

## **DESCRIPTION FOR THE GENERAL PUBLIC**

The research area of the project is in the dynamically developing field of science which is biomedical engineering. The scope includes searching for and developing new biomaterials. By an aging population the needs for new material solutions are still increasing. In biomedical engineering, and especially in bone regeneration, bioactive glasses and glass fibers capable of binding to bone tissue are of great importance. Bioactive glass fibers are also used in the regeneration of nerves and tendons. The elaboration of composites reinforced with glass fibers greatly enhance the mechanical properties of the material. However, there are degradable, mechanically resistant bioactive fibers have not been deeply investigated. By modifying the composition of the glass, additional properties can be obtained such as: anti-bacterial, supporting mechanisms of angiogenesis or the ability to regulate neovascularization. A novelty in this area is the doping of bioactive materials with lanthanide ions. Due to their luminescent properties, they are used in biological imaging. Additionally, it has been shown that by introducing the rare earth elements into the structure and measuring the intensity of luminescence, it is possible to track and monitor the release of the drug. It was also found that bioactive glass and nanofibres obtained by electrospinning method doped with  $\text{Eu}^{3+}$  ions are non-toxic and retain their bioactive properties. Hence, the novelty of the project is the development of bioactive glass fibers doped with lanthanide ions, which have bioactive and sensing properties through the ability of monitoring their degree of degradation by studying and analyzing luminescence spectra. Doping of bioactive glass fibers with rare earth ions will enable optical monitoring of the degradation process while maintaining the bioactive properties of the material. The proposed issues are the innovative nature of the research in the field of biomedical engineering, material science, and photonics. The contribution to the development of science will be a set of basic research on the analysis of thermal, structural, microstructural, optical and luminescent properties, and above all, on the bioactivity of glass and glass fibers, allowing optical monitoring of their degradation by the novel optical method.