

UNIVERSITY TEKNOLOGI MARA

**SYNTHESIS AND CHARACTERIZATION
OF $\text{LiMn}_{(2-x)}\text{Fe}_x\text{O}_4$ CATHODIC NANO
MATERIAL FOR ADVANCED LITHIUM-
ION BATTERIES**

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Thesis submitted in fulfillment of the requirements
for the degree of
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Candidate's Declaration

I declare that work in this thesis was carried out in accordance with the regulations of University Teknologi MARA. It is original and is the results of my work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

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Abstract

New lithium transition metal oxides, $\text{LiMn}_{(2-x)}\text{Fe}_x\text{O}_4$ where $0 < x \leq 0.5$ are first synthesized using the sol-gel method. Stoichiometric samples are prepared. Thermogravimetric analysis (TGA) are carried out on the precursors to study the thermal properties and decomposition of the samples. The precursors are later annealed at 850°C for 24 hours. X-Ray diffractions (XRD) of the samples were taken to examine the crystallinity of the materials and to check the purity of the products. Field Emission Scanning Electron Microscope (FESEM) / Energy Dispersive X-Ray Analysis (EDX) are carried out to observe the changes in surface morphology and to check the stoichiometry. Cyclic Voltammetry (CV) is carried out to determine the characteristics of the electrical potential of the materials. Fabrication of the cathodes and testing of the batteries are later done. The best two materials are then processed to become nano size and were characterized using XRD, FESEM / EDX, particle size analyzer and CV. Fabrication of the batteries are carried out in an argon filled glove box. Batteries fabricated were then characterized for their electrochemical characteristics using the Multistat Solartron 1480 and the results obtained from both bulk and nano materials were compared.

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