In recent years there is a great interest in different materials exhibiting efficient emission in wide infrared spectral range. The proposed research project deals with glasses and optical fibers emitting near-infrared and mid-infrared radiation.

The objectives of the project are: preparation of oxide and oxyfluoride titanate-germanate glasses containing the optically active ions (rare earth and/or transition metal), thermal and structural characterization of glasses using various experimental techniques such as DSC, XRD, EPR, FT-IR and Raman methods, the influence of TiO_2 concentration on preparation and structure-property relationship of glass system, fabrication of titanate-germanate optical fibers with special respect to the influence of technological parameters on glass-fiber forming and luminescence properties, and examination of titanate-germanate glasses and optical fibers containing rare earth and/or transition metal ions for near-IR and mid-IR luminescence. In particular, the radiative and non-radiative relaxation processes and their mechanisms between the optically active ions in titanate-germanate glasses and fibers will be examined in details. We postulate that near-infrared and mid-infrared luminescence lines of rare earths in glasses and optical fibers will be more broader and enhanced in the presence of titanium dioxide TiO_2 playing the role as a network-former or network-modifier, depending on its concentration. We also suggest that the fabrication of titanate-germanate glasses with relatively low OH content and their optical fibers with low OH-induced attenuation is possible under extremely rigorous technological conditions.

These aspects are interesting from the scientific and technological points of view. They are also really important for broadband optical amplifiers operating in the near-infrared range and laser sources emitting mid-infrared radiation. In our opinion, the project gives important contribution to development of scientific research in the field of glass science and technology, applied spectroscopy and infrared fiber photonics.