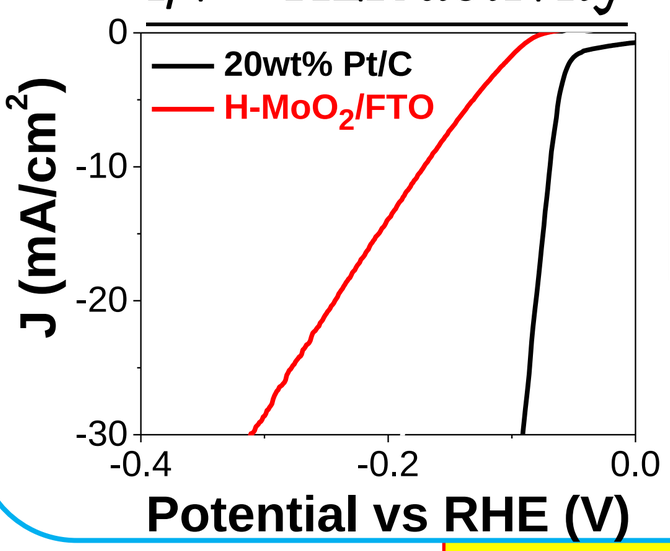
Highly 'Robust' MoO_2 Nanostructures for *Electrochemical Hydrogen Generation*

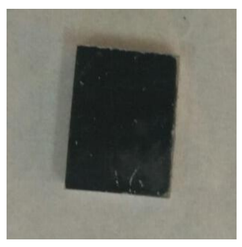
- Immense energy demand & the need for sustainable and clean sources have driven Hydrogen (H_2) production & storage in a cost-effective way.
- High cost and paucity of Pt – the bench mark catalyst
- MoO_2 nanostructures as alternate catalysts for hydrogen evolution reaction (HER)

MoO_2 system

- Hydrogen annealed MoO_2 (H-MoO_2) grown as film on fluorine-doped tin oxide (FTO) substrates
- Low onset potential of 72 mV demonstrated with 3 electrode configuration

i/v – HER activity

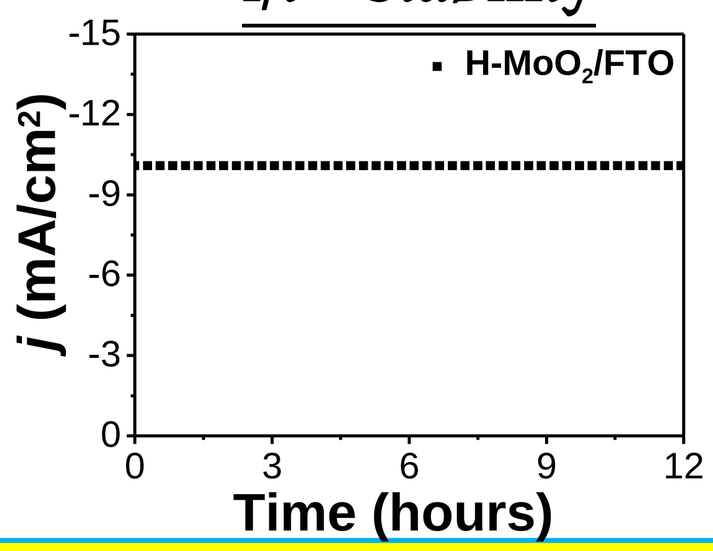




MoO_2 film On FTO

H_2 bubbles

i/t – Stability



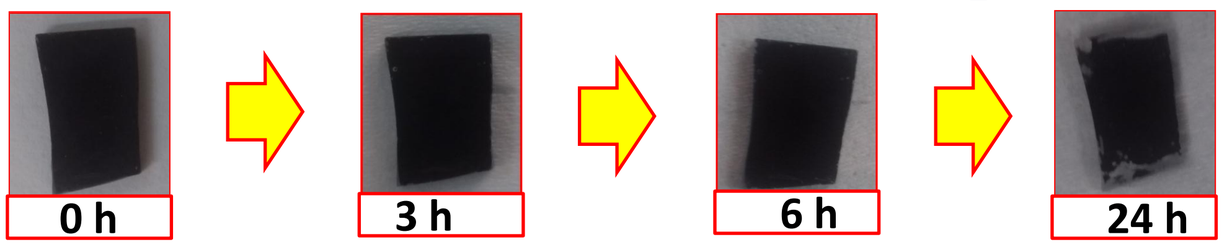
Faradaic efficiency of H_2 gas: 82% @ 10 mA/cm^2

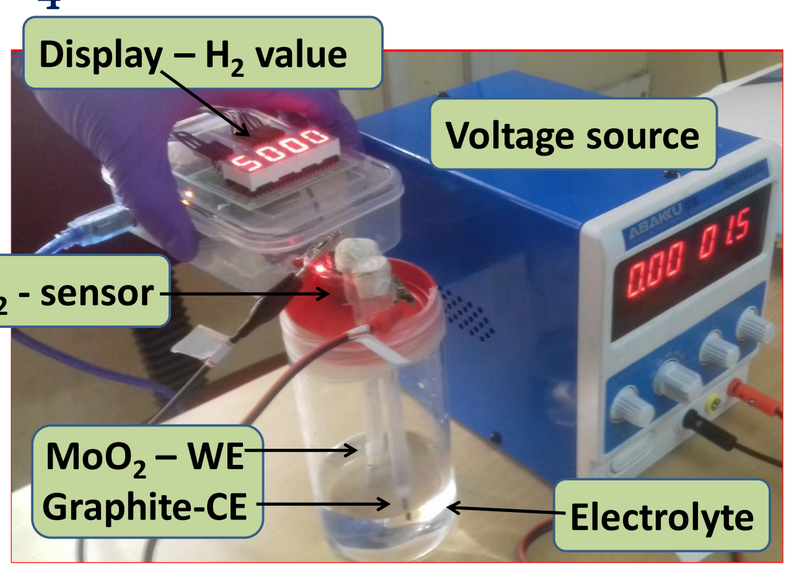
Demo System

- ✓ 2 Electrode system – MoO_2/FTO as cathode; graphite rod as anode
- ✓ Electrolyte: 0.5 M H_2SO_4; H_2 gas sensor (MQ-8); range:10-10000 ppm.

Highlight – Excellent stability

- Sonication test with bath sonicator in 0.5 M H_2SO_4
- 100% Stable upto 6h; after 24 hr ≥90%
- Electrochemical – several thousands of cycles
- Ambient – stable & active at least upto 6 months





Comparison with Commercial Catalyst

Catalyst	Electrolyte	Onset	Overpotential @10 mA/cm^2	Reference
20 wt% Pt/C	0.5 M H_2SO_4	37 mV	69 mV	*Chem. Eur. J.*, 2018,
H-MoO_2/FTO	0.5 M H_2SO_4	72 mV	171 mV	doi:10.1002/chem.201803570

Contributors:

Vivek Ramakrishnan and Neena S. John