Recent years brought wide range of investigations concerning the usability of organic molecules in the (opto)electronics devices, such as organic light emitting diodes (OLED), or organic photovoltaic cells (OPVC). The metalophthalocyanices (MPc) are of great interest due to their high thermal and chemical stability and possibility to tuning their properties by exchange of the central cavity atom or by changes in the chemical composition of ligand. High coefficient of light absorption makes them promising candidates as an active materials in organic photovoltaic cells. Such devices due to their lightweight and flexibility are likely to find their applicability as solar elements. In OPVC the organic material is sandwiched between two metal electrodes. That is why investigations of adsorption of MPc on metallic surfaces are important to provide the progress in development of optoelectronics.

The main electronic effect of adsorption of organic molecules on the metal surface occur due to development of the complex interface. The interface is understood as the layer of molecules, which are in contact with the metal. The interactions between metal and molecule induce the development of energetic states and has decisive voice in creation of structures of molecular layers. Those features influence the efficiency of organic optoelectronics. From investigations carried out so far (both experimental and theoretical) emerged that a number of processes are responsible for electronic properties of interface. That are: charge transfer, creation of chemical bonds, lateral displacement of the surface charge, known as a pillow effect. So far, however, there is no universal model describing all complex processes occurring in metallo-organic systems.

In this project, we plan to explore experimentally the dependence of electronic and structural properties of interface between layer composed of cobalt phthalocyanines (CoPc – donor) and perfluorinated copper phthalocyanines (F_{16}CuPc - acceptor) and the silver surface as a function of layer composition. Knowledge about such dependence will allow for development and fabrication of optoelectronic devices with optimal parameters. To perform our investigations we will utilize complementary experimental solid surface techniques. The X - ray photoemission (XPS) and ultraviolet photoemission (UPS) spectroscopies provide us, on the one hand, with information about molecule-metal and molecule-molecule interactions. On the other hand, will allow to gather information about arrangement of electron states in particular system. For structural investigations we will use low-energy electron diffraction (LEED) and scanning tunneling microscopy (STM). The first will provide with long range arrangement of molecular layer on silver surface, while the second one will allow us to identify the type of the molecule (CoPc/F_{16}CuPc), their local arrangement and provide with information about the topography in the atomic resolution. All mentioned techniques are frequently used for metal – molecular layer interface characterization. In this project, additionally we will use the technique, which will allow us to probe the work function changes, known as Anderson or diode method. Thanks to that technique we will be able to probe the dipole moment induced in the interface by molecular layer adsorption. We also will be able obtain information about interaction of molecular layer with low-energy electron beam. Combination of various experimental techniques and cross check the information provided by them will allow us to determine the structural and electronic properties of CoPc-F_{16}CuPc/Ag(100) system as a function of molecular layer composition.