Supporting Information for

Boosting Sodium Storage of Fe$_{1-x}$S/MoS$_2$ Composite via Heterointerface Engineering

Song Chen$^{1,2}$, Shaozhuan Huang$^2$, Junping Hu$^2$, Shuang Fan$^{1,2}$, Yang Shang$^2$, Mei Er Pam$^2$, Xiaoxia Li$^2$, Ye Wang$^4$, Tingting Xu$^4$, Yumeng Shi$^{1,3}$, *, Hui Ying Yang$^2$, *

$^1$International Collaborative Laboratory of 2D Materials for Optoelectronics Science and Technology of Ministry of Education, College of Optoelectronic Engineering, Shenzhen University, Shenzhen 518060, People’s Republic of China

$^2$Pillar of Engineering Product Development, Singapore University of Technology and Design, 8 Somapah Road, 487372, Singapore

$^3$Engineering Technology Research Center for 2D Material Information Function Devices and Systems of Guangdong Province, College of Optoelectronic Engineering, Shenzhen University, Shenzhen 518060, People’s Republic of China

$^4$Key Laboratory of Material Physics of Ministry of Education, School of Physics and Engineering, Zhengzhou University, Zhengzhou 450052, People’s Republic of China

*Corresponding authors. E-mail: yanghuiying@sutd.edu.sg (Hui Ying Yang); yumeng_shi@163.com (Yumeng Shi)

Supplementary Figures

![Supplementary Figures]

Fig. S1  a XRD pattern and b SEM image of PB nanocubes. SEM images of c FeCN nanocubes and d FeCN/MoS$_2$ composite
**Fig. S2** Survey XPS spectra of the Fe_{1-x}S/MoS$_2$ composite

**Fig. S3** a XRD pattern, b, c SEM images, d, e TEM images and f HRTEM image of Fe$_{1-x}$S nanocubes

**Fig. S4** Nitrogen adsorption-desorption isotherms of Fe$_{1-x}$S/MoS$_2$ composite/Fe$_{1-x}$S nanocubes
Fig. S5 CV curves of Fe$_{1-x}$S nanocube electrode for the first five cycles

Fig. S6 Galvanostatic charge-discharge profiles of Fe$_{1-x}$S nanocube electrode at 100 mA g$^{-1}$

Fig. S7 Galvanostatic charge-discharge profiles of Fe$_{1-x}$S nanocube electrode at various current densities
Fig. S8 SEM image of Fe$_{1-x}$S/MoS$_2$ composite after cycling

Fig. S9 CV curves of Fe$_{1-x}$S/MoS$_2$ composite at different scan rates

Fig. S10 a CV curves of Fe$_{1-x}$S nanocubes at different scan rates. b Normalized contribution ratio of capacitive capacities at different scan rates
**Fig. S11** a In situ EIS spectra evolution of Fe_{1-x}S electrode at different charge/discharge potentials. b First charge/discharge profile of Fe_{1-x}S electrode at 100 mA g^{-1} with labeled points for EIS. c EIS spectra of Fe_{1-x}S electrode after different cycles.

**Fig. S12** E vs. t curve for a single GITT during discharge process

Na-ion chemical diffusion coefficient ($D_{Na}$) is calculated based on the following equation [S1]:

$$D = \frac{4L^2}{\pi \tau} \left( \frac{\Delta E_s}{\Delta E_t} \right)^2$$

where $L$ is Na\(^+\) diffusion length (approximately equal to the electrode thickness for compact electrode), $\tau$ is the relaxation time, $\Delta E_s$ is the steady state voltage change by the current pulse, $\Delta E_t$ is the voltage change during the current pulse after excluding $iR$ drop.
Fig. S13 Contour plots of in situ XRD results and the corresponding selected diffraction patterns of Fe$_{1-x}$S/MoS$_2$ composite electrode during the initial four cycles at 200 mA g$^{-1}$

![Contour plots of in situ XRD results and the corresponding selected diffraction patterns](image)

Fig. S14 The migration path on a Fe$_{1-x}$S surface, and b Fe$_{1-x}$S/MoS$_2$ interface

**Supplementary References**


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