

Research on compounds that react to light or those that can emit it in recent years has rapidly accelerated. Thanks to the development of photochemistry, i.e. science, the impact of light on the structure of the molecule, we can observe the development of new technologies such as organic luminescent diodes (OLED) used in smartphone screens, a new generation of more effective and flexible organic solar panels (OPV) or photodynamic therapy (PDT), which is used to treat cancer or skin conditions.

The main purpose of the presented project is to determine how the change in their structure has an impact on the photophysical properties and, consequently, on the use of the tested compounds. For some time, more and more reports have been found in the scientific literature saying that a small change in the structure of compounds has a huge impact on their behaviour and properties. One such example is donor-acceptor photoactive compounds with a strong Charge Transfer (CT) state, which are used as emitters in organic diodes. A small change in the structure of the compound allows the type of emission to change, from fluorescence to delayed fluorescence, and even in some cases, the change in energy state allows phosphorescence to be observed at room temperature (RTP). Since a small change has such a huge impact on the properties of a compound, can we predict how the arrangement of substituents and their configuration will affect the potential application of the molecule? Can we optimize the photoactive properties of materials by changing the configuration of substituents?

Many photoactive compounds have been synthesized by research groups for a specific purpose and specific applications, but only systems that show good properties in a given field are further investigated and the results are published. However, we should consider whether systems that are characterized by lower efficiency, e.g. in optoelectronics, cannot be used as an efficient source of singlet oxygen, and vice versa. In this project, systems based on a porphyrin ring with phenothiazine substituents will be designed (Figure 1). Porphyrin is an organic compound that is successfully used in all of the previously mentioned fields of photochemistry. Extensive research on changes in physicochemical and photophysical properties that occur with the change of structure will allow a deeper understanding of this relationship and determine the applicability of the tested systems in various fields of photochemistry such as materials capable of generating singlet oxygen, photocatalysts or active layers in organic optoelectronics (e.g. OLED).

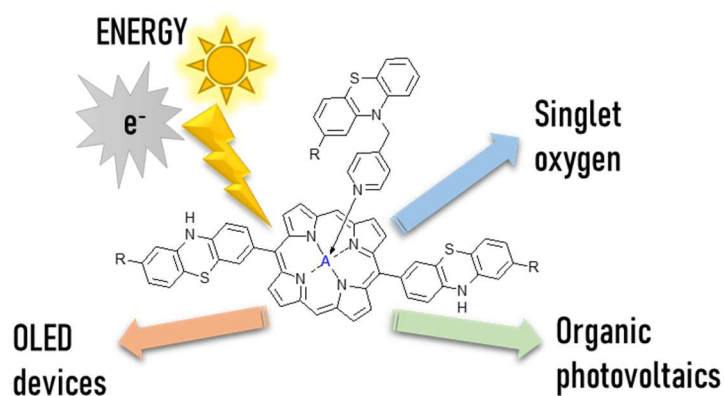


Figure 1 Photoactive compounds have many applications depending on the compound structure and its photophysical properties.