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MODEL BASED ON DIFFERENTIAL EQUATIONS TO EXPLAIN THE QUENCHING OF LUMINESCENT POROUS SILICON IN AN ETHANOL-WATER SYSTEM.

Luminescence quenching in porous silicon has been widely employed due to its sensitivity to numerous molecular species acting as quenchers. Various molecular interactions can induce luminescence quenching, including excited state reactions, molecular rearrangement, energy transfer, complex formation in the basal state, and collisional quenching. Collisional inhibition, also known as dynamic process, occurs when the excited-state silicon is deactivated upon contact with another molecule in solution, called quencher. To explain the interaction of luminescent porous silicon with quenchers in an ethanol-water system, a model based on differential equations was proposed, which is a conventional tool for exploring luminescent processes. This method focuses on analyzing the population density of each energy level involved. Photoluminescence inhibition tests were conducted using ethanol and water. The amount of water was kept constant at 10, 11, and 12 mL, while the amount of ethanol in each batch varied. Spectra were acquired using a fluorescence spectrometer (Varian-Agilent Cary Eclipse) with an excitation wavelength of 360 nm, employing a mount designed for liquids at room temperature. The collected measurements were analyzed and fitted to the proposed model. The findings indicate a strong alignment between the proposed model and the collected data.

Keywords

Porous Silicon, photoluminescent, quenching, differential equiations, model

Reference

Luis Octavio Meza Espinoza, “Estudio de la dinámica luminiscente en nanocristales de ZrO2 y Y2O3 dopados con Yb3+Er3+ por medio de ecuaciones de razón con un enfoque macroscópico y microscópico ,”Centro de investigaciones en óptica A.C., León, 2011.

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