

The scope of the scientific project including receiving glass-ceramic sol-gel systems containing fluoride nanocrystals is located in the modern trends of research for advanced optical materials.

The objectives of the project are: fabrication of glass-ceramic sol-gel materials containing fluoride nanocrystals and the optically active ions (rare earths) and their structural and luminescence investigations using X-ray diffraction, microscopic and spectroscopic methods. In particular, the luminescence spectra of rare earths and their decays in fluoride nanocrystals distributed into sol-gel materials will be examined in relation to potential multicolor lighting applications.

The structural and thermal investigations are planned: X-ray diffraction analysis (XRD), transmission electron microscopy (TEM), infrared spectroscopy (FT-IR) and differential scanning calorimetry (DSC). The following methods using optical spectroscopy (absorption, excitation, luminescence, lifetime measurement, refractive index measurement) are necessary to determine spectroscopic parameters important for the energy transfer processes between rare earth ions.

In our opinion, the proposed project gives important contribution to development of scientific research in the field of nanotechnology and applied spectroscopy. Fabrication and detection of fluoride nanocrystals is interesting from the technological and structural points of view. The spectroscopic investigations are interesting not only from the scientific point of view, but they are important in relation to potential applications. The energy transfer processes between rare earth ions in fluoride nanocrystals present in sol-gel materials will be examined for multicolor luminescence applications.

We assume that the enhanced luminescence can be achieved under different excitation wavelengths through the energy transfer between rare earth ions in fluoride nanocrystals present in sol-gel materials.