

Accepted Manuscript

^{57}Fe and ^{119}Sn Mössbauer, XRD, FTIR and DC conductivity study of $\text{Li}_2\text{O}-\text{Fe}_2\text{O}_3$ - SnO_2 - P_2O_5 glass and glass ceramics

M.Y. Hassaan, M.G. Moustafa, K. Osouda, S. Kubuki, T. Nishida



PII: S0925-8388(18)32328-4

DOI: [10.1016/j.jallcom.2018.06.207](https://doi.org/10.1016/j.jallcom.2018.06.207)

Reference: JALCOM 46543

To appear in: *Journal of Alloys and Compounds*

Received Date: 1 March 2018

Revised Date: 31 May 2018

Accepted Date: 18 June 2018

Please cite this article as: M.Y. Hassaan, M.G. Moustafa, K. Osouda, S. Kubuki, T. Nishida, ^{57}Fe and ^{119}Sn Mössbauer, XRD, FTIR and DC conductivity study of $\text{Li}_2\text{O}-\text{Fe}_2\text{O}_3$ - SnO_2 - P_2O_5 glass and glass ceramics, *Journal of Alloys and Compounds* (2018), doi: 10.1016/j.jallcom.2018.06.207.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

⁵⁷Fe and ¹¹⁹Sn Mössbauer, XRD, FTIR and DC conductivity study of Li₂O-Fe₂O₃-SnO₂-P₂O₅ glass and glass ceramics

M.Y. Hassaan^{*, 1}, M.G. Moustafa^{*, 1}, K. Osouda², S. Kubuki², T. Nishida³

¹ Department of Physics, Faculty of Science, Al-Azhar University, Nasr City 11884, Cairo, Egypt

² Department of Chemistry, Graduate School of Science and Engineering, Tokyo Metropolitan University, Minami-Osawa 1-1, Hachi-Oji, Tokyo 192-0397, Japan

³ Department of Biological and Environmental Chemistry, Faculty of Humanity-Oriented Science and Engineering, Kinki University, Iizuka 820-8555, Japan

*Corresponding author; Email: mgmoustafa@azhar.edu.eg (M. G. Moustafa),
myhassaan@yahoo.com (M. Y. Hassaan)

Abstract

Glass samples with a composition of $1.5\text{Li}_2\text{O} \cdot (1.5-x)\text{Fe}_2\text{O}_3 \cdot x\text{SnO}_2 \cdot 3\text{P}_2\text{O}_5$ ($x = 0.1, 0.3$ and 0.5) were prepared by melt-quench method. X-ray diffraction (XRD) study revealed the glass formation of the as-quenched samples. Each glass sample was heat treated (HT) at 600 °C for 1 h to obtain glass ceramics. HT samples showed precipitation of a small amount of crystalline particles assigned to LiFeP_2O_7 . Local structure of these samples was explored by means of Fourier transform infrared-spectroscopy and Mössbauer spectroscopy. They proved that Fe^{3+} ions occupied the sites of network former, while Fe^{2+} and Sn^{4+} the sites of network modifier. DC conductivity (σ) measurement of these samples showed non-linear temperature dependency. Activation energy showed a slight decrease with an increasing amount of SnO_2 , and the σ measured at 500 K increased from 5.6×10^{-5} to $3.9 \times 10^{-4} \text{ S} \cdot \text{cm}^{-1}$. The σ values of HT samples were one-order of magnitude larger than those of the corresponded as-quenched glass samples, reflecting structural relaxation of the 3D-network composed of distorted FeO_4 and PO_4 tetrahedra. The approximated ratio of electronic- to ionic-conduction, $\sigma_{\text{elec}}/\sigma_{\text{ion}}$, suggested that the conduction became predominantly “ionic” at high temperatures. The present study will be useful for the development of new cathode active material and solid state electrolyte for lithium ion battery.

Keywords:

Lithium iron tin phosphate glass; FTIR spectroscopy; Mössbauer spectroscopy; DC electrical conductivity.

Download English Version:

<https://daneshyari.com/en/article/7990471>

Download Persian Version:

<https://daneshyari.com/article/7990471>

[Daneshyari.com](https://daneshyari.com)