

"New photochromic molecules for the construction of photoswitchable molecular magnets"

Abstract

This project aims at the design of new materials that could harness light energy (including solar energy) at the molecular level and convert it into mechanical motion and magnetization or conductivity ON/OFF switching. These materials will be designed in an 'architectural' fashion by assembling matching molecules carrying desired functions: light absorption, magnetism, conductivity and so on. The main component utilized in the project would be photochromic compounds that show very strong and reversible color change upon exposure to light. Note, that photochromic compounds are widely used in a special type of glasses that become dark in the direct sunlight and bright while the person remains indoors. Very similar molecules will be used as the ON/OFF switches responsive to light. As it appears, the color change in this type of molecules results from significant structural and electronic changes. If these changes are coupled with other molecules (eg. magnetic or conducting ones) a possibility of controlling the magnetism/conductivity of the resulting hybrid through light irradiation arises.

In other words, the implementation of the project will lead to the synthesis of new multifunctional materials that could find applications in the construction of new display devices for smartphones, very sensitive light sensors for better cameras, higher-density data storage devices (no need to remove any photos from the phone anymore!) and low-energy information processing units (charging batteries once a week!). This would also have important implications in medicine (better and smaller disease diagnostic devices), communication (faster and more reliable data transfer/exchange) as well as the environment (multifunctional materials are designed for lower energy consumption). However, before all this becomes possible, many PhD students would have to spend thousands of hours in the laboratories. The following PhD project will significantly advance our understanding of magnetization photoswitching induced by photochromic ligands and bring us closer to these highly desired applications.