

Effect of nickel and iron on structural and electrochemical properties of cathode materials for sodium-ion batteries

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We investigate that the effect of Ni and Fe contents on structural and electrochemical properties of O3-type layered  $\text{Na}[\text{Ni}_{0.75}\text{Fe}_x\text{Mn}_{0.25}]\text{O}_2$  ( $x \frac{1}{4}$  0.4, 0.45, 0.5, and 0.55) in which Mn is fixed at 25%. As increasing the Ni contents, the capacities are gradually higher while the capacity retention and thermal properties are inferior. When Fe contents are increased, by contrast, the electrode exhibits stable capacity retention and satisfactory thermal stability although the resulting capacity slightly decreases. Structural investigation of post cycled electrodes indicate that lattice variation is greatly suppressed from  $x \frac{1}{4}$  0.5 in  $\text{Na}[\text{Ni}_{0.75}\text{Fe}_x\text{Mn}_{0.25}]\text{O}_2$ . This indicates that an appropriate amount of Fe into the  $\text{Na}[\text{Ni}_{0.75}\text{Fe}_x\text{Mn}_{0.25}]\text{O}_2$  stabilizes the crystal structure and this leads to the good cycling performances.