The main goal of the project is to optimize the synthesis protocol and investigate the structural, as well as, optical properties of the micrometric inorganic halide perovskites doped with selected dopant ions. Such materials could be used in the future for efficient luminescent solar concentrators to improve their productivity. In particular, the impact of the halide and dopant ions, as well as, impurity concentration on the energy transfer mechanisms will be examined.

Inorganic halide perovskites have been intensively studied over the past few years. However, the vast amount of literature relates to materials obtained by methods requiring the use of organic reagents leading to the preparation of nanometric colloids. Reports considering perovskites characterized by larger grain sizes are limited in literature. Therefore, in this project, the dry chemistry method will be implemented for the samples preparation. Recently, it was turned out that the morphology, grain sizes or composition of these materials have a strong influence on their spectroscopic properties. Inorganic halide perovskites are very interesting compounds because they exhibit high quantum efficiency, strong absorption cross-section, high color purity and narrow emission bands. The advantage of this material over others is the fact that by modifying its composition by changing the halide ions, it is possible to obtain a tunable wide color gamut covering entire visible spectral range. To improve their stability and luminescence properties the halide perovskites are usually doped with transition or lanthanide ions. Their introduction into the host allows to obtain additional emission bands ranging from ultraviolet to infrared, making them a promising candidate for many applications.

Obtained compounds will be subjected to a detailed structural analysis in term of phase purity and morphology studies using a X-ray diffractometer (XRD) and scanning electron microscope (SEM) images, respectively. The structural characteristics will be extended to Raman spectra measured as a function of temperature. In order to detect phase changes, a detailed analysis of DSC thermographs will be carried out. Further characteristics of the prepared materials will include spectroscopic measurements. In particular, the absorption, excitation and emission spectra, as well as, luminescence kinetics and quantum efficiency will be investigated. In order to better understand the luminescence process in inorganic micrometric halide perovskite powders, the emission spectra will be recorded as a function of temperature. The above-mentioned spectroscopic studies will help to understand the influence of halide and dopant ions substitution on the color luminescence, as well as, mechanisms responsible for generated emission.

It is expected that obtaining micrometric inorganic halide perovskites without organic residues will result in better spectroscopic properties of investigated materials.