DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

Luminescent materials emit electromagnetic radiation (typically visible), as a result of excitation by means other than heating to high temperatures. Depending on the type of excitation, there are several types of luminescence: bioluminescence, chemiluminescence, photoluminescence, radioluminescence and thermoluminescence. Application of this type of material is very wide: materials which people use in everyday life used in solid-state lighting (LED), scintillation materials which are using to X-ray imaging and materials used in dosimetry.

The main area of research, on which we intend to work within the framework of this project, are the photoluminescent study of material doped with lanthanide ions, Sr_2GeO_4:Ce and Sr_2GeO_4:Pr. Scheme to obtain light emission as a result of photoluminescence in some simplification is shown in Figure 1. The electron from the ground level of lanthanide ion (A) is activated by radiation of selected wavelengths (energy) on the excited level of this ion (A*). Next, as a result of non-radiative processes, electron relaxes (reduces energy) to the level from which occurs radiative transition to the ground level (A). As a result of this process, quantum of light is emitted.

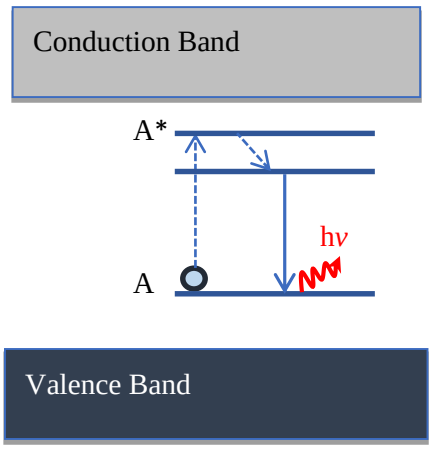

Figure 1. Scheme of the photoluminescence process in material activated by lanthanide ions.

In this project, we will focus on the studies of the matrix Sr_2GeO_4 which has not been described yet in the literature as a matrix for the luminescent material, doped with two different lanthanide ions: cerium ions (Ce^{3+}) and praseodymium ions (Pr^{3+}). Until now, we already obtained information, that Sr_2GeO_4 doped with both of these ions shows luminescence at room temperature. For Sr_2GeO_4 doped with Ce^{3+} ions wideband of d-f emission is generated. However we have found that at room temperature, the strong quenching is observed. But in the case of Sr_2GeO_4:Pr at room temperature, we observed only the luminescence produced as a result of the f-f transitions and there are no signs of luminescence from d-f transitions. Luminescence resulting from d-f electron transitions from the point of view of luminescent materials is highly desirable because of its broad-banding and a very short decay time after the pulse excitation. Therefore, it is very important know the mechanism of quenching of this emission at room temperature in a matrix Sr_2GeO_4. Understanding this mechanism will allow appropriate selection of other dopants for this material or even eliminating/reducing this effect in samples doped with Ce^{3+} or Pr^{3+} ions. The proposed studies are part of the current research on the mechanisms of quenching of activators emission in various host lattices and on modeling of luminescent behavior of various activators, mainly Ce^{3+} by modifying the composition and method of production of luminescent materials.