Cel i streszczenie rozprawy doktorskiej

Pyrene and its derivatives continue to attract considerable interest due to their often unique luminescent properties, which can be used in various fields of science, ranging from materials chemistry (light emitting diodes, light-emitting field transistors, laser dyes) to biology and medicine (luminescent markers, luminescence imaging, etc.)[1-6]. One of the research axes recently carried out at the Department of Organic Chemistry, the Faculty of Chemistry, University of Łódź is development of new reactions of pyrene and its derivatives, which could be used in the syntheses of new compounds exhibiting strong and tunable fluorescent properties for possible practical applications.

This doctoral thesis is a continuation of this research trend. One of its aims was to develop a method for acylation of pyrene with alkynoic acids and to investigate the photophysical properties of the obtained pyrene ynones. In addition, theoretical calculations of the electronic structure and the UV-absorption spectrum of one of these compounds were performed using the (TD) DFT method. Then, one of the ynones obtained, 1-propynoylpyrene, was used to synthesize pyrazolylpyrenes. Pyrazoles are often compounds with strong fluorescent properties[7], so it could be expected that the introduction of a pyrazolyl group into the pyrene system will lead to compounds with interesting fluorescent properties. The reaction of 1-propynylpyrene with phenylhydrazine gave 1-phenyl-3-(piren-1-yl)-1*H*-pyrazole and 1-phenyl-5-(piren-1-yl)-1*H*-pyrazole. It was also shown that the former compound undergoes a regioselective Fujiwara-Moritani alkenylation[8] with n-butyl acrylate. The reaction was catalyzed by palladium (II) acetate and took place under an oxygen atmosphere.

The alkenyl group was introduced in the *ortho* position of the phenyl ring. Photophysical studies have shown that the compounds obtained are effective fluorophores (emission quantum yields ~ 20-65%). Both synthesized pyrazoles showed emission from locally excited states (LE), while the alkenylated compound additionally showed the emission from a state with intramolecular charge transfer (ICT)[9-10].

A method for the synthesis of a pyrazolylopyrene containing an aldehyde group in the pyrazole ring was also developed, starting from readily available 1-acetylpyrene. This compound was subjected to aldol and Knoevenagel condensation, introducing into the molecules strong acceptor groups. The compounds of the type Donor (Pyrene) - *π-electron bridge* -Acceptor - have been obtained, showing emission covering practically the whole range of the visible spectrum. A study of the basic photophysical properties of the synthesized compounds and the calculation of their structures and electronic absorption spectra by the (TD) DFT method were also performed.