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Influences of Gd^{3+} doping modification on the crystal microstructure and electrochemical performance of $Li_{1.20}[Mn_{0.52}Ni_{0.20}Co_{0.08}]O_2$ as cathode for Lithium-ion batteries

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Abstract:

The $Li_{1.20}[Mn_{0.52-x}Gd_xNi_{0.20}Co_{0.08}]O_2$ ($x = 0, 0.01, 0.02, 0.03$) cathode materials have been synthesized by using the combination of co-precipitation with high temperature sintering method. The XRD, SEM, TEM and galvanostatic charge-discharge tests were carried out to study the influence of Gd^{3+} doping on the crystal structural, morphology and electrochemical properties of $Li_{1.20}[Mn_{0.52}Ni_{0.20}Co_{0.08}]O_2$. The XRD result revealed the Gd^{3+} doping modification could decrease the cation mixing degree. The galvanostatic charge-discharge tests results showed the improved electrochemical properties were obtained through the Gd^{3+} doping modification. With the increase of Gd^{3+} doping content, the capacity retentions enhanced from 88.1% to 90.3% and then decrease to 87.0% after 100 cycles with $x = 0.01, 0.02$ and 0.03 , respectively, while the un-doped sample delivered the capacity retention of 85.1%. The $Li_{1.20}[Mn_{0.50}Gd_{0.02}Ni_{0.20}Co_{0.08}]O_2$ exhibited a

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