Electronic Supplementary Information

High-Capacity Full Lithium-Ion Cells Based on Nanoarchitectured Ternary Manganese-Nickel-Cobalt Carbonate and Its Lithiated Derivative

*Jianqing Zhao, Ying Wang**

Department of Mechanical & Industrial Engineering, Louisiana State University, Baton Rouge, Louisiana 70803, United States

*Corresponding Author:

Prof. Ying Wang, Tel: 001-225-578-8577; Fax: 001-225-578-9162; E-mail: ywang@lsu.edu

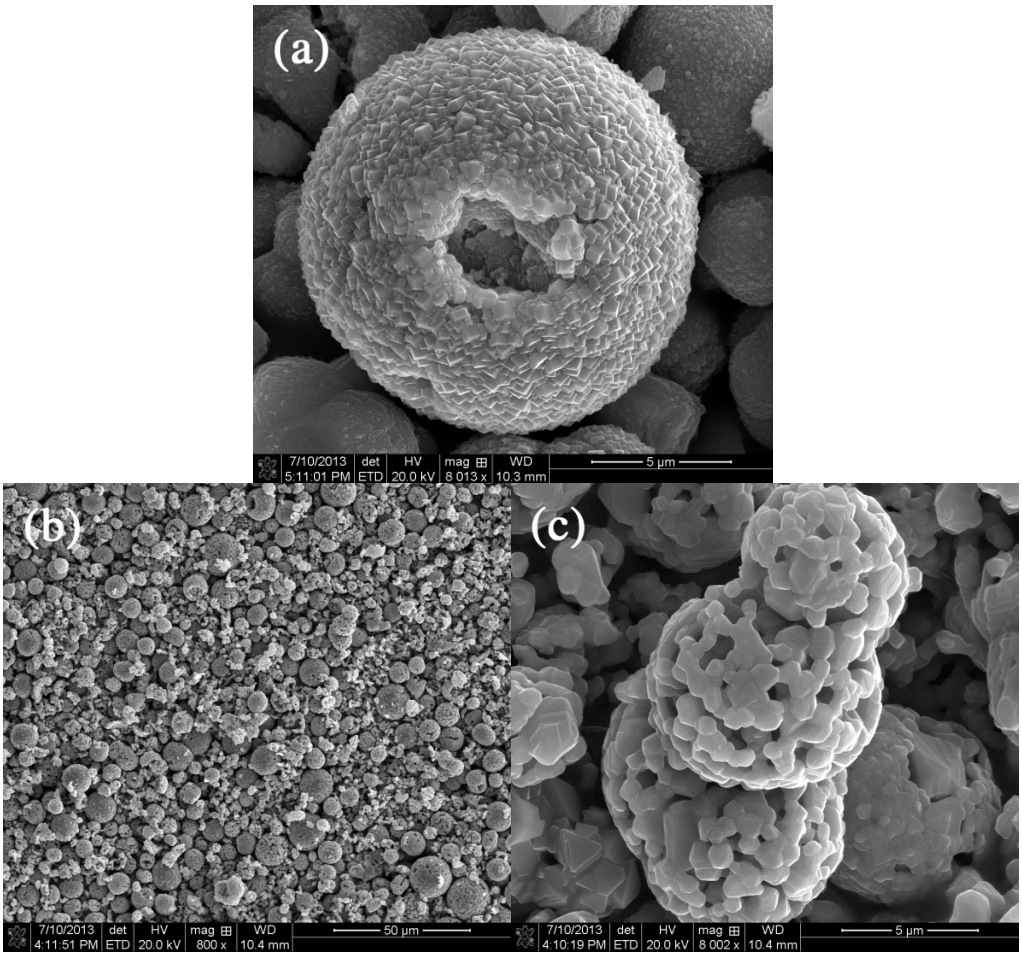

Fig. S1 SEM images of (a) slightly-broken sphere of multi-shell ternary transition metal carbonate compound, and (b) and (c) derivatives after sintering carbonate in air at 900°C in 12 h.

