Nanocomposites and nanomaterials

Luminescent materials based on yttrium-aluminum garnet for LED lighting devices

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A new method of luminescent powders preparing, based on the nitrate salts combustion in the presence of complex organic fuel (urea and hexamethylenetetramine) was developed. The modes of synthesis are optimized and structural and spectral-luminescent characteristics of the ultra dispersed powders of chemical composition Y_2O_3:Eu,Bi and $Y_3Al_5O_{12}$:Ce, with the sizes of 0,8-1,2 mkm are studied. Dependences of spectral-luminescent characteristics of powders are set on concentration and nature of doping impurities, temperature of heat treatment, and type of gas environment. Doping of yttrium-aluminum garnet with cerium at excitation 455 nm causes broadband luminescence in the range of 500 – 700 nm, additional processing of powders in the environment of argon at 1200 °C leads to growth of intensity of luminescence by 1,5 – 2 times for a phosphor received by burning, and addition of gadolinium and lanthanum ions allow to move the spectrum of luminescence in a red area.

In the laboratory of technical ceramics and nanomaterials of the Sukhoi Gomel State Technical University laboratory has developed and patented a new composition and method of forming the phosphor coating on the basis of low-melting glass composition $BaO\text{-}Bi_2O_3\text{-}B_2O_3\text{ -}K_2O\text{-}SiO_2$ with a melting point of not more than 600 degrees and ultra dispersed powder yttrium aluminum garnet doped with cerium and powder Y_2O_3:Eu,Bi, synthesized by the burning of nitric acid salts, in the presence of complex organic fuel: urea and hexamethylenetetramine, and it is a distinctive feature of the method is the introduction in the composition of the powder silica glass as the diffusion scattering component improving lighting characteristics of luminous converter.