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Artificial photosynthesis: Light capture, charge separation and fuel production

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To tackle the ever increasing energy demand of modern society and avoid environmental pollution caused by burning fossil fuels, solar energy is perhaps the most attractive, renewable, clean and inexhaustible energy source. Therefore, efficient capture and conversion of solar energy into chemical energy and electricity by utilizing molecular systems that follow the concept artificial photosynthesis has witnessed rapid growth during recent years. In the design, multi-modular donor-acceptor systems capable of wide-band light capture for maximum utilization of sun light, and subsequently perform the process of photo induced electron transfer leading to long-lived charge separated states of sufficient stored energy are key factors. The stored energy in the electron transfer products will be subsequently utilized for light-to-electricity and light-to-fuel production. The talk will present recent developments in our laboratory on the research topic of building supramolecular systems capable of visible-near infrared light capture, and transporting the captured light to the donor-acceptor site for carrying out successive light induced electron transfer resulting in high potential charge separated states in solution and electrode surfaces. Further, utilization of surface modified artificial photosynthetic systems for solar fuel production will also be highlighted.

Biography

Francis D'Souza Received Ph. D. from the Indian Institute of Science, Bangalore, India in 1992, and post-doctoral studies at the University of Houston and University of Dijon, France. He was a Professor of Chemistry at Wichita State University, Wichita, KS from 1994 to 2011, and joined the faculty of University of North Texas in 2011. He is part of UNT's Bio Nano Photonics research cluster. Francis D'Souza's research covers wide areas of chemistry, nanophotonics and materials science. Principal research interests include chemistry and supramolecular chemistry of porphyrins and carbon nanomaterials, light energy harvesting, photoelectrochemistry and photovoltaics, ultrafast spectroscopy, electrochemical and photochemical sensors and catalysts, fluorescent chemosensors and biosensors, conducting nanocomposite hybrid materials for energy storage and conversion.

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