

SYNTHESIS AND CHARACTERIZATION OF LITHIATED MIXED
METAL OXIDES FOR LITHIUM ION
RECHARGEABLE BATTERIES

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Synthesis and Characterization of Lithiated Mixed
Metal Oxides for Lithium Ion
Rechargeable Batteries

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Declaration.

I hereby declare that the work reported in this dissertation is my own work unless specified and duly acknowledged by quotations.

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Abstract

Lithiated mixed metal oxides for lithium ion rechargeable batteries were prepared by the sol gel technique. Samples consisting of lithium acetate, nickel nitrate, cobalt nitrate, manganese acetate and aluminium fluoride were characterised using X-ray Diffraction (XRD), Differential Scanning Calorimetry (DSC), Fourier Transform Infrared Spectroscopy (FTIRS), Energy Dispersive Analysis of X-rays (EDAX) and Cyclic Voltammetry (CV). Thermal characterization shows that the acetates, nitrates and fluorides of precursors material deform at temperature between 50° to 100°C and the products begin to form at a temperature between 264°C to 271°C. FTIR studies show that the materials must be heated for a longer time duration if the calcination temperature is 800°C or lose its lithium content if calcined at a much higher temperature of 950°C. XRD shows that the materials have the basic structure of LiNiO_2 and EDAX reveals that the materials are $\text{LiNi}_{0.7}\text{Co}_{0.3}\text{O}_2$, $\text{LiNi}_{0.7}\text{Co}_{0.2}\text{Mn}_{0.1}\text{O}_2$, $\text{LiNi}_{0.7}\text{Co}_{0.1}\text{Mn}_{0.2}\text{O}_2$ and $\text{LiNi}_{0.7}\text{Co}_{0.1}\text{Mn}_{0.1}\text{Al}_{0.1}\text{O}_2$. CV proves that Li^+ can intercalate and de-intercalate the materials prepared as evident from the redox couple in the voltammogram. Electrochemical cells of the configuration $\text{LiNi}_{0.7}\text{M}_x\text{M}'_y\text{M}''_{0.3-(x+y)}\text{O}_2 / \text{electrolyte} / \text{C}$ were prepared and the discharge characteristics studied. The cell could be charged up to 3.20 V only.

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