DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

Optically stimulated luminescence (OSL) is a known phenomenon of radiative relaxation of electron excitation in dielectric materials, general idea of which has been developed quite long ago. OSL is traditionally used as a tool for studying properties of various optical and luminescent materials. Besides, the OSL has become a popular procedure for the determination of environmental radiation doses absorbed by archeological and geological materials in efforts to date them.

During the last decade the OSL technique became more and more popular for other tasks of radiation dosimetry (such as, *e.g.* personal dosimetry, environmental dosimetry, and dosimetry in medicine) especially as new synthetic luminescent materials applicable for this purpose appeared, replacing the traditional passive dosimetry technique based on thermally stimulated luminescence.

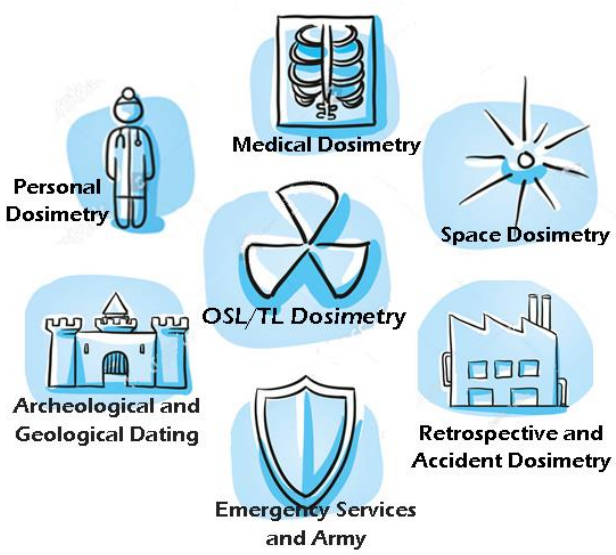

Fig. 1. Main spheres of application of the OSL technique for radiation dosimetry.

Despite the widespread use of the OSL technique for radiation dosimetry, the list of luminescent materials (detectors) applicable for this purpose, including the commercial α-Al_2O_3:C and BeO phosphors, is quite short. Even the commercial phosphors are far from ideal and possess a number of drawbacks and limitations. Therefore intensive studies and search of new materials applicable for OSL dosimetry are continuously conducted all over the world.

The proposed project deals with the comprehensive material engineering study aimed at the development and optimization of new efficient and functional storage phosphors applicable for OSL dosimetry of ionizing radiation. To achieve this goal theoretical calculations using the newest algorithms (computer programs) and computing capabilities of one of the most powerful supercomputers in Poland available in the Wroclaw Centre for Networking and Supercomputing will be combined with the experimental techniques of material engineering available in the Institute of Physics of the Polish Academy of Sciences in Warsaw.

The project is based on the previous studies of the project's authors and other researchers worldwide that demonstrated that the approach of the band gap engineering and the defect-related energy level engineering via modification of the chemical composition of the host, choice of isovalent and non-isovalent codopants, as well as after-growth thermochemical treatment, allow to change the functional properties of phosphor materials in a wide range and can be used successfully for development of new functional materials.

The project proposes a new class of storage phosphors which not only can compete with existing detectors, but also can offer new additional functionality of OSL dosimeters. In particular, the storage phosphors planned to be developed and optimized under the proposed project have high effective atomic number (Z_{eff}) that produces a significant dependence of their output on energy of ionizing radiation. The use of this feature of the so-called high-Z detector material gives the possibility to realize an OSL dosimeter able to measure not only the dose of ionizing radiation, but also to specify the energy range of unknown radiation fields and in such a way to recognize the radioactive source applied. Such a smart OSL dosimeter without doubts looks very attractive and can be useful for personal dosimetry in emergency services or in the army.