Available online at **www.joac.info**

ISSN: 2278-1862

Journal of Applicable Chemistry

2018, 7 (3): 608-615

(International Peer Reviewed Journal)

Thermal, Electrical and Structural Characteristics of $LiNi_{0.925}Mg_{0.075}PO_4$ and $LiNi_{0.9}Mg_{0.1}PO_4$ Cathode Materials

Paulos Taddesse[1]* and Mukemil Sultan[2]

1. Department of Physics, College of Natural Science, Arba Minch University, Arba Minch, **ETHIOPIA**
2. Grinzila Secondary School, Silte Zone, DalochaWereda, Dalocha, **ETHIOPIA**

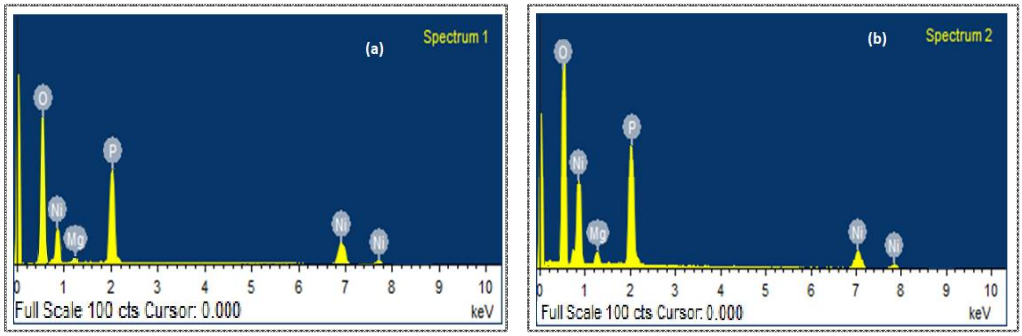
Email:kidspaul@gmail.com

Accepted on 22nd April, 2018

ABSTRACT

Mg substituted lithium nickel phosphates, $LiNi_{0.925}Mg_{0.075}PO_4$ and $LiNi_{0.9}Mg_{0.1}PO_4$ cathode materials are synthesized by three steps solid state reaction method. These materials are characterized by thermogravimetric analysis (TGA), differential thermogravimetric analysis (DTA), x-ray powder diffraction (XRD), energy dispersive x-ray spectrometry (EDS), Fourier transform infrared (FT-IR) spectroscopy and complex impedance spectroscopy (CIS) techniques. From TGA/DTA study, compound formation temperature as well as the weight loss regions are identified. The XRD study of the prepared samples confirms the formation of good crystallization and well-defined diffraction peaks without impurities. From FT-IR study, different peaks are observed at different wavelength regions, which are responsible for the formation of both compounds. From the impedance analysis, it is found that the dielectric constant decreases sharply at low frequency as compared to that at high frequency and become almost constant on further increasing the frequency for both samples. The dc conductivity values of $LiNi_{0.925}Mg_{0.075}PO_4$ and $LiNi_{0.9}Mg_{0.1}PO_4$ are 3.8 x 10^{-9} Scm^{-1} and 3.94 x 10^{-9} Scm^{-1}, respectively. The obtained conductivity results are found in the range of the electrical conductivity of semiconductor (10^{-7} to 10^{3} Scm^{-1}), indicating the semiconductor behavior of the samples.

Graphical Abstract



EDS spectra of (a) $LiNi_{0.925}Mg_{0.075}PO_4$ and (b) $LiNi_{0.9}Mg_{0.1}PO_4$ materials.

Keywords: Cathode materials, Solid state reaction method, Dielectric constant, Dc conductivity.