Chemical Physics

Introduction

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Molecules based on porphyrin chromophores are an example of a group of compounds that can be used as a model for the BChls in the LH2 complex [1]. Like BChls, porphyrin based molecules have very high cross sections, but more importantly they are a chemically stable alternative to BChls. In this project a Zn-porphyrin monomer (G0P1) is chosen as the chromophore in the artificial antenna system. G0P1 has obvious structural similarities with BChl (marked with the yellow squares figure 1) though the center metal is different, which yields different absorption spectra. However, both chromophores have very high cross sections in the visible region and are consequently excellent absorbers of the sunlight.

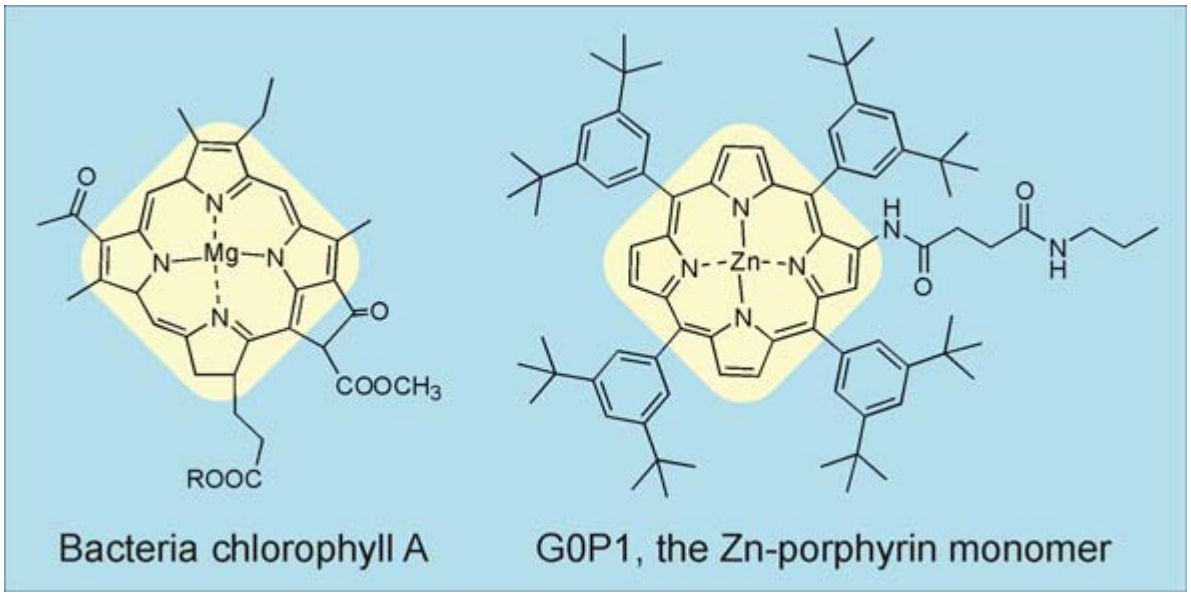

Figure 1. Comparison between the bacterial chlorophyll molecule in the LH2 complex and the Zn-porphyrin monomer (G0P1) in this project.

A sequence of dendrimers evolves by connecting Zn-porphyrin monomers at the end of the arms in single-bonded carbon and nitrogen skeletons expanding systematically in size. The dendrimers expand in size from the first generation dendrimer with 4 Zn-porphyrins (G1P4) up to fifth generation with 64 chromophores (G5P64). The different generation dendrimers are shown in figure 2. In the figure, the dendrimers look like flat discs, but in reality they are spherically shaped due to the flexibility of the skeleton. The Zn-porphyrins are mainly situated on the surface of the sphere, since they are too large for backfolding. In addition to the monomer, the dimer (G0P2) is also used as a

reference compound in the singlet-singlet annihilation measurements.

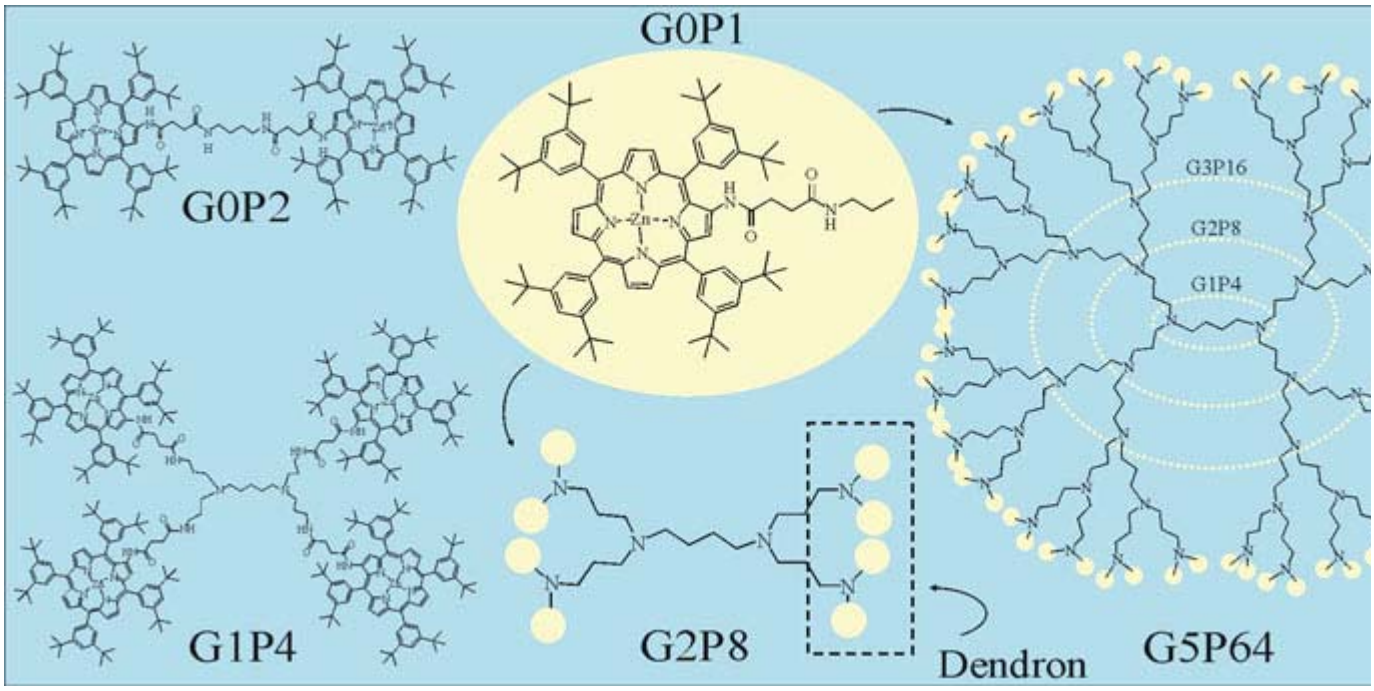

Figure 2. Scheme of the dendrimers ranging from the monomer (G0P1) up to the fifth generation dendrimer (G5P64). The yellow circles in G2P8 and G5P64 correspond to one monomer connected as illustrated for G1P4. The dotted lines in the background of G5P64 marks where the Zn-porphyrins are attached in G1P4, G2P8, and G3P16.

References

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