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Synthesis and optical properties of iron doped gallium nitride nanostructures by sol gel method

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Abstract

Recently, wide band-gap III-Nitride (III-N) materials and its alloys have attracted much research due to its unique properties and diverse field of applications. In the present study, GaN with various concentration of iron (Fe) in the range 0-5 at% nanostructures were prepared by facile solution process using (Ga(NO₃)₃·9H₂O), iron (III) chloride hexahydrate (FeCl₃·6H₂O) at mild temperature for the first time. The microstructure was analyzed by means of X-ray diffraction and atomic force microscopy. The detailed studies demonstrate that the as-synthesized nanoparticles are well crystallized GaN with a hexagonal wurtzite structure and having the average size of 31 nm in diameter. The optical properties of as the prepared GaN are investigated for Fe doping concentrations ranging from 0.1 to 5 at%. The optical band gap value increases with increasing Fe concentration. These results suggest that the Fe doped-GaN is a promising candidate for optoelectronics and spintronics devices.

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