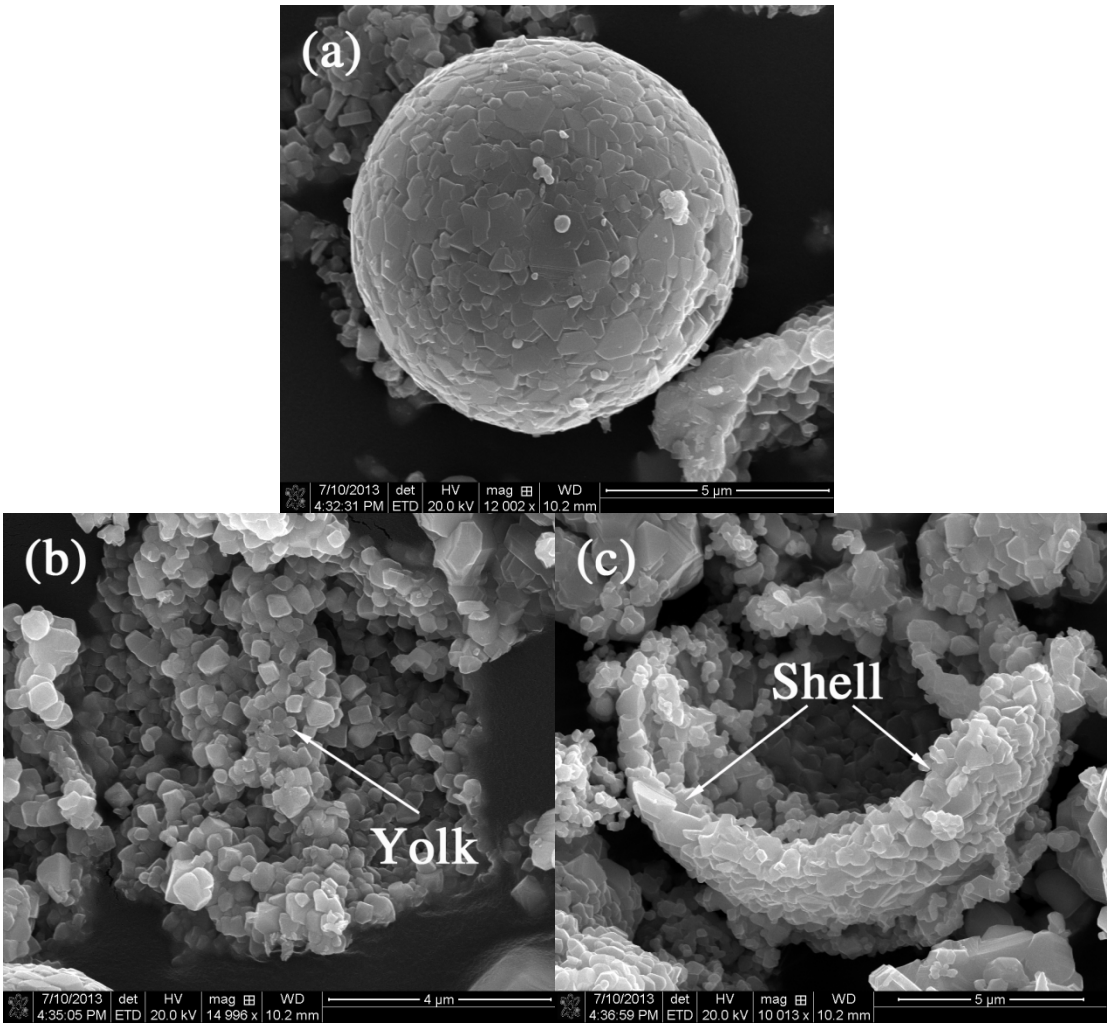

Fig. S2 SEM images of yolk-shell-structured Li-excess $Li[Li_{0.2}Mn_{0.54}Ni_{0.13}Co_{0.13}]O_2$: (a) an intact sphere, (b) a broken sphere showing the yolk structure inside, and (c) a broken sphere showing the shell.

