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Synthesis and electrochemical properties of cation doped spinel LiM_xMn_{2-x}O₄ (M=Ni, Al and x=0, 0.5) cathode materials for Li-ion battery

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Abstract content
   (Max 300 words)

LiMn₂O₄ spinel is attractive cathode material for rechargeable lithium ion battery (LIB) applications such as portable electronics, hybrid electric vehicles and power tools. LiMn₂O₄ has got high attention because of its low cost, low toxicity, safety and high voltage compared to that of layered LiCoO₂ commercialized cathode material for LIB. The most known drawback of LiMn₂O₄ is its capacity fading during repeated charge/discharge cycling. Lithium manganese oxide (LiMn₂O₄) and cation-doped Lithium manganese oxide LiM_{0.5}Mn_{1.5O4} (M=Al, Ni) spinel cathode materials were synthesized using corresponding metal nitrates and urea as starting precursors. The particle size and morphology and the structural and electrochemical properties of the as-synthesized cathode materials were examined by means of scanning electron microscopy (SEM), X-ray diffraction (XRD) and charge/discharge cycle battery tester.

It was found that the cation doping showed great influence on their electrochemical properties and crystalline structure. The LiM_{0.5}Mn_{1.5O4} (M=Al, Ni) cathode materials display a spinel structure indicating a small change in peak position due to differences in size between M(Al, Ni) and Mn ions. Partial cation doping of manganese in the host structure by aluminium (Al) and nickel (Ni) ion yielded successful improvements to get stabilized electrode without any rapid capacity loss. The characteristics of stabilizing the discharge capacity by the two samples are compared and the possible mechanisms will be reported.

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