

Optical absorption and photoluminescence properties of Sm³⁺ doped B₂O₃-ZnO-Li₂O-Na₂O-PbO glasses system

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Borate glasses are one of the appropriate materials combined with rare earth ion for fabricating photonic devices. This article reports on spectroscopic and photoluminescence properties of (65-x) B₂O₃:15 Na₂O:10PbO:5ZnO:5Li₂O: x Sm₂O₃ glasses (where x = 0.05; 0.1; 0.5; 1.0; 2.0 and 4.0 mol%). The glasses have been prepared using the melt-quenching method with total mass of 20 grams mixed in alumina crucible. The optimum size of 3 mm x 10 mm x 10 mm glasses were obtained by cutting and polishing for absorption, infrared, photoluminescence and excitation spectra investigations. Density, XRD and also energy band gap properties were observed to explain the physical phenomena of the glass samples. The results show that the glass structure of Sm³⁺ doped borate glass system confirms to the amorphous phase. The addition of Sm₂O₃ ion in matrix glass from 0.05 mol% to 4.0 mol% causes the absorption intensity increases. The different pattern occur on photoluminescence spectra, where the highest emission intensity achieved on 0.1

mol% Sm₂O₃ for ⁶H_{5/2} → ⁴K_{11/2} transition. Whereas the lowest emission intensity experienced by 4.0 mol% Sm₂O₃. From photoluminescence spectrum, it is well be known that there are ten transition bands corresponding to ⁶H_{5/2} → ⁴F_{11/2}, ⁶H_{5/2} → ³H_{7/2}, ⁶H_{5/2} → ⁴F_{9/2}, ⁶H_{5/2} → ⁴D_{5/2}, ⁶H_{5/2} → ⁴K_{11/2}, ⁶H_{5/2} → ⁶P_{5/2}, ⁶H_{5/2} → ⁴G_{9/2}, ⁴I_{15/2}, ⁶H_{5/2} → ⁴F_{5/2}, ⁴I_{13/2}, ⁶H_{5/2} → ⁴I_{11/2}, ⁴M_{15/2}.

Speaker Biography

Juniastel Rajagukguk has completed PhD from Institut Teknologi Bantung (ITB) on 2016. He is a Associate Profesor at Physics Department, Faculty of Mathematics and Natural Sciences, Universitas Negeri Medan (Unimed) – Medan City, Indonesia from 2008 –now. He has over 30 publications that have been cited over 60 times with H-index from scopus databased is 3. Now he is active in the research field of Optical Spectroscopic of glasses material doped with some rare earth ions such as Nd³⁺, Er³⁺, Eu³⁺, Sm³⁺ and Dy³⁺ and also a reviewer of International Journal.

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