Supporting Information

Perpendicular growth of few-layers MoS_2 nanosheets on MoO_3 nanowires fabricated by direct anion exchange reactions for high-performance lithium-ion batteries

Hui Liu*[a], Xianjin Chen[a], Lu Deng[a], Meng Ding[a], Junqi Li[a] and Xuanmeng He[a]

School of Materials Science and Engineering, Shaanxi University of Science and Technology

Xi'an 710021, P. R. China

*Corresponding author. Tel: +86-29-86177018; Fax: +86-29-86177018.

Email address: liuhui@sust.edu.cn;

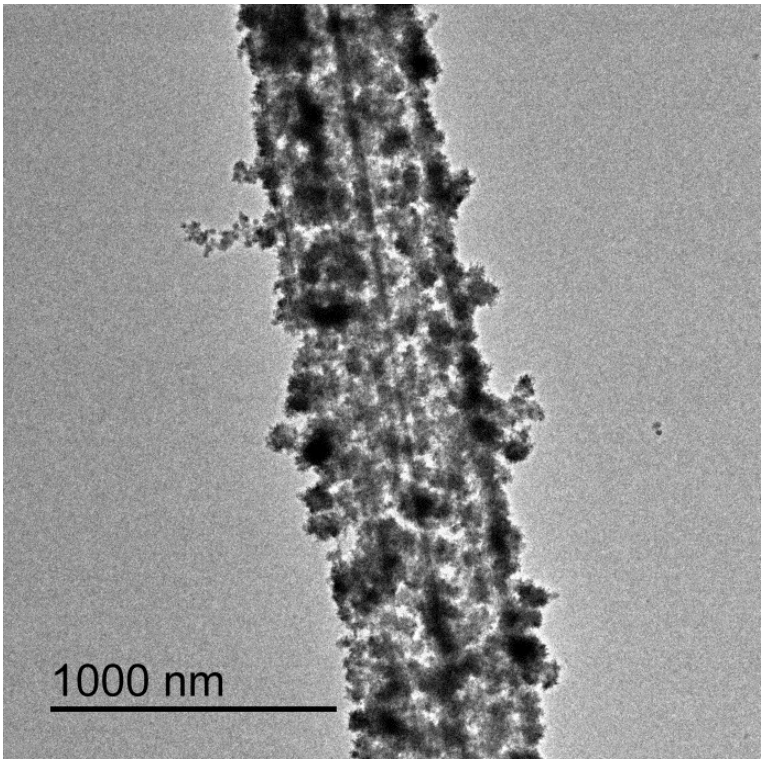

Figure S1 TEM image of the obtained MoO_3@MoS_2 composite when the amount of thiourea is 10 mM

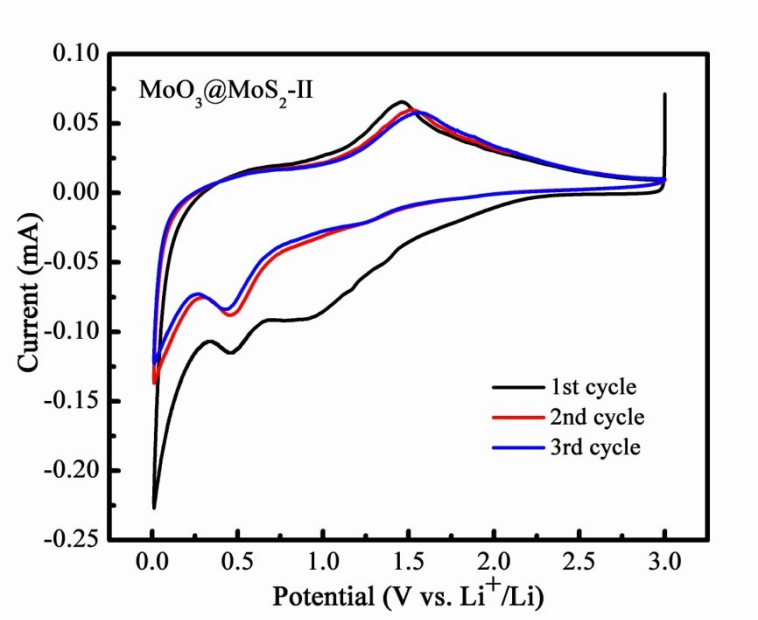

Figure S2 CV curves of MoO_3@MoS_2-II electrodes.

Figure S2 showed the first three cycles of MoO_3@MoS_2-II electrode, in the first reduction cycle, the peak at about 1.0V is associated with the intercalation of Li^+ into the interlayer of the MoS_2, and the peak at 0.50 V may be attributed to that Li_xMoS_2 converted to Mo and Li_2S and also Li_xMoO_3 to Mo and Li_2O. There was an indistinct peak at about 1.75V corresponding to the insertion process of Li^+ into the crystalline MoO_3 to form a Li_xMoO_3 solid solution. In the anode cycles, there was a peak at about 1.5V corresponding to the oxidation of Mo to MoS_2. From the CV curves of MoO_3@MoS_2-II electrodes, it can be infer that the main electrode reactions during the first three cycles were composed of the intercalation of Li^+ into the interlayer of the MoS_2, and then transformed into Mo and Li_2S, and the oxidation of Mo to MoS_2. Such electrode reactions cycles resulted in the capacity loss and relatively low Coulombic efficiency during the first three cycles (Seen in **Figure 8b**). The CV curves were agreed with the charge/discharge curves in **Figure 8a**.

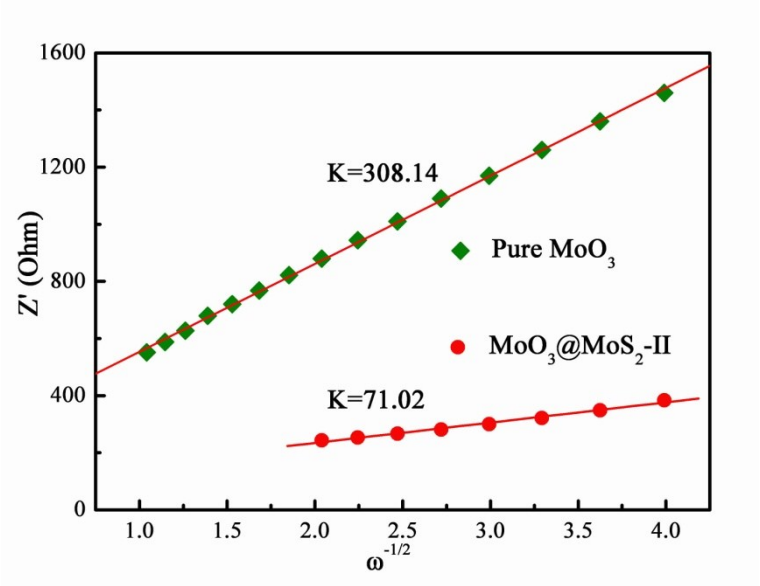

Figure S3 Linear fit of the relation of $\mathbf{Z'}$ and $\boldsymbol{\omega}^{-1/2}$ at low frequency of pure MoO_3 and MoO_3@MoS_2-II electrodes.