Electronic Supplementary Information (ESI)

Porous $0.2Li_2MnO_3 \cdot 0.8LiNi_{0.5}Mn_{0.5}O_2$ nanorods as cathode materials for lithium-ion batteries

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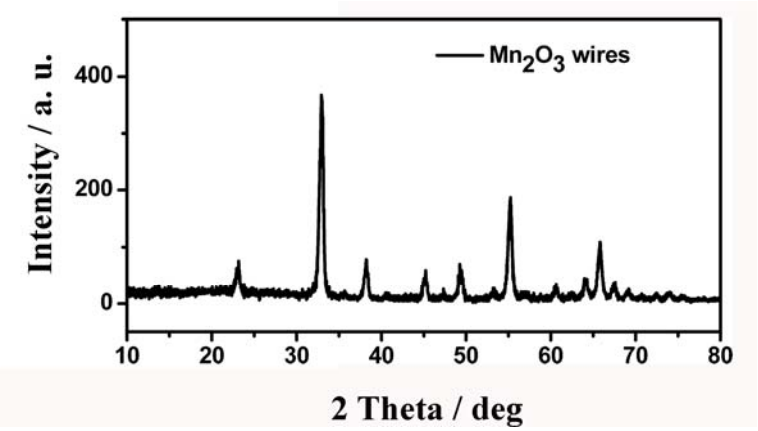

Fig. S1. The XRD profiles of Mn_2O_3 nanowires.

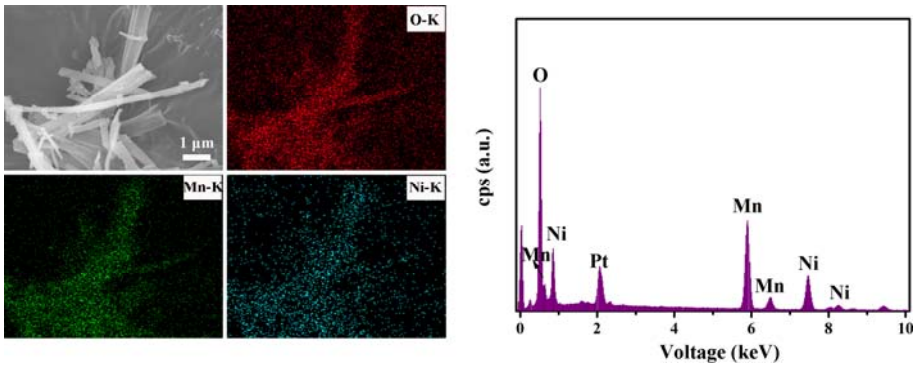

Fig. S2.The EDS mapping of LLNMO PNR showing the presence of Ni, Mn and O.

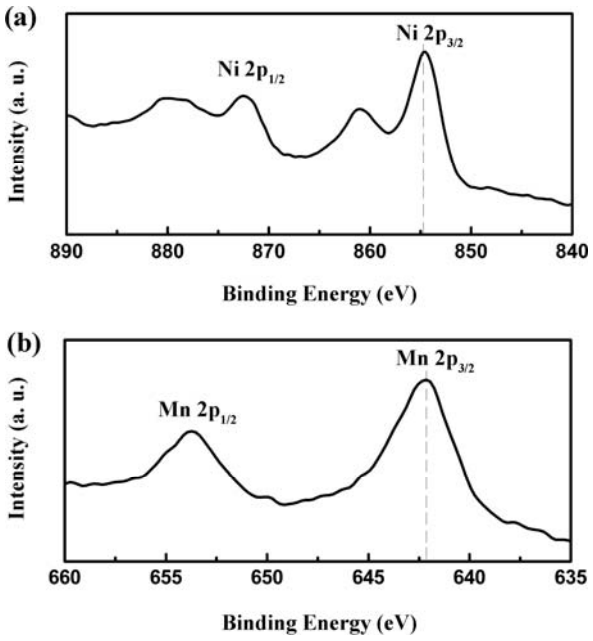

Fig. S3. XPS spectra of Ni 2p and Mn 2p for LLNMO PNR.

