SSNN 26P LUMINESCENT PROPERTIES OF RARE EARTH ACTIVATED ZnO BINARY AND TERNARY MATERIALS

A.V. Rogachev[1], A.V. Semchenko[1]*, V.V. Sidsky[1], D.L. Kovalenko[1],
V.F. Gremenok[2], E.P. Zaretskaya[2], E. Rusu[3], M.S. Tivanov[4]
[1]*Francisk Skorina Gomel State University, Sovetskaya 104, Gomel, 246019, Belarus;*
[2]*Scientific-Practical Materials Research Centre of the National Academy of Sciences of Belarus, P. Brovki Str., 19, Minsk, Belarus,*
[4]*Institute of Electronic Engineering and Industrial Technologies, Academy of Sciences of Moldova, 3/3 Academiei St., Room 202, Kishinev, MD 2028, Moldova*
[4] *Belarusian State University, Nezavisimosti av, 4, 220030, Minsk,Belarus*
* E-mail: *semchenko@ gsu.by*

Development by sol-gel method of nanostructured luminescent materials based on binary and ternary oxides and containing rare earth ions for use as inorganic photoluminophors, active layers for solar cells and inert scintillators for various radiation types are discussed.

The structural and luminescent properties of the materials obtained according to the different compositions, synthesis conditions and type of activator ion has been studied.

Zinc oxide ZnO is widely used in a number of optoelectronic devices such as solar cells. ZnO films can be prepared by various methods. Of particular the opportunities to obtain ZnO films with controlled physical properties by sol-gel synthesis is very attractive. This method combines the simplicity of the process and the lower cost of used equipment and materials. The required amount of zinc acetate and aluminium and rare earth salts filled into absolute isopropyl alcohol and stirred in order to manufacture the ZnO:Al/RE layer from the precursor (sol). Then sol was stirred for 30 minutes. Sol was kept at the room temperature (22±2)° C for 2-3 days. Monoetalamin was selected as the catalyst because reduced the exposure time to two days and ensure their stability during the month. After applying the sol onto the surface of glass, single crystal silicon etc., the samples were placed in the furnace and were heated stepwise at intervals of 20 °C to the temperature of 350 0C for 10 minutes. The process of applying and drying had been repeated until the desired thickness of the ZnO:Al/RE layer was achieved.

Phosphors composition Y_2O_3-Al_2O_3-B_2O_3:Eu^{3+}, Nb_2O_5:B_2O_3:Eu^{3+}, Y_2O_3-Al_2O_3-B_2O_3:Ce^{4+}, Nb_2O_5:B_2O_3:Ce^{4+} were synthesized by the sol-gel method starting from inorganic salts of metals with isopropyl alcohol as solvent. Then the solution was heated to 700 C for 20 minutes with constant stirring. It was accompanied by solvent evaporation. The resulting sol was applied onto quartz glass substrate and heat-treated at 1100 C. The synthesized materials with thickness of 1-3 mm had high luminescence intensity.

The work was supported by Belarusian Foundation for Fundamental Research (Project T15-MLD033) and by Academy of Sciences of Moldova (project 15.820.18.02.05/BE).