A Tipping Point for Solar Fuels?

Meyer/UNC

Scientific Achievement

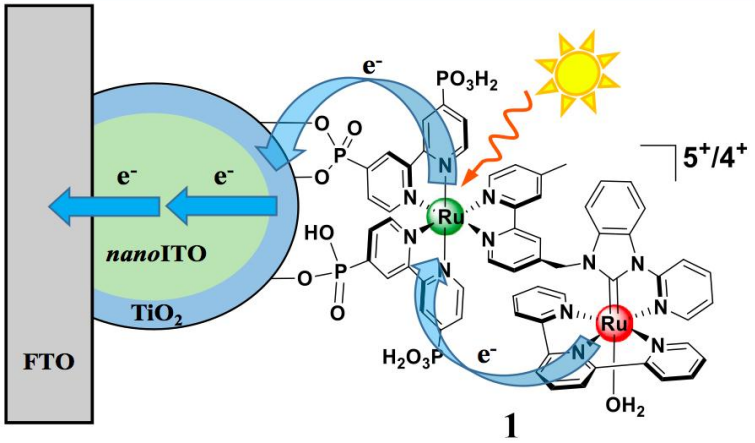
A working "artificial leaf" for solar water splitting has been constructed, based for the first time on a dye sensitized photoelectrosynthesis cell (DSPEC).

Significance and Impact

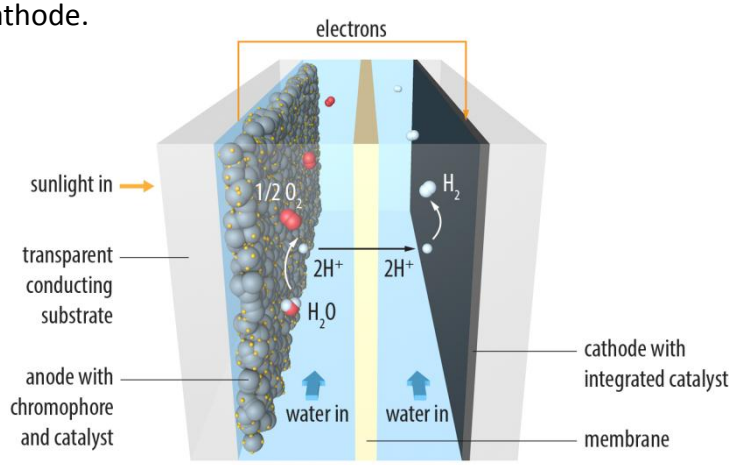
Visible light water splitting with a minimum bias (~0.2 V) has been demonstrated in a molecular assembly derivatized core/shell structure consisting of a nanoparticle, mesoporous transparent conducting film with a thin overlayer of TiO_2.

Research Details

- A core/shell photoanode was created by coating a nanoparticle film of tin-doped indium oxide (*nano*ITO) with a conformal layer of TiO_2 by using atomic layer deposition (ALD).
- Integration in a DSPEC with a Pt cathode with visible illumination gave an absorbed photon conversion efficiency of 4.4% for water splitting.



(Above) Illustrating interface binding, assembly structure, and a kinetic scheme following MLCT excitation of the chromophore in the assembly on core/shell *nano*ITO/TiO_2.
(Below) Graphic depiction of a DSPEC with H^+ reduction at a Pt photocathode.



Alibabaei, L.; Brennaman, M.K.; Norris, M. R.; Kalanyan, B.; Song, W.; Losego, M.D.; Concepcion, J.J.; Binstead, R.A.; Parsons, G.N.; Meyer, T.J. *Proc. Natl. Acad. Sci. USA*, **2013**, *110 (50)*, 20008-20013. http://dx.doi.org/10.1073/pnas.1319628110

Work was performed at UNC Chapel Hill and NC State University

U.S. DEPARTMENT OF ENERGY | Office of Science | SOLAR FUELS UNC EFRC | UNC ENERGY FRONTIER RESEARCH CENTER | North Carolina Central University | Duke University | RTI International | UF University of Florida | Georgia Institute of Technology | rasei | NREL