Complex Nanostructured Materials for Efficient Solar Energy

Yan-Gu Lin (林彥谷)[1*], Yu-Chang Lin (林佑錩)[1,2], Chun-Kuo Peng(彭俊國)[1,2], Chao-Lung Chiang (江昭龍)[1], and San-Yuan Chen (陳三元)[2]

[1]National Synchrotron Radiation Research Center, 101 Hsin-Ann Road, Hsinchu Science Park, Hsinchu, Taiwan
[2]Department of Materials Science and Engineering, National Chiao Tung University, Hsinchu, Taiwan
lin.yg@nsrrc.org.tw

Abstract

Metal oxide nanostructures with hetero-contacts and phase boundaries offer unique platform for designing materials architectures for solar harvesting applications. Besides the size and surface effects, the modulation of electronic behavior due to junction properties leads to modify surface states that promote higher efficiency. The growing possibilities of engineering nanostructures in various compositions (pure, doped, composites, heterostructures) and forms (particles, tubes, wires, films) has intensified the research on the integration of different functional material units in a single architecture to obtain new materials for solar energy harvesting application. In this work we present the deposition and modification of semiconducting metal oxides and their multilayers for photoelectrochemical (PEC) hydrogen production. The deposition parameters for thin film creation were optimized with respect to the PEC performance of the resulting materials in neutral solution. The long-term performances of the metal oxide photoanodes were determined in neutral solution as well.

Keywords - Water Splitting; Solar Hydrogen; Heterostructure; Photoelectrochemical; Seminconductor