

# Supplementary Information

## Fast and Facile Preparation of S Nanoparticle by Flash Nanoprecipitation for Lithium-sulfur Battery

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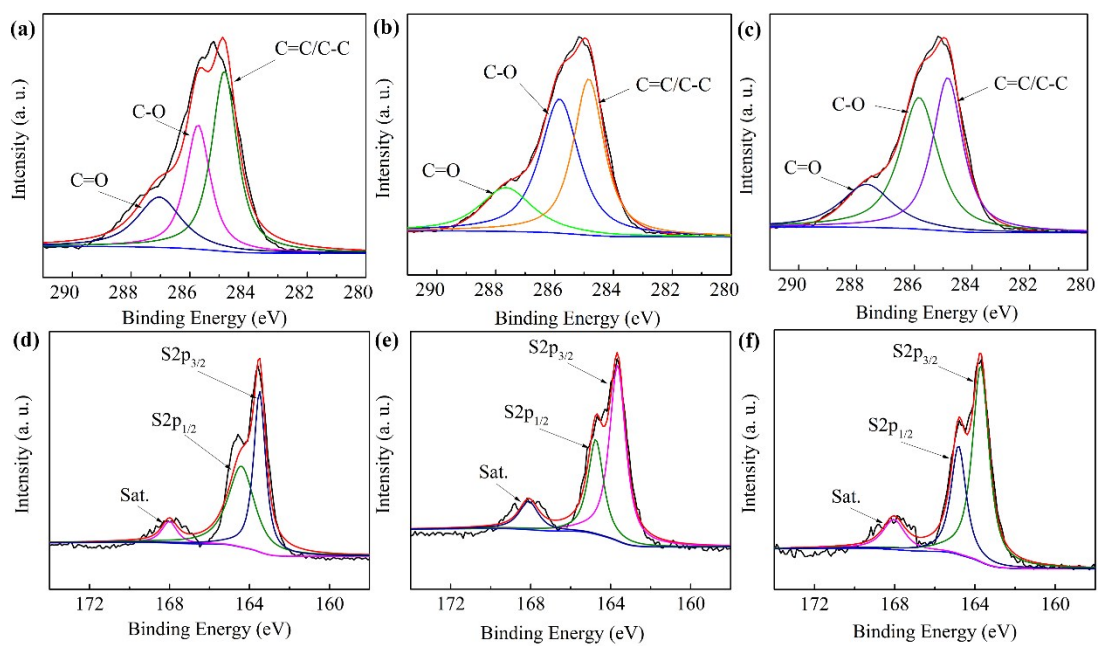
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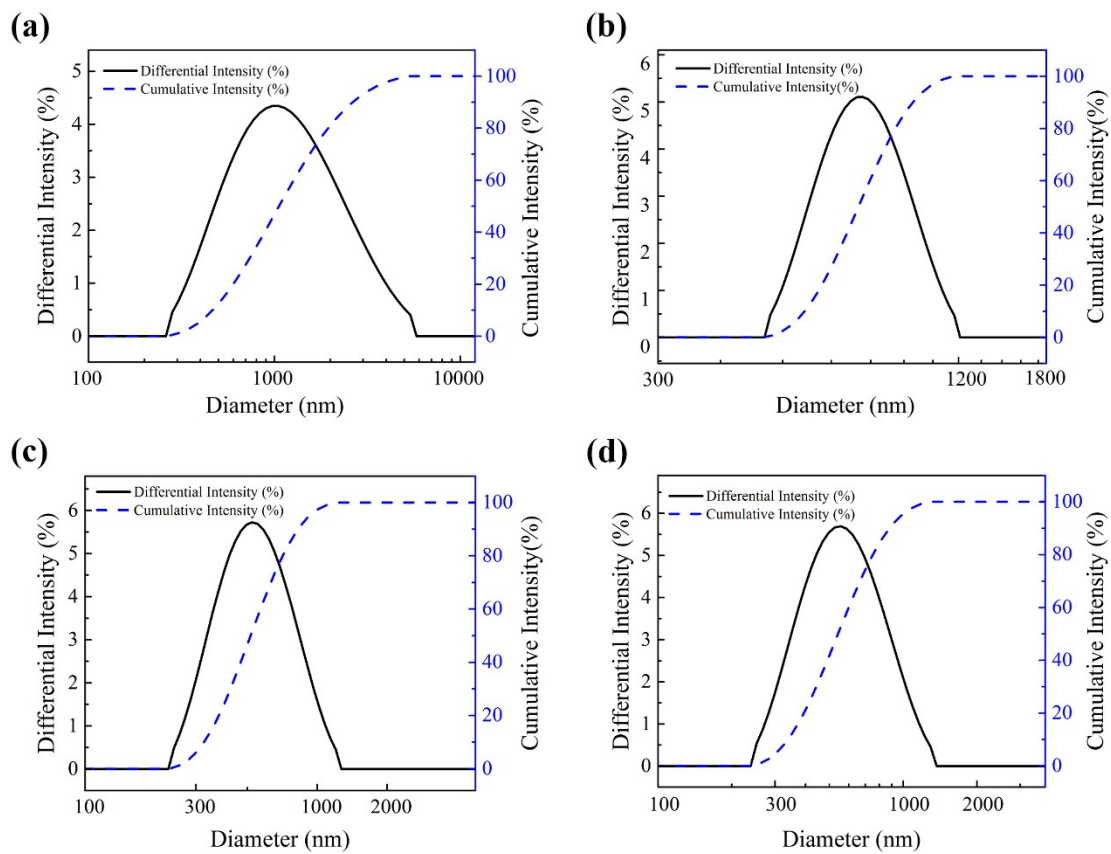
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Table S1. Sulfur loading percentage of Li-S batteries based on various hollow structured sulfur hosts.

