Electronic devices are very important part of the contemporary commercial world. Many among them are silicon-based devices. Customers expect miniaturisation of the devices at low price, however the technology of contraction of silicon-based devices will reach its limit. An alternative way of obtaining smaller, cheaper and more effective devices are organic thin films based on small molecules or polymers. The rapid growth of organic electronics started in the mid-80's when the light-emitting diodes, organic photovoltaic cells and field-effect transistors have been discovered.

The proposed project involves the investigation of the utility of NDI derivatives as a functional materials for organic electronics. The project has been divided into two parts: the synthesis of NDI-based compounds for *i)* dual-functioning electrochromic and fluorochromic devices and *ii)* photovoltaics.

Naphthalenediimides have found useful applications as versatile building blocks in supramolecular chemistry and as n-type semiconductors. They also possess high electron affinity, good charge carrier mobility, and excellent thermal and oxidative stability, making them promising candidates for organic electronics applications, photovoltaic devices, and flexible displays. When the electrochromic material changes its emission properties with applied properties it is possible to construct dual-functioning electrochromic and fluorochromic devices. For this purpose compounds should exhibit emission properties in the solid state. Although both electrochromism and fluorescence properties of NDI-based molecules have been already investigated their combined electro(fluoro)chromic properties and their use in dual-functioning electrochromic and fluorochromic devices have not been explored. The proposed project opens a new pathway for developing high-performance emission/color dual-switchable materials, which will greatly stimulate and promote the creative photochemical applications.

The proposed project involves also the investigation of the utility of NDI derivatives as n-type semiconductors for the construction of organic supramolecular photovoltaics. A series of NDI-based acceptors and complementary donors have been designed to self-assembly utilizing π-π stacking and hydrogen bonding interactions. It is expected that proposed compounds will form highly ordered donor-acceptor structures exhibiting enhanced photovoltaic activity and they will be used in the construction of supramolecular organic solar cells. The realization of the project will increase the knowledge on the utility of NDI derivatives as n-type semiconductors for the construction of supramolecular organic solar cells. The positive results of the project implementation will allow for the construction of supramolecular solar cells exhibiting high power conversion efficiency.