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Impact of Li_2O/Metal Mole Ratio on Lithium-ion Battery Anode Performance

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In this study the electrochemical impact of Li_2O/metal mole ratio on the cycle life of lithium-ion battery anode materials is demonstrated. For this purpose, nanostructured layered $LiNi_{1/3}Mn_{1/3}Co_{1/3}O_2$ (LiNMC) and spinel $LiMn_{1.5}Ni_{0.5}O_4$ (LiMNO) materials, traditionally known as cathode materials, are evaluated as anode materials and compared against their lithium-free versions NMC (Ni:Mn:Co=1:1:1) and MNO (Mn:Ni=3:1). The Li_2O/metal ratio in fully lithiated states are 2.0 for lithium containing (LiNMC and LiMNO) and 1.3 for lithium-free (NMC and MNO) samples. Battery tests show that capacity fading of lithium containing samples is 3 to 4 times larger than lithium-free samples. The differences in the electronic conductivities and voltages profiles of lithium containing and lithium-free anode materials are suggested to be the origin of such electrochemical disparity.

Keywords: lithium battery, conversion anode, composite,

FULL TEXT