

Nanooptics and photonics

Copper and Copper-Europium nanospecies embedded in quartz glass: spectral characterization

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Transition and RE ions proved to be very promising dopants for elaboration of multifunctional materials – effective photo-, X-ray- and thermoluminophors, scintillators and etc. Quite recently we reported on cerium and europium nanospecies in quartz glass [1]. Now we extended investigations and here we present spectral study on copper and copper-europium nanospecies in quartz glass.

The set of samples with different content of Cu (0.025-0.05 wt %) and Eu (0.01-0.05 wt %) which denoted as Cu/SiO₂ and Cu,Eu/SiO₂ were prepared using modified sol-gel method [1]. The main results received in the study:

i UV-vis absorption spectra of Cu/SiO₂ and Cu,Eu/SiO₂ consist of two kinds of bands – very intensive and broad bands in the range of 220-250 nm and the next ones 290-300 nm. The first kind of bands were attributed to CT transition O²⁻ → Cu²⁺ ions while the next ones we assigned as transition 3d⁹4s → 3d¹⁰ of Cu¹⁺ ions.

ii Photoluminescence (excitation-emission) spectra of Cu/SiO₂ and Cu,Eu/SiO₂ display bands in the range of 250-350 nm and 500-560 nm, respectively, which are caused by 3d⁹4s ← 3d¹⁰ of site-dependent Cu¹⁺ ions.

iii Photoluminescence (excitation-emission) spectra of Eu/SiO₂ and Cu,Eu/SiO₂ exhibited fine line structure arising from ⁵D₀ → ⁷F_n manifolds (570–750 nm) of Eu³⁺ ions. Domination of the ⁵D₀ → ⁷F₂ transition in the spectra clearly points on low site symmetry of Eu³⁺ ions.

1. Ignatovych M., Borysenko M., Davydenko L., Borysenko L., Veres M., Himics L., Koos M. Cerium and europium nanospecies in quartz glass: synthesis and spectral study // *Mat.-wiss. u. Werkstofftech.*-2016.-**47**(2–3). P. 193-197.