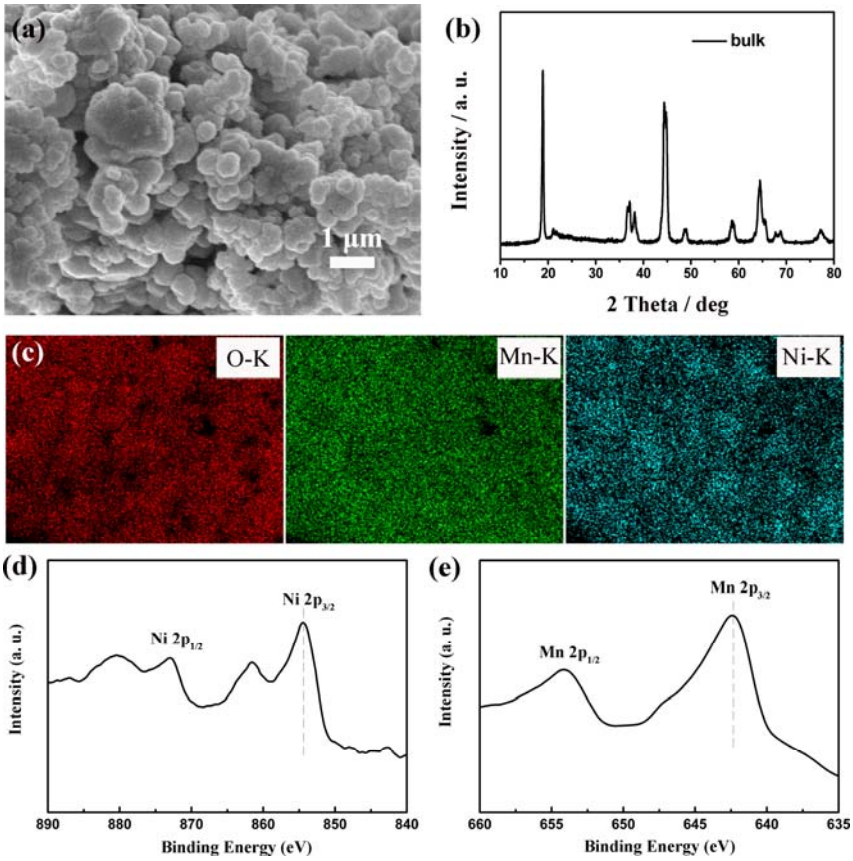

Fig. S4. (a) SEM image, (b) XRD profile, (c) EDS mapping and (d, e) XPS spectra of LLNMO bulk.

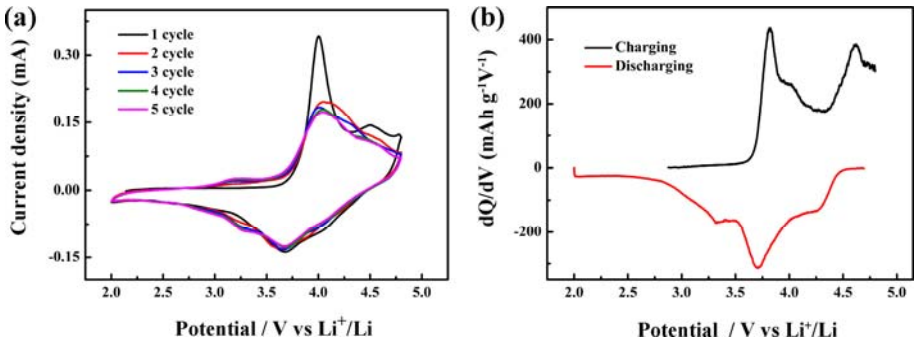

Fig. S5. (a) Cyclic voltammograms of LLNMO PNR at a scan rate of 0.2 mV/s in the potential range of 2.0–4.8 V. (b) Differential capacities versus voltage (dQ/dV) of the as-prepared LLNMO PNR at 0.2 C rate. In the CVs, the two oxidation peaks in the initial cycle correspond to the two well-defined regions in the initial charge-discharge

