Abstract

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Title of the doctoral thesis: Synthesis and study of photophysical and photochemical properties of phthalocyanines and azaphthalocyanines

Phthalocyanines (Pc) and their aza-analogs azaphthalocyanines (AzaPc) are planar macrocyclic complexes derived from porphyrins with a significant absorption band in the range 620-800 nm. Due to their unique photophysical and photochemical properties, together with the high variability of macrocycle substitution, they are important representatives in the modern concepts of materials, industry, electrotechnics and medicine. They are used as photosensitizers in photodynamic therapy of cancerous and non-malignant diseases, fluorescence quenchers for molecular probe labeling in biology or drug and gene delivery agents in cellular environment. The effect of Pc and AzaPc is influenced by their structure, mainly by the character of peripheral substituents, the central chelated metal and the type of the macrocycle.

In the first part of the thesis, the influence of intramolecular charge transfer (ICT) on the series of unsymmetrical tetrapyrazinoporphyrazines and tribenzopyrazinoporphyrazines with different peripheral substituents carrying two dialkylamine substituents as ICT donors was studied. This process is arranged by a free electron pair on peripheral nitrogen as a charge donor, while the macrocyclic core is its acceptor. The obtained results show that the efficiency of ICT can be closely related to the nature of the macrocycle and its peripheral substituents.

In the second part of this thesis, new heteroatom substituted derivatives of 3,4-tetrapyridoporphyrazines (TPydPz) and their synthetic approach were described. The series of TPydPz were studied due to their spectral, photophysical and photochemical parameters, and the results were compared with structurally similar compounds.

The final part deals with water soluble fluorescent poly(amidoamine)-based dendritic molecules. Their photophysical activity were studied in aqueous solution over a wide pH range.