International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI)

Balapur P.O., Hyderabad – 500005, Telangana, India

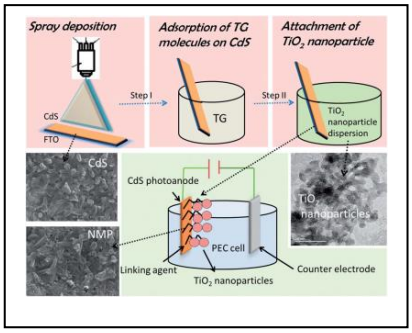
Solar electrochemical *nano*-electrode for H_2 generation /CO_2 conversion

Overview

Photoelectrochemical electrodes exhibiting solar photon absorptivity and long sustainability (>1000hrs) are being developed to achieve 7% solar-to-hydrogen (STH) ratio. Nanostructure semiconductor/chalcogenide and composites (CdS, CdSe, Ga-In phosphide) are important systems used in photoelectrochemical cells (PEC). There is need to develop stable photoelectrode or improve the life of known systems (Fe_2O_3, II-VI metal chalcogenide *as* CdS, CdZnS). CdS/ CIGS/Si are efficient systems which need to be modified by nanostructuring for sustainable performance. This is best suited with *nano*-(Ti/Ni oxide) and *nano*-MoS_2 based systems.

Key Features

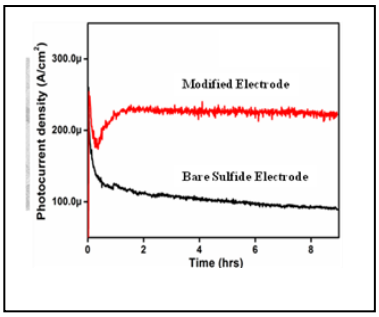
- Simple solution process for electrode (film) deposition
- High solar absorption and improved stability
- Scalable manufacturing process



Simple method to obtain electrodes with improved chemical stability

Potential Applications

- Solar PEC H_2 generator, Fuel gas-*cooking, cutting, welding*
- Optical material for absorber, photo-chromic display, LED, solar cell
- CO_2 conversion to usable fuel
- Pollutant removal under solar light



Performance characteristic Nano-modified electrodes

Intellectual Property Development Indices (IPDI)

- Performance is validated at laboratory scale
- Sustainable performance under simulated conditions
- Solar-to-hydrogen (STH) ratio of > 3% for stable performing electrodes

Status	1	2	3	4	5	6	7	8	9	10

Major Patents / Publications

1. Indian patent granted on " Method of Deposition of double perovskite of Sr Fe Nb-O film on substrate by spray coating technique & the coated substrate thereof" invented by **P.H.Borse**, - IN 2014DE01151A, Nov 6, 2015
2. **Borse, P.H.***et.al* Stable hydrogen generation from Ni- and Co-based co-catalysts in supported CdS PEC cell Dalton Transactions, 2016; 45 (27), 11120-11128
3. **Borse** PH. et.al. Nanoniobia modification of CdS photoanode for an efficient and stable photoelectrochemical cell. Langmuir 2014;30(51):15540-15549

Centre for Nano Materials
ARCI, Balapur PO., Hyderabad 500005, Telangana, India
Tel : +919490447615,+91 40 24452457 / 24452454; Fax : +91 40 24442699
Email: phborse [at] arci [dot] res [dot] in / vijay [at] arci [dot] res [dot] in / tata [at] arci [dot] res [dot] in