Electrochimica Acta 128 (2014) 172–177

Solution-combustion synthesized nickel-substituted spinel cathode materials (LiNixMn2-xO4; 0≤x≤0.2) for lithium ion battery: enhancing energy storage, capacity retention, and lithium ion transport

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Abstract

Spherically shaped Ni-substituted LiNixMn2-xO4(x = 0, 0.1, 0.2) spinel cathode materials for lithium ion battery with high first cycle discharge capacity and remarkable cycling performance were synthesized using the solution-combustion technique. XRD confirmed the successful synthesis of the various spinel structures, with the Bragg diffraction peaks shifting to higher 2 _ angles accompanied with lattice shrink-ing as the Ni concentration increased. The SEM images of the spinels revealed essentially spherical morphology. Galvanostatic charge-discharge experiments showed that by substituting the pristine spinel with a low amount of nickel enhanced the cell potential (hence the energy storage capability) and greatly improved the capacity retention (ca. 99%) even after 100 cycles. Electrochemical impedance spectroscopy experiments corroborated the enhanced capacity retention as lithium ion intercalation/de-intercalation resistance for the Ni substituted spinels was significantly improved (more than a magnitude higher) compared to the pristine spinel.