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I-CReST 2025:115-078 – A Synthesis and Characterisation of Doped Dysprosium in $LiMnTiO_4$ Cathode Materials for Lithium-Ion Batteries

*[1]Noor Arda Adrina Daud, [1,2,3]Aida Fazliza Mat Fadzil, [3]Nur Nisha Naiema Zulkarnain

[1]*Centre of Foundation Studies, Universiti Teknologi MARA, Cawangan Selangor, Kampus Dengkil, 43800 Dengkil, Selangor, Malaysia.*

[2]*Institute of Science (IoS), Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia.*

[3]*Faculty of Applied Sciences, Universiti Teknologi MARA,40450 Shah Alam, Selangor, Malaysia.*

*E-mail: noorarda2753@uitm.edu.my

ABSTRACT

The demand for enhanced performance in Li-ion batteries necessitates the development of advanced cathode materials. This study investigates the synthesis and characterisation of dysprosium-doped $LiMn_{1.9}Ti_{0.1-x}Dy_xO_4$ (x = 0.00, 0.01, 0.05) cathode materials, focusing on their structural, compositional, and morphological properties. The primary objective is to understand how dysprosium substitution at the titanium site influences these properties and the overall electrochemical performance of the material. Using the self-propagation combustion synthesis method, we achieved high purity and single-phase formation with reduced particle sizes. The thermal properties were studied by Simultaneous Thermal Analysis (STA). Structural analysis through X-ray diffraction (XRD) revealed significant changes in the crystal lattice parameters, confirming successful doping. Field emission scanning electron microscopy (FESEM) provided detailed insights into the morphology of the material. These results suggest that dysprosium-doped $LiMnTiO_4$ is a promising candidate for next-generation Li-ion battery cathodes. In conclusion, this research demonstrates the potential of dysprosium doping in enhancing the properties of LiMnTiO4 cathode materials, offering valuable insights for the development of high-performance and sustainable energy storage solutions.

Keywords: Cathode; Lithium-ion; LiMnTiO4; Dysprosium