Syntheses and Photophysical Properties of Yb(III) Coordination Compounds by Porphyrin Ligand with Two Phosphine Oxides

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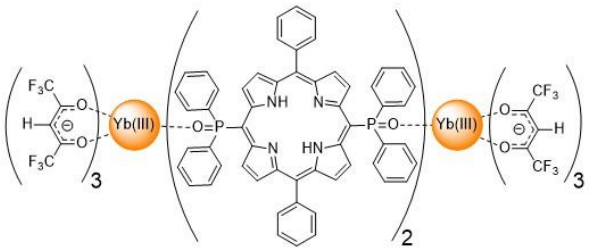
Dimeric structures of porphyrin derivatives have attracted attention to mimic the special pair in reaction center apparatuses of natural photosynthetic organisms.[1] In particular, cofacial porphyrin dimers have been prepared by covalent or metal coordination linkage of two porphyrins. In this study, we focused on trivalent lanthanide ions for a linker unit which have large coordination numbers (from eight to ten) and flexible coordination structures. We have reported various lanthanide coordination compounds using phosphine oxide ligands.[2] Here we report synthesis and photophysical properties of a novel porphyrin dimer linked with trivalent lanthanide complexes.



Yb-hfa-PorPO

A porphyrin ligand (**PorPO**) with phosphine oxide groups at *meso*-positions was synthesized according to the reported procedure.[3] A novel porphyrin dimer complex (**Yb-hfa-PorPO**) was prepared by the complexation of a $CHCl_3$ solution of **PorPO** with a MeOH solution of $Yb(hfa)_3(H_2O)_2$ (hfa: hexafluoroacetylacetonato). The resulting complex was characterized by ESI-MS and IR spectroscopy. Single crystal X-ray analysis showed dimeric **PorPO** structure linked with two $Yb(hfa)_3$ complexes. The distance between porphyrin rings was approximately 3.4 Å, suggesting π-π interaction of the porphyrin moiety. The UV-Vis absorption spectrum of **Yb-hfa-PorPO** showed a broad Soret band and red-shifted Q-bands compared to those of the monomeric **PorPO** in toluene solution. This result suggests that **Yb-hfa-PorPO** is stable even in a solution. We successfully prepared a novel π-stacked porphyrin dimer built by lanthanide complexes for the first time.

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