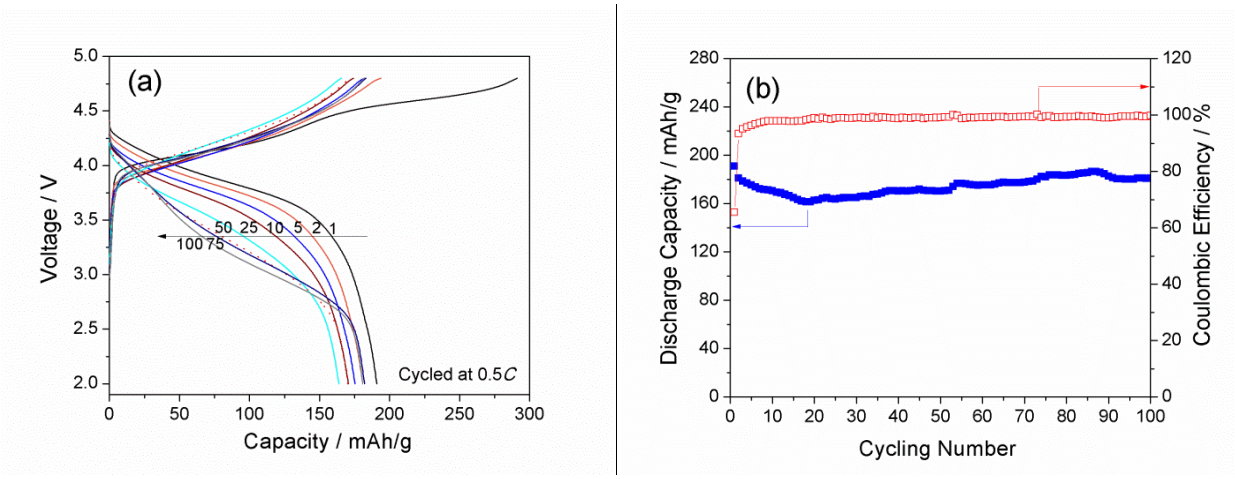

Fig. S3 Cycling performance of yolk-shell-structured Li-excess $Li[Li_{0.2}Mn_{0.54}Ni_{0.13}Co_{0.13}]O_2$ as lithium-ion battery cathode material in half battery cell testing with lithium metal as the counter electrode at 0.5 *C* (1*C* = 250 mA/g) in a voltage range of 2.0 - 4.8 V *vs*. Li/Li^+: (a) charge and discharge curves at the 1, 2, 5, 10, 25, 50, 75 and 100^{th} cycle, and (b) capacity retention and Coulombic efficiency as a function of cycle number.

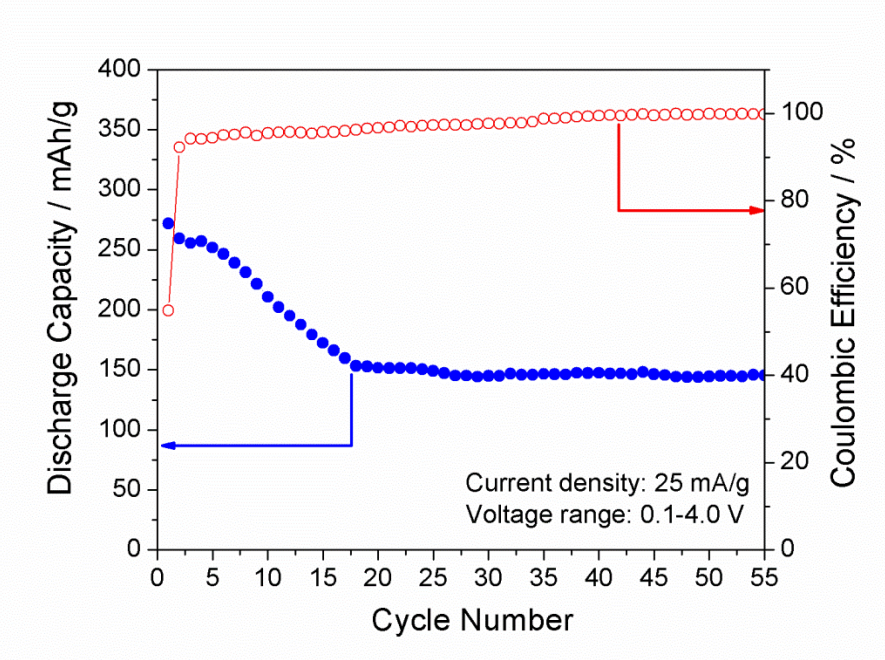

Fig. S4 Discharge capacity and Coulombic efficiency of a full lithium-ion battery based on $MNCCO_3$ MS anode and LMNCO YS cathode as a function of cycle number when cycled at 25 mA/g in a voltage range of 0.1 - 4.0 V.