	70%	0.2C	1239	100^{th}	825	10

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10. This work