Nanocomposites and nanomaterials

CeO_2 nanoparticles as energy transfer mediators in luminescent lantanide complex with organic ligand-antenna

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Lanthanide compounds are perspective materials for light-emitting systems and medicine due to the sharp emission bands, long lifetimes, and large Stokes shifts [1]. The direct excitation of Ln^{3+} ions is a weak phenomenon, as it occurs only through symmetry-forbidden *f-f* transitions. Thus, the search of new routes for luminescence sensitization is important task for modern chemistry.

We have developed the method of synthesis of luminescent nanocomposite based on lanthanide coordination polymer $Eu(BTB)(H_2O)\cdot 5(H_2O)(C_6H_{12}O)_{0.5}$ (H_3BTB = 1,3,5-benzenetris(4'-benzoic) acid, $C_6H_{12}O$ = cyclohexanol) (CP) and CeO_2 nanoparticles (NP). CeO_2 NP were chosen as sensitizers due to their strong absorption band in UV spectrum.

The composite was synthesized by formation of CP in the presence of previously prepared CeO_2 NP. The phase and the structure of the composite were confirmed using XRD and TEM.

Characteristic Eu^{3+} narrow emission bands are observed in the luminescence spectra of individual CP and nanocomposite. The luminescence intensity of the composite is more than four times higher compared with individual complex. It may be explained by assumption that NP CeO_2 in the composite work as mediators of energy transfer that lead to more effective energy transfer from BTB^{3-} to emitting level of Eu^{3+}. So, we have demonstrated the possibility to increase the Eu^{3+}-luminescence quantum yield in CP by formation of the nanocomposite $CeO_2/Eu(BTB)(H_2O)\cdot 5(H_2O)(C_6H_{12}O)_{0.5}$.

1. *Zhang X., Wang W., Hu Z., Wang G., Uvdal K.* Coordination polymers for energy transfer: Preparations, properties, sensing applications, and perspectives // Coord Chem Rev.-2015.-**284**.-P. 206–235.