Supporting Information

In-situ carbon-coating and Ostwald ripening-based route for Ni$_3$S$_4$@C hollow spheres with superior Li-ion storage performances

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Figure S1. XRD pattern of the pure-phase of NiS$_2$ precursor.
Figure S2. SEM images of the nickel sulfide hollow micropheres without carbon-coating.
Figure S3. Raman spectrum of Ni$_3$S$_4$@C hollow microspheres. As shown in this image, the two major Raman bands are located at 1350 and 1600 cm$^{-1}$. The band located at 1600 cm$^{-1}$ corresponds to the G peak from the breathing motion of sp$^3$ rings, while the one located at 1350 cm$^{-1}$ is in good agreement with the D band, which is generally associated with a double-resonance effect. The value I$_D$/I$_G$ can be used to evaluate the degree of disorder for pyrolytic carbon, and the measured I$_D$/I$_G$ intensity ratio is approximate 2.3, indicating the amorphous phase is a major component of the carbon layer.
Figure S4. N$_2$ adsorption/desorption isotherms (a) and the corresponding pore size distribution (b) of the Ni$_3$S$_4$@C hollow microspheres.
Figure S5. TGA curve of Ni$_3$S$_4$@C hollow microspheres under O$_2$ atmosphere from the room temperature to 900 °C.
Figure S6. SEM image of Ni$_3$S$_4$@C hollow microspheres after 100 cycles at a current density of 0.1C.
**Figure S7.** Li-ion storage performance of \( \text{Ni}_3\text{S}_4@\text{C} \) hollow microspheres and bare \( \text{Ni}_3\text{S}_4 \) hollow microspheres at a current density of 0.1C (about 100 mA g\(^{-1}\)). The bare \( \text{Ni}_3\text{S}_4 \) hollow microspheres were synthesized via the similar hydrothermal crystallization route, while no using of glucose as the carbon source.
Figure S8. EIS spectra of Ni$_3$S$_4$@C hollow microspheres and bare Ni$_3$S$_4$ hollow microspheres.