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Investigation on the thermal properties, density and degradation of quaternary iron and titanium phosphate based glasses

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Abstract

The possibility of producing phosphate based glasses (PBG) with tailored degradation profile allows for unique utilisation in biomedical application. Various compositions in the phosphate based glass (PBG) system of (50-x)P2O5-40Ca-(5+x)Na-5TiO_2 and (50-x)P_2O_5-40Ca- (5+x)Na-5Fe_2O_3, where x= 5 and 10 were prepared and characterised. Method as differential scanning calorimetry (DSC) has been used to characterise the thermal properties of these phosphate based glasses . It was observed that both glass transition temperature (Tg) and onset of crystalisatisation temperature (Tx) increased with increasing phosphate content. In addition, Tg values were found to be higher for the P_2O_5-CaO-Na_2O-TiO_2 glass system compared to P_2O_5- CaO-Na_2O-Fe2O_3 glass system. The density result showed that increasing the P2O5 content at the expense Na_2O led to a decrease in density for both glass systems. The dissolution study of these glasses was conducted in phosphate buffered saline (PBS). It was observed that the dissolution rate of P_2O_5-CaO-Na_2O-Fe_2O_3 glass system was higher than the P_2O_5-CaO-Na_2O-TiO_2 glass system. The dissolution rate for both glass systems was in the order of 10^{-6} g cm^{-2} hr^{-1}. © Published under licence by IOP Publishing Ltd.

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