

## **Physical, structural, and Raman spectroscopic traits of neodymium-doped lead Oxyfluoride zinc phosphate glass**

### **ABSTRACT**

Nd<sup>3+</sup> with composition of (60 - x) P<sub>2</sub>O<sub>5</sub> - 10ZnO - 30PbF<sub>2</sub> - (x) Nd<sub>2</sub>O<sub>3</sub> where (0.0 ≤ x ≤ 2.0 mol %) was prepared using a melt-quenching approach to the development of transparent glasses. These glasses have been confirmed to be an amorphous structure through XRD analysis. The glass density, molar volume and ionic packing density were obtained in the range of 3.978- 4.157 g cm<sup>-3</sup>, 41.949 - 41.073 cm<sup>3</sup> mol<sup>-1</sup> and 0.614-0.624, respectively. Using Fourier Transform Infrared (FTIR) and Raman Spectroscopy, the chemical functional groups and biomolecules of samples were characterised. The FTIR spectra revealed six main bands assigned to P-O, P-O-P, P=O, (PO<sub>3</sub>)<sub>2</sub><sup>-</sup> and hydroxyl groups (O-H), while Raman shift detected five symmetric and asymmetric bands attributed to P-O-P bonds in Q<sub>1</sub> units, (PO<sub>4</sub>)<sub>3</sub><sup>-</sup> bonds in Q<sub>0</sub> units, (PO<sub>3</sub>)<sub>2</sub><sup>-</sup> bonds in Q<sub>1</sub> units, (PO<sub>2</sub>)<sup>-</sup> bonds in Q<sub>2</sub> units and P=O bonds in Q<sub>3</sub> units. It is believed that the proposed oxyfluoride glasses may be useful and suitable applicant to lasing materials and sensors sensitivity.