Picket-gable Porphyrin as a New Hb Model

Iwao Tabushi, Tomikazu Sasaki, Toshiyuki Kondo

Dep.of Synshetic Chemistry, Kyoto University, Yoshida, Sakyo-ku, Kyoto 606, Japan

Hemoglobin which is a tipical allosteric enzyme binds dioxygen molecule cooperatively. The cooperativity of hemoglobin is best understood as the information transmission coupled to the complex conformation change of the protein four active sites. However, mechanistic detailes of this coupling are still quite uncertain. Up to date, only the multi-sites interactions are reported to give fairly large cooperativity coefficient (n) but multi-site interaction is not appropriate model for the betterunderstanding of cooperativity, since n depends the number of interacting sites. Recently we prepared gable porphyrin, 1, as a novel hemoglobin model, which dicobalt complex showed cooperative oxygen binding (n = 1.5) in the presence of a suitable bridging bifunctional ligand , N,N'- diimidazolylmethane, at -20°C in DMF. The presently observed cooperativity is satisfactorily large when expressed in ratio of oxygen binding equiliblium constants (K_2/K_1 = 8.6 ± 0.8) which is comparable to that of hemoglobin ($\sqrt[3]{K_4/K_1}$ = 6 ~ 10). To develop this artificial hemoglobin to stable Fe porphyrin-O_2 complex, a new dimeric porphyrin complex was prepared. Thus, we have tried to prepare "picket-gable" porphyrin·Fe complex as the best model for hemoglobin.

Preparation of picket-gable porphyrin was performed via. the stepwise approrch as described in sheme 1. The synshetic intermediate 6 and 10 allowed us to separate the **α,α,α** -isomer from the atropisomeric mixture. The spectroscopic characteristic is the well resolved Soret band (419 and 430nm) similar to that of gable porphyrin (412 and 425nm). Further investigations of picket-gable porphyrin are now under way.

sheme 1