

# Preparation and study the properties of gallium doped zinc oxide nanocomposite for use in photodetector and scintillation materials

Sanaz Alamdari<sup>1,2,\*</sup>, Morteza Sasani Ghamsari<sup>2</sup>, Majid Jafar Tafreshi<sup>1</sup>

<sup>1</sup>Department of Physics, Semnan University, P.O. Box 35195-36, Semnan, Iran

<sup>2</sup>Photonics and Quantum Technologies Research School, Nuclear Science and Technology Research Institute, 11155-3486, Tehran, Iran

Received: 28.09.2018    Final revised: 18.01.2019    Accepted: 13.02.2019

## Abstract

In this article, a transparent gallium doped zinc oxide (GZO) nanocomposite with novel photoluminescence properties was prepared at room temperature. The GZO nanocrystals were synthesized by the simple sol-gel method. The optical, structural, and morphological properties of the samples were investigated by various analyses including photoluminescence spectrum, UV-visible absorption spectrum, XRD, EDAX, FTIR, TEM, and FESEM images. The XRD analysis showed that the samples had a wurtzite structure consistent with all crystalline plates of ZnO without any extra peaks or oxide phases. Two nanocomposites, one containing dried nanopowder and the other containing calcined nanopowder, were also prepared. The calcined nanocomposite exhibited good optical properties, including 70% optical transparency in the visible wavelength region with a high green emission peak at room temperature. Moreover, the presence of gallium and zinc and the related bonds in the structure was confirmed by EDAX characterization. The results have shown that the GZO composite has a novel luminescence property in the blue-to-green visible region, which can be a good candidate for photo detection and scintillation applications with a very low cost.

**Keywords:** Sol-gel, composite, ZnO, synthesize, gallium, luminescence properties

---

\* Corresponding Author: [alamdari\\_sanaz68@yahoo.com](mailto:alamdari_sanaz68@yahoo.com)

