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Supporting Information

Synthesis of Few-layer MoS_2@N-doped Carbon Core-shell Hollow Spheres using Cationic Surfactant as a Template for Highly Stable Lithium-ion Storage

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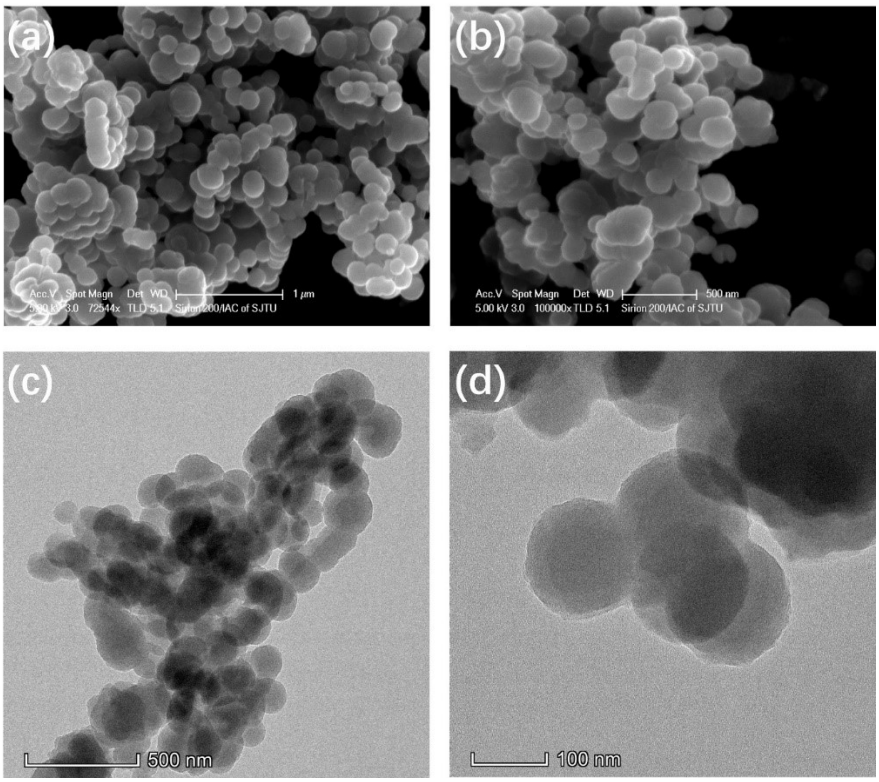

Figure S1. (a, b) SEM and (c, d) TEM images of the PPY spheres prepared under the same condition without the addition of $(NH_4)_2MoS_4$.

