סמינר כימיה פיסיקלית ואנליטית

יום א' 25.06.2017 שעה 12:30

Gadiel Saper

Schulich Faculty of Chemistry,

Grand Technion Energy Program

נושא:

HARNESSING PHOTOSYNTHESIS FOR H_2 PRODUCTION

This research was conducted under the supervision of:

- Prof. Noam Adir, Schulich Faculty of Chemistry
- Prof. Gadi Schuster, Faculty of Biology
- Assoc. Prof. Avner Rothschild, Department of Materials Science and Engineering

ההרצאה תתקיים בחדר הסמינרים הפקולטי (קומה 4, ליד לשכת הדיקן)

לפני ההרצאה

chfruma@techunix.technion.ac.il
www.schulich.technion.ac.il
T. + 972 4 829 3654
F. + 972 4 829 3499
Technion City
Haifa 32000 Israel
קרית הטכניון
חיפה 32000

Harnessing Photosynthesis for H_2 Production

Abstract:

In the last 100 years, humans have been using fossil fuels as the main resource of energy. Not only is the supply of these fuels dwindling, but the use of these fuels emits carbon dioxide, thus leading to global warming. In recent years, much research has been conducted in the field of alternative renewable energy, with an emphasis on the production of hydrogen as a solar fuel. Photosynthesis, nature's "solar energy conversion machine", is an evolutionary conserved process from bacteria to plants responsible for maintaining an oxygen rich atmosphere and for the production of complex carbohydrates. Using photosynthesis for the production of solar fuels is an up and coming field in academia with many studies focusing on various ways to extract electrons from the photosynthetic systems. Here, we describe the construction of two bio-photo-electrochemical cells based on cyanobacteria and spinach photosynthetic membranes to produce hydrogen fuel. In the first system, we used live cyanobacteria cells that were gently treated, thus, allowing the extraction of electrons with an endogenous mediator to an external graphite electrode. We showed that the electron are extracted from photosystem I and that the electron source is the respiratory system. For the second bio-photo-electrochemical cell we used spinach thylakoids. Here we extracted the electron from photosystem II with exogenous ferricyanide to a fluorinated-tin-oxide electrode. We proved that the electron source is water oxidation by the activity of the photosystem II oxygen evolving complex. For both systems the energy is used on the anode to produce hydrogen gas. The spinach solar cell produces high currents originating from water that decays relatively fast, but the active material can easily be replaced to maintain high rates of electron transfer. The cyanobacteria based cell generates lower currents, yet, has a significantly longer life time. By studying and understanding both systems we lay the foundation for future research to combine the advantages of both systems.

chfruma@technunix.technion.ac.il
www.schulich.technion.ac.il
T. + 972 4 829 3654
F. + 972 4 829 3499
Technion City
Haifa 32000 Israel
קרית הטכניון
חיפה 32000