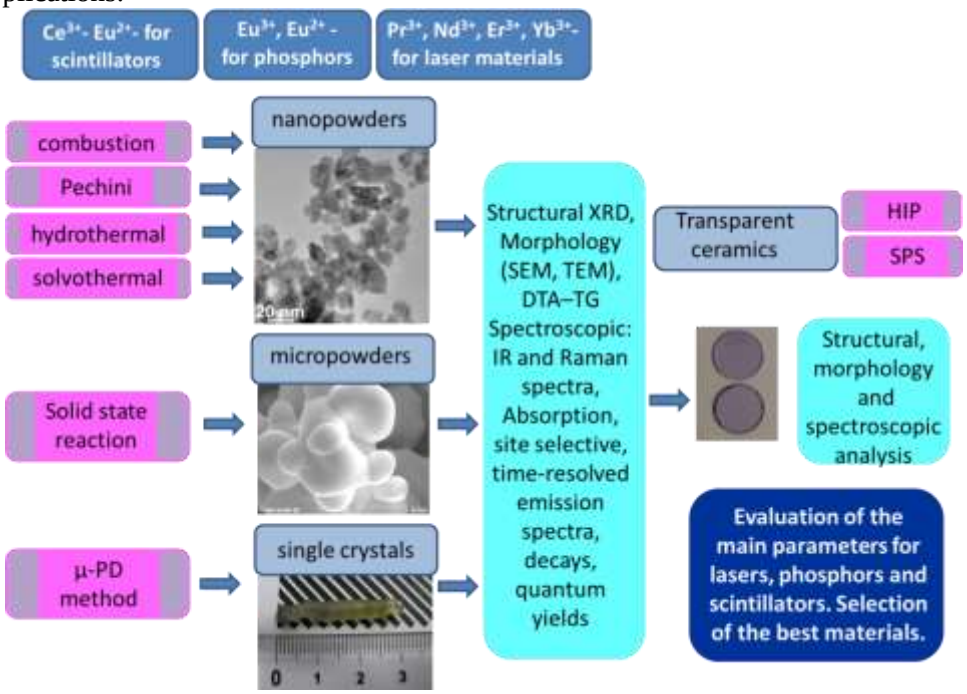
The development of optical transparent ceramic materials for applications in laser sources, phosphors and scintillators under UV and blue LED pumping is an ultimate aim of materials technology. It is also a dream of optical materials scientists to develop new transparent polycrystalline ceramics, which can be used with a performance equal to or even better than that of previous conventional single crystals. Effectively, the polycrystalline ceramics possess many advantages in comparison to single-crystals: bigger size, better mechanical strength, high content of doping activators, lower temperature of synthesis, less time-consuming, ability to engineer profiles. However, to prepare the polycrystalline transparent ceramics two restrictive conditions should be fulfilled: the compounds have to crystallize in the cubic system and the size of the crystallites must be in the order of tens of nanometers. Until now, only a few commercial compositions of un-doped transparent ceramics are known as cubic structure: garnets ($Y_3Al_5O_{12}$, $Lu_3Al_5O_{12}$), sesquioxides (Y_2O_3, Sc_2O_3, Lu_2O_3), spinels ($MgAl_2O_4$) fluorides (CaF_2), selenides (ZnSe) and perovskite-type BMT ($Ba(MgZrTa)O_3$) and still less for rare earth-doped garnets and sesquioxides ones.

It is why the main objective of the proposal is to succeed the challenge of the synthesis accompanied of structural and spectroscopic characterizations of some inorganic materials of both good mechanical strength, thermal properties and chemical stability by selecting only those of the cubic crystallographic system, within the expected goal of future optical transparent ceramics. To study have been selected the host lattices, in which the substitution of RE^{3+} rare earth luminescent ions will take place with compatibility of valence with un-active trivalent cations like La^{3+}, Y^{3+}, Lu^{3+}. Surprisingly, today commercial transparent RE^{3+}ions-doped ceramics are only: garnets (Nd^{3+}/Yb^{3+}-doped $Y_3Al_5O_{12}$, $Lu_3Al_5O_{12}$), sesquioxides (Nd^{3+}/ Yb^{3+}-doped Y_2O_3, Sc_2O_3, Lu_2O_3), fluorides (Yb^{3+}-doped CaF_2).

The aim of the project is both, synthesis, structural and spectroscopic characterizations of unknown oxide cubic inorganic optical materials. The selected host lattices are excellent hosts for accepting RE^{3+} dopants as Ce^{3+}, Pr^{3+}, Nd^{3+}, Eu^{2+}, Eu^{3+}, Er^{3+} and Yb^{3+} ions that emit high intensity in the visible and near infrared regions, with potential application as laser devices, phosphors, scintillators, not only as powders and single crystals but also as ultimate goal transparent ceramics. The subject of the investigations cover also the compounds and phases containing especially Nd^{3+}, Eu^{3+}, Yb^{3+} ions as structural probes by some special transitions, very useful in basic research of new compositions in complementary of usual X-Ray structural analysis.

The development of optical transparent ceramic materials applied in laser sources, phosphors and scintillators is an ultimate aim of materials technology widely used in industrial, medical, military and scientific applications.



Schematic presentation of the implementation of the project.