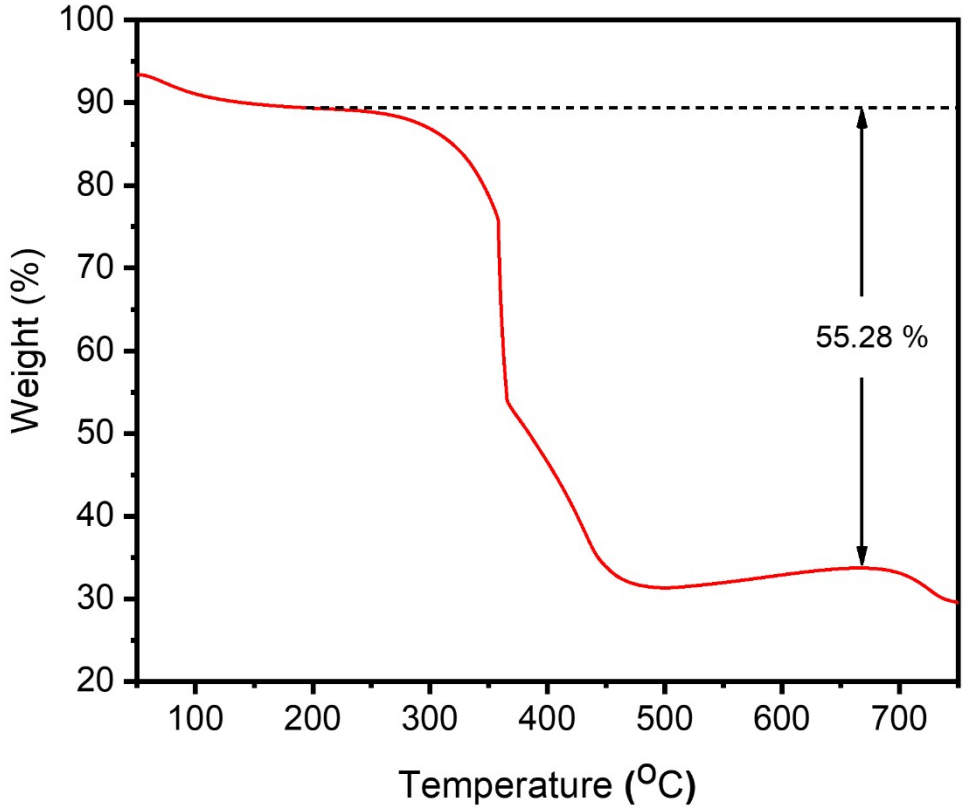

Figure S2. TGA curve of the PPY-100 hollow sphere.

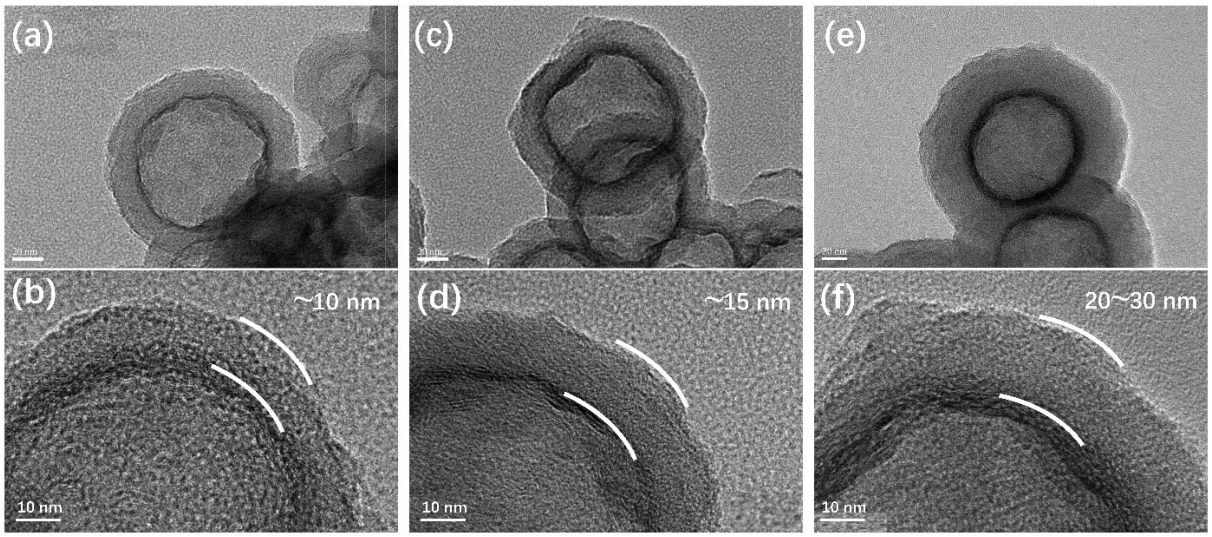

Figure S3. TEM and HRTEM images of (a, b) PPY-50, (c, d) PPY-100 and (e, f) PPY-150.

