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Characterization of $LiNi_{0.85}Co_{0.10}M_{0.05}O_2$ (M=Co, Al, Fe) for lithium secondary batteries

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Due to the increased production and use of portable devices, lithium secondary batteries with extended lives and higher power output are in demand. Since the performance of the lithium secondary batteries is limited by the properties of the positive electrodes, a significant amount of research has been focused on the synthesis, processing and/or electrochemical identification of positive cathode materials for use in these batteries.[1,2] Several oxides are being considered for use as 4 V cathode materials for lithium batteries: the spinel $LiMn_2O_4$ and the layered oxide $LiMO_2$ (M=Co and/or Ni). Each of these cathode materials has advantageous and detrimental characteristics that have an impact on their further development for lithium-ion batteries.

Recently a unique combination of two or more cations substituting for M in $LiMO_2$ was reported to have some promising features, including a high capacity, a long cycle life, and an enhanced thermal stability, for use as a new cathode material.[3,4]

In this work, we report on the characterization of the four-cation oxide, $LiNi_{0.85}Co_{0.10}M_{0.05}O_2$ (M=Co, Al, Fe etc.). The electrochemical, structural and thermal behavior of these materials and the validity for application of these oxides to the realistic batteries are investigated.

References

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