הטכניון - מכון טכנולוגי לישראל

TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY

הפקולטה להנדסה כימית
ע״ש וולפסון
The Wolfson Department of Chemical Engineering

**Wolfson Department of Chemical Engineering Seminar**
**Lecture Hall 6, Wolfson Department of Chemical Engineering,**
**Wednesday, January 1st, 2020 at 13:30**

# Nanometer Scale Membranes for Closing the Artificial Photosynthesis Cycle


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Solar driven electrosynthetic $CO_2$ reduction to transportable fuels by artificial photosynthesis constitutes a potential solution to the geographical and temporal intermittency of renewable energy resources. State-of-the-art *integrated* solar fuel generators use multijunction photovoltaic devices coupled to $CO_2$ reduction reaction (CO2rr) and oxygen evolution reaction (OER) electrocatalysts. To avert fuel from being oxidized at the anode and $O_2$ from reaching the cathode, the CO2rr and OER reaction environments need to be compartmentalized. The compartments are normally separated by a ~100 micrometer-thick membrane, which adds a significant transport resistance to the already energy-demanding reactions. Decreasing the membrane thickness to the smallest achievable is a possible route to minimizing this channel of energy loss. However, this requires redesigning solar fuel generators, which in turn requires new materials integration strategies.

In this talk, I will present how we combined nanofabrication techniques with organic and inorganic synthetic procedures to fabricate a new solar fuel generator, which uses a **two-nanometer thick membrane** to separate the CO2rr and OER compartments**.** This membrane, which is made of ~2 nm thick $SiO_2$ layer embedded with ~2 nm long conjugated organic molecules provides the required compartmentalization and electronic connection at the nanometer scale. I will also show how such a membrane can be used to couple a bacterial compartment with an abiotic electrocatalyst.


**Refreshments will be served at 13:15**