SYNTHESIS AND PROPERIES OF ERBIUM AND YTTERBIUM OXIDE NANOPARTICLES AND FABRICATION OF POLYMER NANOCOMPOSITES ON THEIR BASIS

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Abstract

The method of synthesis and investigations of erbium and ytterbium oxide nanoparticles, deposited on the surface of silicon nanoparticles are presented. The basis of the developed technology consists in the thermal decomposition of rare earth salts in the polyatomic alcohol environment at temperatures higher as the boiling temperature of water. This enables us to obtain oxide nanoparticles without hydrate form admixture. Also, the given method allows us to perform anhydrous synthesis at temperatures not higher as 200 C, what preserves nanoparticles in their initial state without agglomeration. So the result of the synthesis is an oxide nanoparticle, free of agglomeration and hydrate admixtures, what makes not necessary the high temperature treatment, which is usually applied in the synthesis of similar nanoparticle according to the literature data. Transparent nanocomposite material was obtained by insertion of the above mentioned erbium and ytterbium oxide nanoparticles to the photopolymerizable acrylate composite in the presence of silicon nanoparticles, with and without addition of gold nanoparticles. The luminescence of the synthesized rare earth oxide nanaparticles as well as of the polymer nanocomposite on their basis was investigated in the visible and infrared spectral range. The enhancement of luminescence was established in the presence of gold nanoparticles. The developed nanocomposite material can be applied in novel integrated optical structures.

Keywords: Polymer nanocomposite, rare earth oxide nanoparticles, gold nanopartciles, luminescence

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