Advances in efficient solar production of hydrogen fuel

Stuart Licht
Department of Chemistry and Institute of Catalysis
Technion Israel Institute of Technology
Haifa, 32000, ISRAEL.
email: chrlicht@techunix.technion.ac.il

Abstract

Solar water splitting can provide clean, renewable sources of hydrogen fuel, although prior models had indicated only low conversion efficiencies would be attainable. A novel model is derived and initial results presented for thermal-photo electrochemical solar water splitting processes by semiconductors, which is the first derivation of band edge restricted thermal enhanced solar water splitting efficiencies. A theoretical basis is developed for solar energy conversion efficiencies in the 50% range as determined with contemporary thermodynamic values. The theory combines photodriven charge transfer, with excess sub-bandgap insolation to lower the water potential, providing a process of highly efficient elevated temperature solar electrolysis of water to hydrogen fuel.