The term „radioluminescence" is used to describe the emission of light (mainly visible or ultraviolet) from a sample which is being excited by ionizing radiation. Materials that show radioluminescence are termed „scintillators", and a single flash of light being a response to absorption of a quant or ionizing particle is called „scintillation". From year to year the area of scintillator applications extends its limits. In turn, larger volumes of scintillation materials are needed and new requirements emerge. This increasing demand motivates scientific studies and growth technology development. Although the broad application of scintillators in various branches of science (high energy physics, nuclear physics, astronomy, chemistry) is beyond doubts, one is much less aware of presence of scintillators in daily-use devices. In physics and astronomy the basic role of scintillators is detection of particles originating in collisions in accelerators and colliders (e.g. the calorimeter within the CMS system at LHC, CERN, Geneva, consists of more than 60000 $PbWO_4$ scintillator crystals), quanta and ionizing particles, cosmic rays and solar neutrinos. From other applications one should indicate medical equipment such as positron emission tomographs (PET), positron emission mammographs (PEM) or X-ray computer tomographs (CT). Industrial uses like product quality control, security and control systems in air transport, and oil ledges exploration, are also worth mentioning.

Although it is possible to observe scintillation from all three states of matter (solids, liquids, and gases), the today's scintillator market is dominated by inorganic solid state materials, the majority of which are wide bandgap insulators. In frames of the current project we want to propose a new scintillator, which is not based on an insulator, but on a semiconductor instead. This is a relatively unique approach, seldom reported in literature. To the best of our knowledge, no rare-earth doped semiconductor scintillator has been proposed so far.

We have tentatively tested the scintillation performance of a semiconductor, β-Ga_2O_3, activated with cerium ions. The initial results are very promising, but the most important scintillation parameter, the light output, is still below the value offered by $Bi_4Ge_3O_{12}$ (BGO), the worldwide reference scintillator which displays about 8500 photons per 1 MeV of absorbed energy (ph/MeV). However, we are fully convinced that there is some room for improvement. Therefore, in frames of the "GO SCINT" project, we aim at achieving a value of 10000 ph/MeV with the new β-Ga_2O_3:Ce scintillator. Of course, to develop and optimize this material, much more advanced studies are desired. A number of crystals with various compositions are planned to be grown. Then, their most important properties will be examined, providing a feedback for possible further growth series. The acquired data will be analyzed qualitatively and quantitatively in order to understand the physical processes taking place inside the material at ionizing excitation. As a conclusion, a scintillation mechanism will be postulated for both β-Ga_2O_3 and β-Ga_2O_3:Ce crystals.