SSNN 8P **A COMPARATIV STUDY OF GaN AND Ga_2O_3 NANOCRYSTALS OBTINED BY HYDROTHERMAL AND SOLID STATE PHASE REACTIONS**

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There is actually a considerable interest in the preparation of nanoparticles on the basis of semiconductor and oxide materials due to the influence of nanoparticle dimensionality upon their optical, radiative, and magnetic properties. Particularly, optical properties of GaN nanostructures are interesting for applications in solid-state lightening.

We report on monoclinic Ga_2O_3 nanoparticles preparation by two methods (hydrothermal growth and solid state phase reactions), and conversion of the obtained Ga_2O_3 nanoparticles into GaN nanocrystals by nitridation. Ga_2O_3 nanoparticles doped with Eu have been also produced. High purity $Ga(NO_3)_3$ $9H_2O$ and 1M NaOH chemicals from Sigma-Aldrich have been used for synthesis of Ga_2O_3 nanoparticles in the hydrothermal growth. The experimental procedure consists in dissolution of 2.5M of gallium nitrate in 50 ml of distilled water and adjustment of the solution pH to the value of 9 by means of the 1M NaOH solution under vigorous stirring. The suspension is introduced in a teflon autoclave with a steel shell to ensure a good sealing. The process lasts for 5 hours at the temperature of 220^{o}C. The particle separation after autoclaving was performed by settling and filtering with a subsequent drying in an oven during 2 hours at 80^{o}C. The obtained powder was studies by means of XRD spectroscopy which demonstrated the presence of a single Ga_2O_3 phase.

Ga_2O_3 synthesis by solid state reactions has been performed with high purity $Ga(NO_3)_3$ $9H_2O$ and CH_4N_2O precursors from Sigma-Aldrich. The technological procedure consists in grinding together the precursors, introduction of the produced mixture in a porcelain crucible which is subsequently introduced in a furnace for calcinations through heating at 900^{o}C for 4 hours. The obtained white powder was characterized by XRD spectroscopy which demonstrated the presence of a single Ga_2O_3 phase.

GaN nanoparticles have been produced from Ga_2O_3 nanocrystals under flowing ammonia with a subsequent nitridation in a mixture of NH_3 and H_2 with flow rates of 0.35 and 2.5 l/min, respectively. The Ga_2O_3 powder was placed into a horizontal tube furnace with a quartz boat and heated at temperature of 900-950 ^{o}C during 90-150 min After annealing, the furnace was switched off, and cooling down occurred in a natural fashion. The diffraction peaks observed in the XRD pattern of the produced GaN powder can be indexed to a hexagonal wurtzite structure. The sizes of the produced high crystallinity GaN nanoparticles deduced from the XRD spectra according to Sherrer formula are around 28.6 nm.

Apart from XRD characterization, the produced materials have been studied by means of scanning electron microscopy, EDX analysis, photoluminescence, Raman and FTIR spectroscopy. The results of these investigations are discussed in this report.

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