

Artificial photosynthesis the first chapter: Light driven hydrogen generation from water

Sang Ook Kang

Department of Advanced Materials Chemistry, Korea University

In the area of artificial photosynthesis, particularly for the generation of hydrogen from water, much attention has been paid on organic-inorganic hybrid system. Most of all, a dye/TiO₂-combined system has been suggested and its potential utility was well manifested. However, due to its complicated nature of charge interactions in between dye and TiO₂ -interface there remains a great challenge to establish the charge-activity relationship, per se light driven charge generation and recombination kinetics with respect to the amount of hydrogen produced. Further complexity of that hybrid system has been witnessed when sacrificial donor and aqueous media are considered. To unveil the operating mechanism on such a dye/TiO₂-combined system, we have prepared organic dyes suitable to account for the effect of sacrificial donor as well as water interactions, and prepared the typical dye-grafted TiO₂ films to investigate charge-activity relationship. Femtosecond flash photolysis clearly defined the dye effects anchored on to the TiO₂ platform. In addition, photodynamic data contemplated well to the dye orientation proposed by the DFT calculations. Recent findings provide fundamental understanding on the dye-grafted TiO₂ system and establish a firm background how future dye-sensitized organic-inorganic hybrid system can be designed for the light driven hydrogen generation from water.

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