

Optical Properties of Nano-Structures of Eu(II) Compounds in Frozen Saline Melts

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Nanoscale systems based on Eu(II) compounds are obtained by stabilization intra saline matrices at molten salt systems of crystallization.

In the experimental study of nanostructures of Eu(II) compounds in the salt systems the optical properties not inherent in the individual Eu(II) compounds via the electron spectroscopy of diffuse reflectance, IR spectroscopy, luminescence spectroscopy methods was established. The NaCl – EuF₂ mechanical mixture, like EuF₂ practically shows no luminescence. Also in frozen melt NaCl – EuF₂ the luminescence is weak.

In diffuse reflectance spectra in the near-IR range the distinct absorption bands of low intensity which are caused by 4*f*-4*f* electron transitions in the Eu(III) are available. At the interaction of NaCl and EuF₂ the complexation is not present that promotes rapid oxidation of the last one to Eu(III) compound.

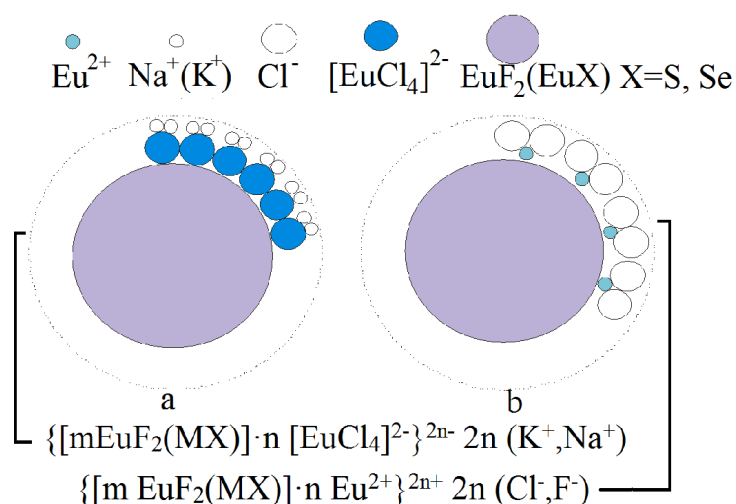


Figure. – Scheme of the electrical structure of EuF₂ (EuX) nanoparticles in salt systems:

- a) – NaCl–KCl, KCl;
- b) – NaCl.

The outer shell of EuF₂ nanoparticles in the KCl or NaCl – KCl systems, which includes the [EuCl₄]²⁻ or the [Eu₂Cl₅]⁻ complex ions, are protected from the

oxidation of europium (II) (Fig.). Thanks to this in the systems of KCl – EuF₂ and NaCl – KCl – EuF₂ an intensive blue luminescence which is caused by 5*d*-4*f* electron transitions in the Eu²⁺ ions is manifested. Thus by comparing the optical properties of the studied systems, it is easy to see that the frozen NaCl – KCl – EuF₂ melt is located in an intermediate position between the NaCl – EuF₂ and the KCl – EuF₂ systems. Influenced by factors such as concentration quenching and coordination environment of Eu(II) the optical properties of nanostructures of Eu(II) compounds appear. There are suggestions that emission is caused not by the nanoparticles of Eu(II) compounds, but by their shells.