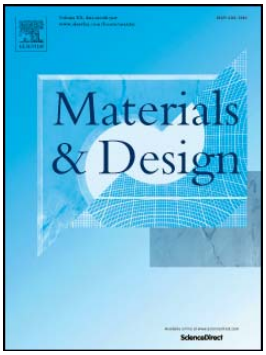

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Electrical and dielectric analysis of phosphate based glasses doped with alkali oxides

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Abstract

In this work, new phosphate glasses with the molar composition $20.7P_2O_5$–$17.2Nb_2O_5$–$13.8WO_3$–$34.5A_2O$–$13.8B_2O_3$ where A=Li, Na and K were prepared using the melt quenching technique. These type of glasses have potential to absorb hydrogen in its structure, which makes them promising materials to be used as electrolytes in intermediate temperatures fuel cells. Additionally, niobium phosphate glasses can also have applications such as glass fibers, optical lenses, hermetic sealing and electrodes. The structure of the obtained samples was analyzed using Differential Thermal Analysis (DTA), X-Ray powder Diffraction (XRD), and Raman spectroscopy and the morphology by Scanning Electron Microscopy (SEM). The DTA measurements revealed values of glass transition temperature around 415 °C, and the Raman analysis showed that the amount of alkali and niobium oxides included on the studied compositions, successfully disrupted the P-O-P chains characteristic of the phosphate glasses. Dc (σ_{dc}) and ac (σ_{ac}) conductivities and dielectric spectroscopy measurements were performed as function of the temperature (200-370 K) which presented a conductivity predominantly ionic ($\sigma_{electronic}/\sigma_{ionic}$ of about 10^{-4}). The dielectric spectroscopy was measured in the frequency range 100-1MHz.

Keywords: Phosphate glasses, hydrogen absorption, differential thermal analysis, electrical measurements, Raman spectroscopy, X-ray powder diffraction