Nanotechnology encompasses technologies that achieve and facilitate better materials integrations, gives better materials parameters, new properties, enables precise control of their morphology (shape, size, architecture) and gives us much higher flexibility in number of applications starting from electronics, photonics ending on personal medicine and biology. In line with these developments, **this is an integrated proposal at the cutting edge of physics, chemistry, material science and electronics** with the **specific aim of fabrication of thin-film light sources based on colloidal quantum nanostructures (QNs) emitting in NIR spectral range (NIR-QLED).**

This type of solution can find applications in **night-vision displays** i.e. for military applications, can be also considered as an active part of various **sensors (biosensors) integrated on chip**, or as **low-light illumination source** in many other detection systems.

The Project will consist several important research aspects: **TECHNOLOGICAL**: One of the most important step for an efficient operation of such device is synthesis of high quality and stability QNs, as well as fine control of their structural quality and physicochemical properties of their surface. Apart from optimization of nanostructures surface and properties of QNs, a complex structure of QNs will be design and growth, where the cores will be covered with a novel inorganic shells to get a better integration of nanostructures with the host films and to get a higher emission intensity. In the framework of this task, obtained QNs will be embedded in thin films, and other thin films and contacts will be deposited to obtain a full diode architecture. **ANALYTICAL**: All obtained structures (QNs, QNs core-shell, thin films, diode architecture) will be characterized with use of fundamental and advanced optical spectroscopy, optical imaging techniques, electrical characterization and structural analysis. **ENGINEERING**: To conduct reliable research we are going to modify and automatize our growth systems to obtain the highest possible reproducibility of both QNs growth and thin films deposition. In this aspect of the Project we are also going to design and to build the new system for electrical characterization of obtained by us structures.

All abovementioned topics consist high number of fundamental problems to solve. The aim of the Project is however to verify our answers to these problems and our understanding in practice by obtaining a working prototype of device at the end of the Project.