curve. The front region at a lower voltage (<4.5 V) is attributed to Ni^{2+}/Ni^{4+} redox resulting from $LiNi_{0.5}Mn_{0.5}O_2$, which is the main source of the reversible capacity. The subsequent flat region above 4.5 V can be attributed to the irreversible removal of Li_2O from Li_2MnO_3, which is the activation of the materials and generally results in a large initial irreversible capacity. However, after the initial charge-discharge, the two regions overlay, resulting in a broad peak in the following CV curves. The decrease of peak intensity also reflects the capacity fade.

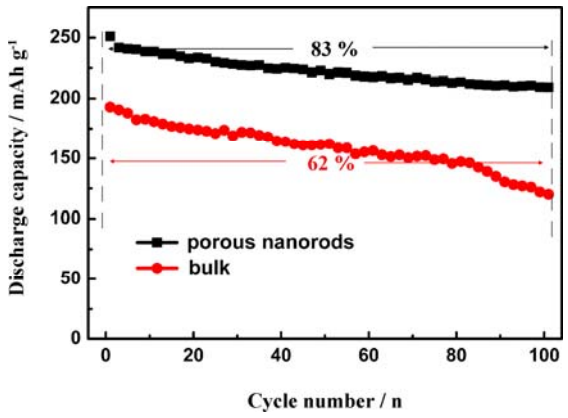

Fig. S6. Cycling performance of LLNMO PNR and bulk at 1 C discharge rate and 0.2 C charge rate.

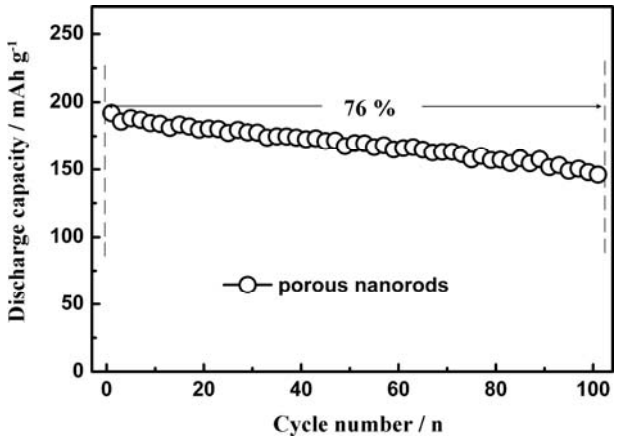

Fig. S7. Cycling performance of LLNMO PNR at 5 C discharge rate and 0.2 C charge

rate.

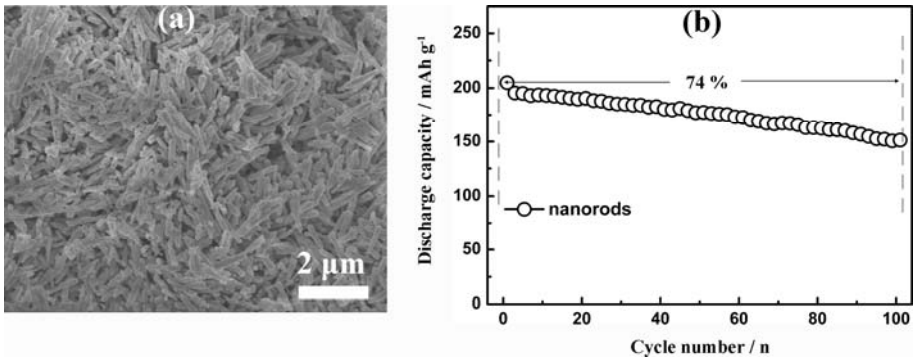

Fig. S8. (a) SEM of LLNMO nanorods and (b) cycling performance of LLNMO nanorods at 1 C discharge rate and 0.2 C charge rate. LLNMO nanorods were synthesized in a manner similar to that of LLNMO PNR, only using β-MnO_2 nanorods instead of Mn_2O_3 porous nanowires.