STUDY ON OPTICAL AND STRUCTURAL PROPERTIES OF LITHIUM ZINC PHOSPHATE GLASSES

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Final Year Project Report Submitted in
Partial Fulfilment of the Requirements for the
Degree of Bachelor of Science (Hons.) Physics
in the Faculty of Applied Sciences
Universiti Teknologi MARA

JULY 2017

ABSTRACT

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Glasses with chemical composition of $(60 - x)P_2O_5$-25ZnO-$(15 + x)Li_2O$ with $0.0 \leq x \leq 5.0$ mol% are prepared by melt quenching technique. The glass properties dependence of Li_2O content were investigated. The physical properties, by mean of density and molar volume are determined. The amorphous nature, optical absorption and structural behaviour are characterized using X-ray diffraction (XRD), ultraviolet-visible-near infrared (UV-Vis-NIR) and Fourier Transform Infrared (FTIR) respectively. In this work, the glass densities are found increases in the range of 2.6991 gcm^{-3} to 2.7848 gcm^{-3} and molar volume decreases from 40.7450 gcm^{-3} to 37.4839 gcm^{-3} with respect to Li_2O concentration. Meanwhile, the optical band gap by mean of their direct and indirect transition is found ranging from 2.5253 eV to 3.0737 eV and 1.6700 eV to 2.6990 eV respectively. The Urbach energy was found varies from 0.9594 eV to 3.4454 eV. Meanwhile, the refractive index is found vary from 2.4833 to 2.8952. The FTIR spectra exhibited seven bands which centered at 512 cm^{-1}, 767 cm^{-1}, 918 cm^{-1}, 1087 cm^{-1}, 1281 cm^{-1}, 1627 cm^{-1} and 3441 cm^{-1} wavenumber that assigned as vibration of Zn-O, symmetric stretching vibration of P-O-P rings, asymmetric stretching vibration of P-O-P groups, asymmetric stretching of PO_2^- group, asymmetric stretching vibration P=O, bending vibration of water molecule and fundamental stretching of hydroxyl group.

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