

The research proposal entitled “Boron-based fluorophores - functionalization, properties and their tests for versatile usage” is focused on new and highly fluorescent dyes that are going to be tested within various fields of science. The research will be started with the synthesis of new compounds, which will be isolated from reaction mixtures and then purified. Then, their structure will be confirmed by physicochemical methods and basic properties will be measured with the use of instrumental methods. In parallel to the experimental works quantum-chemical calculations will be carried out. These will allow better understanding of some molecular properties of dyes. The comparison of the experimental and computational data will allow choosing the most interesting compounds for further, more detailed studies. This approach is especially useful when experimental measurements are time- or cost-demanding. A reasonable choice of compounds for further research will allow to: a) performing tests of the current and modified calculations protocols, b) studies on larger than usually molecules that could be important to science and society.

All compounds and their modifications will be tested during the project implementation for their usefulness in bioimaging by two-photon excited fluorescence microscopy and as a spectral probes used in specific intermolecular interactions. It is also assumed that for some compounds a side-tests will be carried out in the field of material chemistry. So, the tests will be run to know the potential of dyes in the following fields:

- a) OLED (*Organic Light-Emitting Diode*) – the dyes synthesized during project implementation will be used in further reactions in order to obtain complexes with electroluminescent properties,
- b) Free radical polymerization – some of the dyes in the current project will be tested towards their usefulness in free radical polymerisation. These kinds of tests are suitable for stereolithography (prototyping).
- c) Surface modification – it is planned that some chosen compounds will be used in modification of the surface of electrodes. Such modification is highly desired by analytics including medicinal one.

The international, scientific cooperation between researchers of various specialities will deliver in-depth understanding of the properties of photophysical and photochemical processes within investigated series of molecules. The group of theoretical chemists in Nantes is one of the most active groups in Europe in the field of photophysical properties of fluorescent compounds.