

Fluorescence - emission of light from excited atoms or molecules - is an extremely important phenomenon, widely exploited in chemistry, physics, biology, medicine or environmental protection. Fluorescence measurements provide information not only about the structure and dynamics of the emitting objects, but also about their environment, which is crucial for practical applications. Fluorescence is the operational principle of many different sensors. Fluorescence microscopy is the basic tool in biology and medicine, used for imagining cells and tissues. Two Nobel prizes awarded in the last years for the discovery of green fluorescent protein, naturally synthesized by some living organism and for the development of super-resolved fluorescence microscopy demonstrate a huge progress in fluorimetry. What is particularly attractive, using fluorescence it is now possible to observe single molecules.

The main obstacle for further progress in single molecule spectroscopy is the lack of sufficiently photostable and bright fluorescent objects – fluorophores. The goal of this project is to obtain such new compounds, of which the photostability and brightness would be over one hundred times larger than those obtained so far. We plan to achieve this objective by chemically modifying isomers of porphyrin, a molecule justly called “pigment of life”. The novel fluorophores could be applied not only in microscopy, but in all cases when the fluorescence signal carries an important information on the environment the molecule resides in.