Physical and Structural Properties of Sm 3+ Doped Phosphate Glasses

by Abd Hakim S

Physical and Structural Properties of Sm^{3+} Doped Phosphate Glasses

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Abstract

Various hosts such as glass, crystal and poly crystalline are treated with soil ions. In this research the medium of glass was made with composition (70-x) P_2O_5 - $10Bi_2O_3$ - $10Na_2O$ - $10Gd_2O_3$ - xSm_2O_3 with x = 0; 0.05; 0,1; 0, 5; 1.0; 3.0 (mol%) doped by active ion xSm_2O_3. Molar mass, density (ρ), Sm^{3+} ion concentration (N), field strength (F) have increased in value as the Sm^{3+} concentration increases , the dielectric constant (ε) has an increase in pada PBNaG:S1, PBNaG:S3 dan menurun pada PBNaG:S2, PBNaG:S4, PBNaG:S5, molar refractivity (Rm) increases in PBNaG:S1, PBNaG:S4 and decreases in PBNaG:S2, PBNaG:S3, PBNaG:S5, while for molar volume, polar radius and inter nuclear distance decreases with increasing concentration Sm^{3+} in phosphate glass. Contrast to the refractive index, the susceptibility of the oxide ion polariability (αm) and reflection loss do not change in value. Spectrum diffraction shows that the shape of pattems are found no sharp peaks along the diffraction angle observation area (2θ).

Background

Glasses doped with soil ions rarely attract the attention of researchers because of their wide application in fields such as optical fibers, laser materials, fluorescence screens, optical detectors, and wave guides (Mawlud, S.Q., 2019). An interesting advantage of this rare earth material (RE) is that it is able to maintain its amorphous nature. The choice of host material is important for improving the efficiency of the luminescence process. The phosphate glass has high mechanical properties, and high thermal stability (Thomas, and Chithambo, 2018). Bismuth material is useful as a protective material in place of lead (Pb). Glasses containing bismuth ions produce more radioactive resistance. In addition, glass with Bi_2O_3 has a long lifetime for the optoelectronic field because of its high density and refractive index (Wantana, Kaewjaeng, Kothan, Kim, H. J., & Kaewkhao, J. 2017).

Method

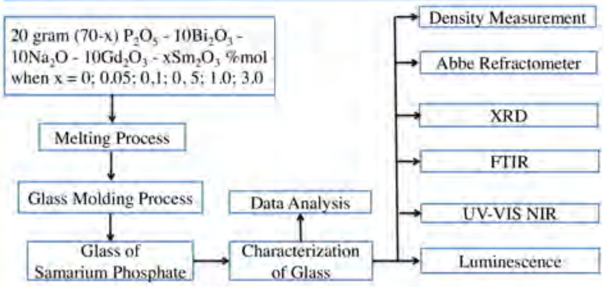

Figure 1. The prosess of making sm^{3+} glass with melt-quenching method

Results

Figure 2 : Medium glass after the process of forming size and smoothing

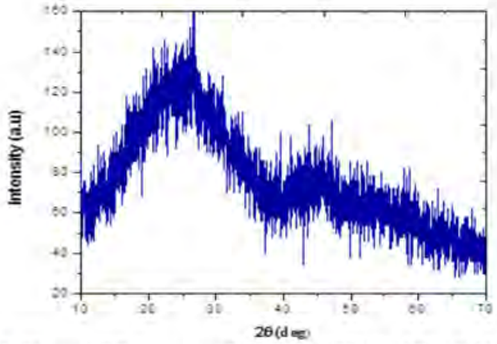

Figure 3. Glasses XRD spectrum (70-X) P_2O_5-$10Bi_2O_3$-$10Na_2O$-$10Gd_2O_3$-xSm_2O_3 (x=3.0%mol PBNaG)

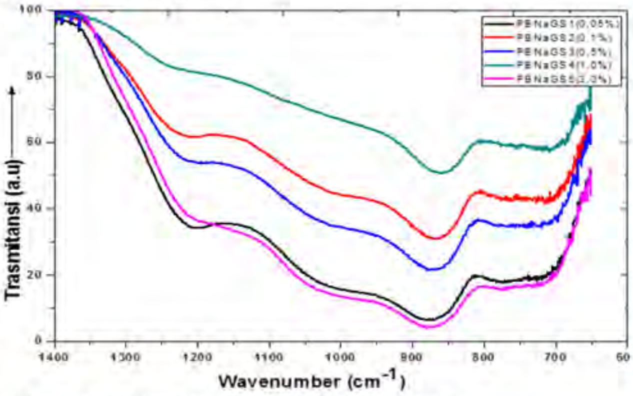

Figure 4. FTIR spectrum for Sm^{3+} -phosphate glass

Conclusions

This study it was reported that the manufacture of glass medium doped by active ion Sm^{3+} to be applied as a glass laser medium optical amplifier in the near infrared operating range. it can be concluded that: The effect of the variation of the active ion concentration of Sm^{3+} on the optical properties of the Phosphate glass material is that the density of each sample increases slowly following the increase in the concentration of Sm^{3+} and the refractive index gradually increases from 1630 for undoped glass to 1653 for 3.0 Sm^{3+} glasses. Glass structure of Phosphate as Samarium doping glass material for variations of the Sm^{3+} concentration is obtained that the glass medium Sm: Phosphate does not contain crystalline properties as evidenced by the amorphous properties observed in the glass type Sm: Phosphate. This shows that the Sm^{3+} ion concentration does not affect the medium diffraction pattern of glass. Sm: Phosphate.

Acknowledgments

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