"Design of Novel Pyrene-Dendronized Porphyrins Exhibiting Efficient Fluorescence Resonance Energy Transfer (FRET): Optical and Photophysical Properties"

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A novel series of pyrene dendronized porphyrins bearing 2 and 4 pyrenyl groups (TME-Py_2G1 and TME-Py_4G2) were successfully synthesized. Initially, first and second generation Fréchet type dendrons (Py_2-G1OH and Py_4-G2OH) were prepared from 1-pyrenylbutanol and 3,5-dihydroxybenzylic alcohol. These compounds were further linked to a trimesitylphenylporphyrin containing a butyric acid spacer via an esterification reaction to obtain the desired products. Dendrons and dendronized porphyrins were fully characterized by FTIR and ^{1}H NMR spectroscopy and their molecular weights were determined by MALDITOF. Their optical and photophysical properties were studied by absorption and fluorescence spectroscopies. In the dendrons the formation of dynamic excimers was detected, whose intensity increases with the number of pyrenyl units. However, in the pyrene dendronized porphyrins a significant decrease in the amount of pyrene monomer and excimer emission was observed, jointly with the appearance of a new emission band at 651 nm, which demonstrated that FRET takes place from the excited pyrene monomers or excimers (donors) to the porphyrin (acceptor). The FRET efficiency was found to be almost quantitative between 97-99%.