Low Cost Electrode Materials for The Rechargeable Li-Ion Batteries

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Lithium-ion rechargeable battery is a rapid developing technology to provide stationary storage solutions to enable the effective use of renewable energy sources. The technology is already in use for low power applications such as consumer electronics and power tools. However, for the popularization of this technology as a cheaper portable power source need the development of low cost and performance enhanced materials. Among various materials proposed for the cathode in Li-ion battery (LIB), $LiCo0_2$ has most widely been used. However, the high cost of this material is a main obstacle for reaching it to the common mass as a cheaper and reliable potable power source.

This work was based on synthesis and electrical characterization of Li(Ni113Mni13CoR113)-xiCux)02 (x = 0.00, 0.11, 0.22, 0.33) materials synthesized by Pechini method. The Pechini method is a low cost technique which results in powders with high purity, homogeneity and particle morphology that are greatly preferred for Li-ion battery cathodes. Subsequently powders were calcined and characterized with X-ray diffractometry. The four probe d.c electrical characterizations were performed on the pellets sintered at 1000 °C for 4 h in static air.

The electrical conductivity at 25 °C is about $1x10^{-4}$ S/cm and $1.5x10^{-3}$ S/cm at 150 °C for $_{Li(Niii3Mnii3C01/3)02.}$ **For** the Li(Ni113Mn113Co1{i3)-xiCux)02 (x =, 0.11, 0.22, 0.33) materials, electrical conductivity is in the range of 16 to 49 S/cm. The materials show an increase of the conductivity with the temperature and hence a possible semiconducting behaviour.

As a whole, this study shows the ability of preparing low cost Cu doped Li(Niii3Mn113C0(013)-xiCux)^{0}2 (x = 0.11, 0.22 and 0.33) by Pechini method, having excellent electrical properties suitable for LIB electrodes.

Key words: Rechargeable batteries, Li-ion battery, Electrode materials, Cathodes, ternary oxides