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SYNTHESIS AND CHARACTERIZATION OF Er3+ DOPED 10Al2O3-60Li2O-30B2O3 INVERTED GLASSES

In recent years, rare earth metals such as erbium have gained great importance in various technological applications. At the same time, borate glasses have emerged as another crucial material due to their ability to form glass even at relatively low cooling rates and under pressure alone[1]. B2O3 glasses facilitate melting, reduce viscosity and surface tension, which improves the material's workability and performance during processing. To analyze these materials, infrared (IR) spectroscopy [2] is used to identify the functional groups present in the sample. Subsequently, optical absorption spectroscopy reveals the main absorption bands, especially in the case of the Er3+ dopant ion, where electronic transitions from the ground state 4I15/2 to excited states such as 4I13/2, 4I11/2, 4I9/2, 4F9/2, 4S3/2, 4H11/2, and 4F7/2 are expected. To better understand the interaction between atoms and light in these systems, the Judd-Ofelt theory will be applied [4]. This theory allows the calculation of parameters such as Ω2, Ω4, and Ω6, which provide information about the local symmetry around the dopant ion (Er3+), as well as properties such as the viscosity and rigidity of the material. In addition, measurements such as the ratio of observed to predicted light emission (βexp, βcal), the probability of light emission instead of other forms of energy (AR) and the light absorption efficiency (σp), among others, will be employed. For a more detailed analysis of the dynamics of the systems, the theory developed by Inokuti and Hirayama will be used [3]. This will allow us to determine the lifetimes of the excited states, as well as to understand the predominant electrostatic interaction mechanisms, the critical interaction distance and the energy transfer efficiency between neighboring atoms.

Keywords

Glass, Erbium-doped, Spectroscopy, Transitions.

Reference

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