Experimental Section

Material preparation

The Zeolite imidazole ester skeleton material was synthesized according to a typical method.[1] Typically, 0.735 g of Zn(NO$_3$)$_2$·6H$_2$O (99%, Aldrich) was employed to obtain a mixture with Zn/MeIM/methanol in a molar ratio of approximately 1 : 8 : 700. And the mixture was aged 1h at room temperature, and then the ZIF-8 precipitate was centrifugation and washed with fresh methanol three times, and dried at 60 °C.

To obtained the N-doped C: 0.15 g of as-prepared ZIF-8 powder was annealed at 700 °C in the Argon atmosphere for 2 h with a heating rate of 3 °C min$^{-1}$. After Cooling to room temperature, take the black power in 50ml of 12M HCl for 12 h at 80 °C, then rinsed with deionized water until the solution became neutral, and dried at 60 °C. The black power was N-doped carbon.

To grow MoS$_2$ to coat the N-doped carbon: 0.021 g of N-doped C power was dispersed into 40ml of deionized water and ultrasonication for 1 h. Then 0.3g of sodium molybdate (Na$_2$MoO$_4$·2H$_2$O, 99%, Aldrich) and 1.25g L- cysteine was added under vigorous stirring. After stirring 30 min, the solution was then transferred into a 50ml Teflon-lined stainless steel autoclave and maintained at 220 °C for 24 h. Then the autoclave was left to cool down to room temperature. The black product was collected by centrifugation and washed with deionized water and ethanol 4 times, and dried at 60 °C. Similarly, the preparation process of MoS$_2$ is similar except for the addition of N-doped carbon templates.[2]

Material Characterization

The samples were thoroughly characterized by using scanning electron microscope (SEM) on a Hitachi S-4800 microscope, transmission electron microscopy (TEM) on an FEI Tecnai F20 electron microscope, powder X-ray diffraction (XRD) on a Rigaku DMAX2500 X-ray diffractometer, and thermal gravimetric analysis (TGA) on a Netzsch STA449C instrument using a heating rate of 10°C min$^{-1}$ in air. The Brunauer-Emmett-Teller (BET) surface area was determined using a Micromeritics model ASAP 2020M+C physical and chemical adsorption analyzer X-ray photoelectron spectroscopy (XPS) analysis was performed on a KRATOS AXIS ULTRA-DLD spectrometer with a monochromatic Al Ka1 radiation (hv5=1486.6 eV).

Electrochemical measurement

The electrochemical properties were determined using CR 2025-type coin cells. In a
process of fabricating the LIBs. The anode electrode prepared by 80 wt% active material, 10 wt% conductive carbon black, and 10 wt% carboxyl methyl cellulose on pure Cu foil. The electrolyte was consisted of a solution of LiPF6 (1M) containing vinylene carbonate (2wt %) in ethylene carbonate/dimethyl carbonate/diethyl carbonate (1:1:1, volume ratio). The assembly of the test cells was performed in an argon-filled glove box with water and oxygen contents less than 1 ppm using pure lithium foils as the counter electrode, and Celgard 2400 was used as the separator. The cells were then aged for 8 h before measurement. The electrochemical test were carried out on a multi-channel current static system (Arbin Instruments BT 2000, USA), in the voltage range of 0.01-3 V (vs Li/Li+).

References

Fig. S1 (a) High resolution XPS spectra of S 2p in C@MoS$_2$ sample; (b) High resolution XPS spectra of Mo 3d in C@MoS$_2$ sample; (c) high resolution XPS spectra of N1s in C@MoS$_2$ sample; (d) high resolution XPS spectra of N1s in C sample.
Fig. S2 Specific surface area of the three samples: (a) C; (b) MoS$_2$; (c) C@MoS$_2$. 
Fig. S3 The coulombic efficiencies of C, MoS$_2$ and C@MoS$_2$ electrodes.
Fig. S4: Nyquist plots of the C, MoS\textsubscript{2} and C/MoS\textsubscript{2} electrodes at open potential before cycling.