Host materials	S content	Ref.
S-x	99 wt. %	In this paper
HCS	70 wt. %	1
Multi shelled HCS	86 wt. %	2
Yolk-Shell S@TiO <sub>2</sub>	71 wt. %	3
Yolk-Shell S@PANI	82 wt. %	4
S@PTh	71.9 wt. %	5
TiO@C-HS	70 wt. %	6
SCSPs/mrGO	90 wt. %	7
S/PPy-MnO <sub>2</sub>	70 wt. %	8



**Figure S1** XPS spectra of S-x. C 1s spectra of (a) S-20, (b) S-50, (c) S-80. S 2p spectra of (d) S-20, (e) S-50, (f) S-80.



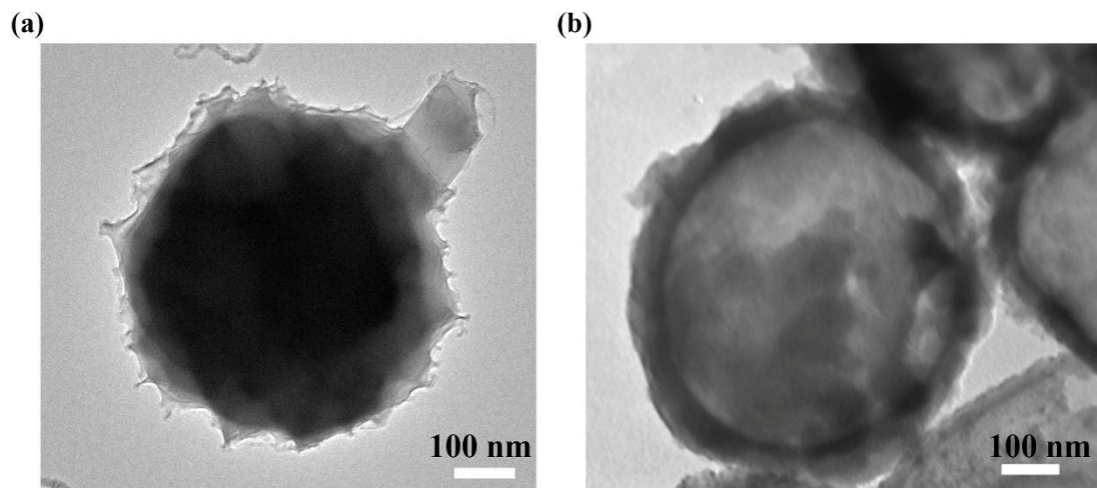
**Figure S2** DLS size distribution of (a) S-20, (b) S-50, (c) S-80, (d) S-110

**Table S2.** Physical Parameters for S-x

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Sample	Speed	R <sub>e</sub>	DLS size (nm)	PDI
1	20	672.7	1036.7	0.340
2	50	1849.9	763.1	0.109
3	80	3228.9	532.4	0.076
4	110	4809.7	507.9	0.068

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**Figure S3** TEM images of (a) S-110 and (b) S-110 after being heated at 155 °C for 5 h

**Table S3.** Electrochemical performance of Lithium-Sulfur batteries based on various hollow structured sulfur hosts

Host materials	Cycle capacity (mAh g <sup>-1</sup> )			Ref.
	Initial	Retention	Current density	
S-110	1030.7	807.7	50 cycles at 0.1C	In this work
Sulphur-TiO <sub>2</sub>	1030	690	1000 cycles at 0.5C	9
Polyaniline-Coated Sulfur	1101	765	200 cycles at 0.2C	10
Sulfur/Polythiophene	1119.3	830.2	80 cycles at 0.1 A g <sup>-1</sup>	11
Polyaniline-Coated Sulfur/Carbon	1405	596	100 cycles at 0.1C	12
Sulfur/Carbon	1285	750	500 cycles at 0.2C	13
SiO <sub>2</sub> -coated sulfur	1420	763	50 cycles at 0.1C	14
Hollow Carbon-Sulfur	1070	900	150 cycles at 0.2C	15

**Table S4.** The EIS spectra fitting of the S-x cathode.

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Sample	$R_s$ ( $\Omega$ )	$R_{ct}$ ( $\Omega$ )
S-20	7.6	62.5
S-50	5.08	78.2
S-80	4.375	55.5
S-110	2.105	15.5

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