NT-P005

Hybrid between Inorganic Material and Biological Photosystem1 for Light Energy Application

김영혜, 남기태*

서울대학교 재료공학부

The attractive features of photosynthetic reaction center proteins for energy application make them useful in solar energy conversion to hydrogen fuel or electrical energy. Almost unity charge separation quantum yield and its rapid speed of ~1ns, absorbance region in visible light (480~740 nm) and high proportion of photosynthetically active solar energy of 48.5% allowed photosystem1 to exploited as a bio-material for photo-energy devices. Directionality of photosystem1 in electron transfer can solve main problem in two-step water splitting process where back reaction deteriorates the overall efficiency. In the study, photosystem1 was extracted from spinach and the photo-induced excited electron in the reaction center was utilized in various field of light energy application. First, hydrogen evolving system realized by photodeposition of platinum at the end of the electron transfer chain, with combining specific semiconductor to oxidize water in the first step of Z-scheme. The evaluation by gas-chromatography demonstrated hydrogen evolution through the system. For the further application of photoelectrical material on electrode, photosystem1 have been controlled by copper ion, which is expected to assemble photosystem in specific orientation followed by maximized photoelectrical ability of film. The research proposed concrete methods for combining natural protein and artificial materials in one system and suggested possibility of designing interface between biological and inorganic materials.

Keywords: photosystem biohybrid protein photosynthesis