

ABSTRAK

Donna Helen Br Rajagukguk (8206140001) Pengembangan Medium Penguat Optik Berbasis Ion Samarium (Sm^{3+}) Didoping Pada Gelas Fluoro Borophosphate. Program Pascasarjana Universitas Negeri Medan 2022

Penelitian ini bertujuan untuk mengetahui pengaruh senyawa fluoro terhadap sifat luminesensi, sifat radiatif, dan sifat optik dari medium gelas borofosfat didoping dengan ion Sm^{3+} . Komposisi medium gelas yang digunakan adalah $(64-x)\text{P}_2\text{O}_5-5\text{B}_2\text{O}_3-15\text{ZnO}-15\text{Li}_2\text{O}-y\text{YF}-1\text{Sm}_2\text{O}_3$ (% mol) dengan $y = 0$ dan 15 serta Y merupakan unsur logam, yaitu Kalsium (Ca), Natrium (Na), Litium (Li) dan Al (Aluminium). Pembuatan material gelas fluoro borofosfat didoping ion Sm^{3+} menggunakan teknik *melt-quenching* serta dikarakterisasi menggunakan FTIR, XRD, *Abbe Refractometer*, UV-Vis-NIR *Spektrophotometer*, dan *spektrofluorophotometer*. Hasil karakterisasi berguna untuk menganalisis beberapa sifat yang dihasilkan oleh medium gelas, seperti sifat fisis, struktur, optik, luminesensi, dan radiatif. Beberapa parameter sifat fisis gelas borofosfat telah diperoleh yaitu, volume molar, indeks bias, densitas, jarak antar ion, kekuatan medan, radius polaron, konstanta dielektrik, refraksi molar, polarisasi molar. Hasil karakterisasi XRD dan FTIR menunjukkan bahwa gelas bersifat *amorf* dan adanya unit struktural dari ikatan P-O-B. Teori Judd-Ofelt diterapkan pada spektrum serapan optik dan penentuan sifat radiatif gelas borofosfat. Hasil yang diperoleh adalah intensitas parameter JO dengan tren $\Omega_4 > \Omega_6 > \Omega_2$. Kromatisitas CIE digunakan untuk mengetahui warna emisi yang dihasilkan oleh gelas borofosfat yang didoping dengan ion Samarium dengan hasil koordinat (0,59, 0,40) menunjukkan gelas memancarkan warna emisi oranye.

Kata Kunci : Gelas Borofosfat, Samarium, *Melt-quenching*.



ABSTRACT

Donna Helen Br Rajagukguk (8206140001) Development of Optical Amplifier Based on Fluoro- Borophosphate Doped Samarium (Sm^{3+}) Ion Glasses. Postgraduate School of Universitas Negeri Medan 2022.

This study aims to determine the effect of fluoro compounds on the luminescence properties, radiative properties, and optical properties of borophosphate glasses medium doped with Sm^{3+} ions. The composition of the glasses medium used is $(64-x)\text{P}_2\text{O}_5-5\text{B}_2\text{O}_3-15\text{ZnO}-15\text{Li}_2\text{O}-y\text{YF}-1\text{Sm}_2\text{O}_3$ (% mol) with $y = 0$ and 15 and Y is a metal element, namely Calcium (Ca), Sodium (Na), Lithium (Li) and Al (Aluminum). The manufacture of fluoro borophosphate glasses material doped with Sm^{3+} ions using the melt-quenching technique and characterized using FTIR, XRD, Abbe Refractometer, UV-Vis-NIR Spectrophotometer, and spectrofluorophotometer. The characterization results are useful for analyzing several properties produced by the glasses medium, such as physical, structural, optical, luminescence, and radiative properties. Several parameters of the physical properties of borophosphate glasses have been obtained, namely, molar volume, refractive index, density, inter nuclear distance, field strength, polaron radius, dielectric constant, molar refraction, and molar polarization. The results of XRD and FTIR characterization showed that the glasses was amorphous and the structural units of P-O-B bonds were present. Judd-Ofelt theory is applied to optical absorption spectra and the determination of radiative properties of borophosphate glasses. The result obtained is the intensity of the JO parameter with a trend of $\Omega_4 > \Omega_6 > \Omega_2$. CIE chromaticity is used to determine the emission color produced by borophosphate glasses doped with Samarium ion with coordinates (0.59, 0.40) showing the glasses emitting an orange emission color.

Keywords: Borophosphate Glass, Samarium, Melt-quenching.

