RUTGERS ENERGY INSTITUTE

Jean Wilson Day Memorial Lecture

DANIEL NOCERA
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Harvard University

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Computing Research and Education (CoRE) Building

Solar-to-Fuels & Solar-to-Fertilizer Production

*Bio: Daniel G. Nocera is the Patterson Rockwood Professor of Energy at Harvard University. He is widely recognized in the world as a leading researcher in renewable energy. His group has pioneered studies of the basic mechanisms of energy conversion in biology and chemistry with a particular focus on multielectron transformations and the coupling of protons to electron transfer (i.e., proton-coupled electron transfer). A focus in the group has been to exploit this mechanistic knowledge for the generation of solar fuels. His group has recently accomplished a solar fuels process that captures many of the elements of photosynthesis and he has now translated this science to produce the artificial leaf, which was named by Time magazine as Innovation of the Year for 2011. He has since achieved solar-to-hydrogen efficiency of greater than 10%. He has also demonstrated a path to liquid fuels using a bio-engineered bacterium, Ralstonia eutropha to efficiently convert carbon dioxide, along with hydrogen produced from the artificial leaf, into biomass and fusel alcohols. In this hybrid microbial | artificial leaf system, equivalent solar-to-biomass (10.2%) and solar-to-fuels (6.7%) yields exceed that of terrestrial plants. These science discoveries set the stage for a storage mechanism for the large scale, distributed, deployment of solar energy. Other areas of interest in the group include the development of proton-coupled electron transfer and its application to radical enzymology, the development of new cancer therapies by creating nanocrystal chemosensors for metabolic tumor profiling, the creation of spin frustrated materials, which has culminated in the discovery of the quantum spin liquid, and the invention of molecular tagging velocimetry technique for the measurement of highly turbulent fluid flows. Learn more at Prof. Nocera's*his webpage: https://chemistry.harvard.edu/people/daniel-g-nocera

Abstract: The artificial leaf accomplishes a solar fuels process that captures the elements of photosynthesis – the splitting of water to hydrogen and oxygen using light, from neutral water, while incorporating the development of "self-healing" catalysts. We have further advanced the design by developing a bio-engineered bacterium that utilizes the hydrogen produced to convert carbon dioxide into biomass and alcohols.

Sponsored by Department of Chemistry & Chemical Biology

Individuals who wish to meet with Prof. Nocera, should contact Alan Goldman Alan.Goldman@chem.rutgers.edu or and Anuradha Kadam ak1208@chem.rutgers.edu