Description for general public

Cross-conjugated dyes and their derivatives are very important class of organic compounds, mainly because of wide range of applications, such as high-quality pigments using as clothes and car dyes, fluorescence microscopy. Moreover, this type of dye undergoes renaissance due to development of modern technologies such as photonics or molecular electronics. Seeking of new functional materials showing intriguing optoelectronic characteristics, prof. Gryko's group have discovered first methodology for the synthesis of completely unknown cross-conjugated dyes, based on dipyrrolonaphthyridinedione (DPND) core (Scheme 1). The presence of electron-rich pyrrole ring and electron-poor carbonyl group on nitrogen atom opens completely new area for exploration.

The primary goal of this project is to expand knowledge about this unique, cross-conjugated dyes based on DPND core through combination of its intriguing optical properties with synthetic potential of pyrrole and carbonyl group. We plan to obtain, characterize and investigate optoelectronic properties of new, heterocyclic compounds with horizontally or vertically π-expanded surface. Experimental research will be supported by theoretical calculations.

The relationship between the optical properties and the way of chromophore extension will be investigated, since the target molecules will be novel heterocyclic materials which may possess suitable electrochemical and optoelectronic properties hence they may be utilized in various applications in the future.

Technological changes, which occurred within the last decade induced the demand for new organic materials. In particular polycyclic aromatic compounds are critical for such applications as: organic light-emitting diods (OLEDs), artificial photosynthesis (photovoltaics), fluorescent probes etc. These technologies have direct influence on medical diagnostics, cell phones, digital cameras and organic solar cells etc. Although many such compounds exists, there is continuous search for new ones possessing better properties. The final effect of this project is the development of new organic dyes, which may have interesting optical properties. They might be used in organic electronics or/and as fluorescent markers.