Facile synthesis of yolk-shell MoO$_2$ microspheres with excellent electrochemical performance as Li-ion battery anode

Xianfa Zhang$^a$, Xiaoxiao Song$^a$, Shan Gao$^a$, Yingming Xu$^a$, Xiaoli Cheng$^a$, Hui Zhao$^a$, Lihua Huo$^{a\ast}$

*Correspondence author E-mail: lhhuo68@yahoo.com
Fig. S1 XRD patterns of solvothermally prepared precursors of MoO$_2$ at different reaction times
The XRD patterns of MoO$_2$ electrode before/after cycling are shown in Fig. 2. The diffraction peaks of electrode before/after cycling can be indexed to monoclinic MoO$_2$ phase (JCPDS file no. 65-5787). The lattice constants of MoO$_2$ electrode before/after cycling are $a = 0.562208$ nm, $b = 0.484176$ nm, $c = 0.550935$ nm; $\beta = 120.04^\circ$ and $a = 0.562817$ nm, $b = 0.484184$ nm, $c = 0.564467$ nm; $\beta = 121.35^\circ$, respectively. The unit cell volumes of the MoO$_2$ electrode before/after cycling are 0.12983 nm$^3$ and 0.13137 nm$^3$, respectively and the volume change ($\Delta V/V$) is 1.17%, indicating the structure stability of these MoO$_2$ microspheres.
Fig. S3 SEM images of the MoO$_2$ electrode before cycling (a) and after cycling (b)

The FE-SEM images of MoO$_2$ electrode before/after cycling are shown in Fig. 3. The morphology of the MoO$_2$ electrode material before/after cycling still maintains the yolk-shell structure. The inter space between the core and shell and porous surface are not as clear as those observed before cycling, may be due to the electrolyte filling after cycling.