

**SYNTHESIS AND EMISSION PROPERTIES OF HYBRID MATERIALS  
BASED ON SILICA, TITANIA AND LANTHANIDE (III)  
AMINOPOLYCARBOXYLATES**

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Despite the growing amount of data obtained for silica-containing hybrid systems, the interpretation of features of their spectroscopic properties is still contradictable. Some authors claim that the inorganic matrix is not involved in luminescence sensitizing and that the observed increase of luminescent characteristics is caused by reduction of non-radiative pathways, while others propose that there is an energy transfer from singlet and triplet levels of the hybrid matrix to resonant levels of Ln(III) ions. One of the ways to understand the effect of the inorganic matrix is the gradual modification of the hybrid material. In such systems, one of the components, namely silica, provides the covalent grafting of the organic compound, while the second component, the lanthanide complex, acts as a luminescent unit. In its turn the inorganic host can be optically «transparent» ( $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ ) or optically active ( $\text{TiO}_2$ ,  $\text{Bi}_2\text{O}_3$ ). Such methodology leads to hybrids of different composition, which opens the way for new class materials with unique properties. To the best of our knowledge, only few attempts of adding Eu (III) to  $\text{SiO}_2 - \text{TiO}_2$  composites are known. This approach can combine the outstanding optical properties of europium ions and hybrid inorganic hosts. We studied the influence of the relative Si/Ti ratio, the concentration of Eu (III) doping and the order of addition of components on the emission properties of materials in order to characterize these systems.

In this work, we report the results of spectroscopic studies of Ln(III) complexes with ethylenediaminetetraacetic (EDTA) and diethylenetriaminepentaacetic (DTPA) acids embedded in silica and mixed silica-titania inorganic matrices (Fig. 1). The attachment of Eu(III) complexes was made with the use of both covalent and non-covalent interaction. Samples were studied of different ratios ( $\text{TiO}_2/\text{SiO}_2 = 20/80, 10/90, 5/95$ ) and different concentrations of europium complexes. Peculiarities of the synthesis of such materials and properties of lanthanide-centered luminescence in visible region as well as perspective of practical use are discussed.

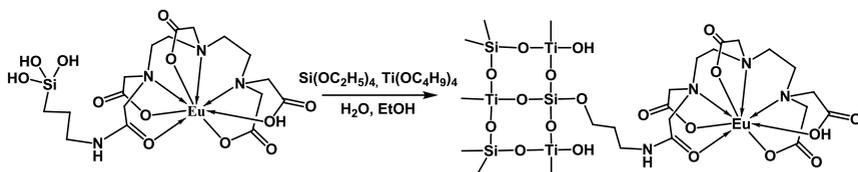


Fig. 1. Synthesis of hybrid material with Eu-DTPA complex covalently attached to a  $\text{SiO}_2/\text{TiO}_2$  network