Abstract

The aim of the described dissertation was to design and synthesize a range of new, donor-acceptor oligopyrrole systems containing fluorophore subunits. The main inspiration of the project was the possibility of studying interesting combinations of π-extended porphyrin and hexapyrrolylhexaazacoronene cores, with peripherally introduced chromophores with different properties.

In the course of these investigations, a series of hybrid pyrrole precursors were made, which were subsequently used as building blocks in the synthesis of larger oligochromophore systems. The resulting pyrrole analogs showed a range of potentially useful properties, such as high molar absorption coefficients, high fluorescence quantum yields, or good solubility in organic solvents. In addition, studies have been carried out on a multi-step synthetic pathway to efficiently attach heteroatoms (Br, Cl), as prospective attachment points for fluorophore subunits, such as BODIPY.

Based on many experiments, the concept of peripheral modification was developed, which allowed to control the key features of the electronic structure, such as band gap size, absorption, photoluminescence and redox properties. Systems consisting of the acceptor part of metalloporphyrin (M = Zn, Pd) and four donor antenna subunits (BODIPY) were obtained via, palladium catalysed synthesis under Suzuki coupling conditions. By altering the structure of the external chromophores and the length of the linkers, the resulting oligopyrrole structures could potentially be tuned to ensure efficient intramolecular energy transfer. These systems were studied by means of femtosecond transient absorption spectroscopy, which showed that the obtained multichromophore cassettes are efficient energy transfer systems according to the Förster mechanism.