SYNTHESIS AND PROPERTIES OF GABLE PORPHYRIN

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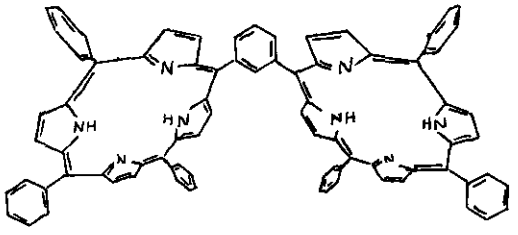
A number of multiheme-proteins are known in nature, and they play very interesting and important role in biological systems. For example, cytochrome c_3 (cyt c_3) which has four heme units trasport electron very efficiently in sulfate-reducing bacteria as well as in solid state or in artificial menbrane. The authors report the preparation of "gable porphyrin" as a good model for cyt c_3. Significant porphyrin-porphyrin interaction and heme-heme interaction were observed for gable porphyrin and the corresponding bis-iron complex, respectively. These interaction, viz., porphyrin-porphyrin and heme-heme interaction were investigated by electronic absorption spectrum, fluorescence spectrum and EPR spectrum. Striking UV/VIS spectroscopic characteristics of the present gable porphyrin is the remarkable splitting of the Soret band which appeared at 416 and 428 nm in a marked contrast to the single band at 418 nm for tetraphenylporphyrin (TPP). This remarkable splitting seems to reflect the strong interaction between two lateral compornent of the porphyrin orbitals of gable porphyrin. Moderate interaction between two porphyrin rings was also suggested by fluorescence spectrum and EPR spectrum. The reduction of gable·Fe^{3+}·imidazole complex with TPP·Mn^{2+} showed biphasic characteristics, where the rate constant of the slower reduction step was about 1/2 of that for TPP·Fe^{3+} reduction by TPP·Mn^{2+}, whereas the faster reduction of gable·Fe^{3+} was much faster than the later. In conclusion, gable porphyrin and its metal complexes exhibit unique porphyrin-porphyrin interaction, providing an excellent "local" model of cyt c_3.



"gable porphyrin"