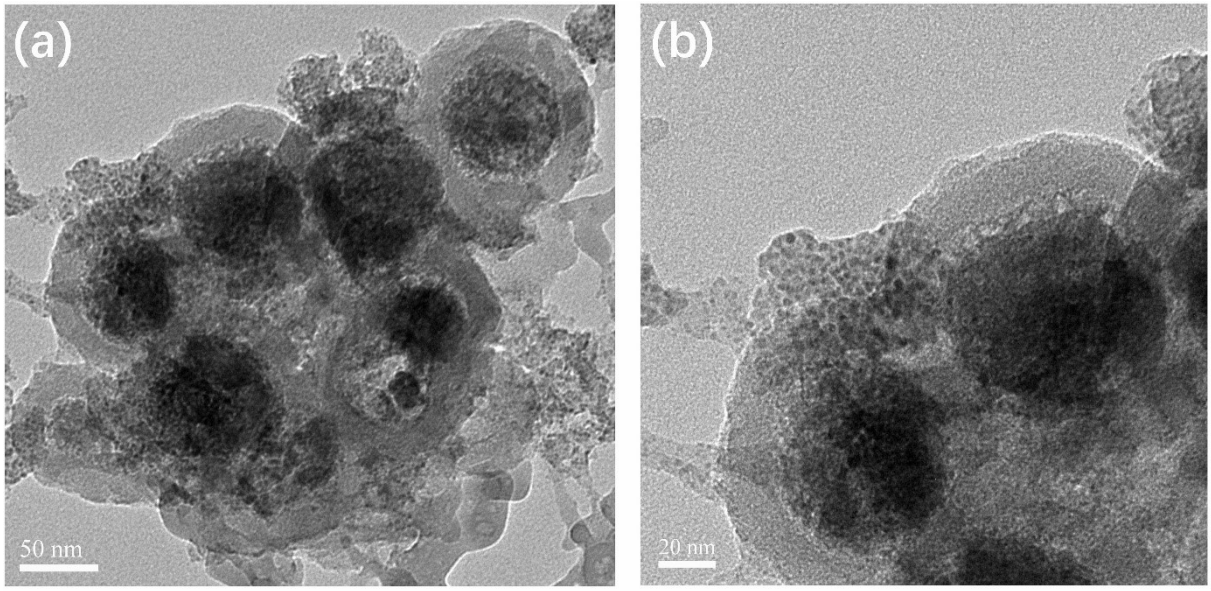

Figure S4. (a) TEM and (b) HRTEM images of PPY-100 after 100 cycles at 0.1 A g^{-1}.

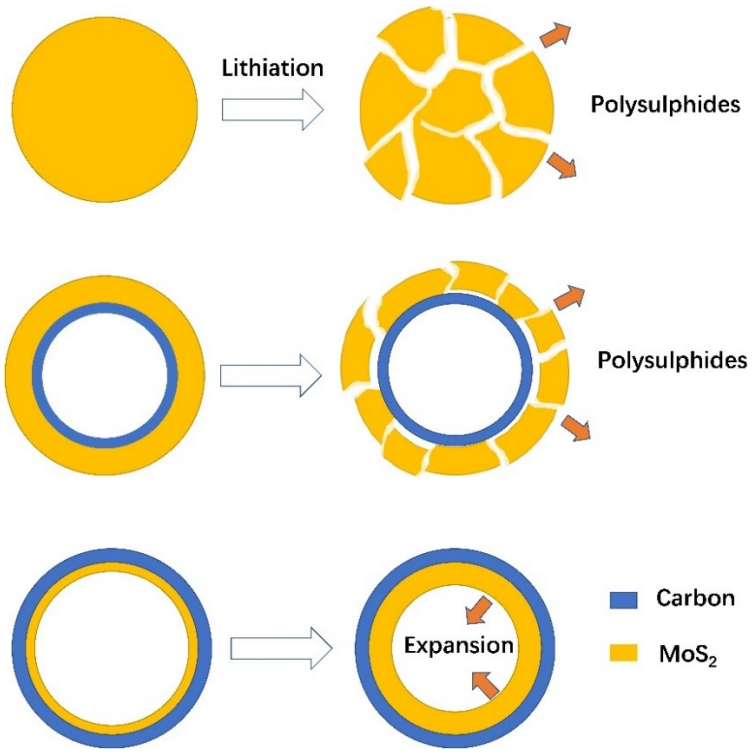

Figure S5. MoS_2 experiences large volume expansion and dissolution of polysulphide, resulting in rapid capacity decay. The core–shell structure provides a stable core, MoS_2 is in direct contact with the electrolyte, whcih leads to polysulphide dissolution as well. The core-shell hollow morphology with carbon shell provides internal void space to accommodate the volume expansion and prevent polysulphide dissolution during lithiation process.

Table S1. Comparison of lithium-storage performance for PPY-100 against other MoS_2 and MoS_2/carbon based materials.

Materials	Current density A g^{-1}	Cycle number	Capacity mAh g^{-1}	Ref
EF-MoS_2@NC hollow spheres	**1**	**1000**	**829**	**This work**
TiO_2@MoS_2	0.1	200	714	1
MoS_2 nanosheet@TiO_2 nanotube	0.1	100	472	2
CNT@MoS_2	5	1000	800	3
CNT@MoS_2@C	1	500	905	4
TiO_2@NC@MoS_2	1	200	590	5
C@MoS_2	0.4	200	952	6
CuS@MoS_2	0.2	200	912	7
C@TiO_2@MoS_2	1	600	775.2	8

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