

Synthesis of nanostructure yttrium-aluminum garnet powders activated with cerium, europium, gadolinium and their luminescent characteristics

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A progressive method of luminescent nanostructure yttrium-aluminum garnet powders doped with rare-earth ions was developed. This method based on the nitrate salts combustion in the presence of complex organic fuel (urea and hexamethylenetetramine). The modes of synthesis are optimized and structural and spectral-luminescent characteristics of the ultradispersed powders of chemical composition $Y_3Al_5O_{12}:Ce, Eu, Gd$ with the sizes of 0.8-1.2 μ are studied. The nanostructure powders were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), and IR-spectroscopy. The components $Y(NO_3)_3 \cdot 6H_2O$; $Al(NO_3)_3 \cdot 9H_2O$; $Ce(NO_3)_3 \cdot 6H_2O$; $Eu(NO_3)_3 \cdot 6H_2O$; $Gd(NO_3)_3 \cdot 6H_2O$; $CO(NH_2)_2$; $(CH_2)_6N_4$ are mixing in distilled water. The

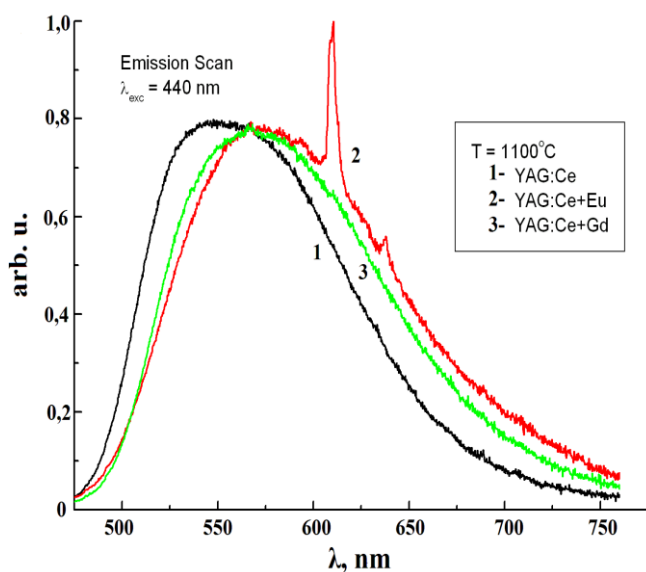


Fig. Luminescent spectra $Y_3Al_5O_{12}:Ce, Eu, Gd$

emission. Doping of yttrium-aluminum garnet with cerium and gadolinium at excitation 440 nm leads to curve shift in longer wave length too (during firing in the air at 1100°C in all cases). $Y_3Al_5O_{12}:Ce, Eu, Gd$ phosphors prepared through combustion reaction under controlled condition can be applied in light emission diodes source with emission of warm white light.

solution is concentrated in the oven at 80 – 100 °C to obtain the gel and is heat-treated in muffle furnace at 1100 °C. The spectral-luminescent characteristics depend on concentration and nature of doping impurities, temperature of heat treatment, and type of organic fuel. Doping of yttrium-aluminum garnet with cerium at excitation 440 nm causes broadband luminescence in the range of 480 – 700 nm, additional powders doping with europium leads to curve shift in longer wave length and appearance additional band 610 nm on curve, belonging of europium ions