All-Oxide Solar Cells: $NiO/Cu_2O/ZnO/SnO_2$ Heterojunction (PV-2)

A joint India-U.S. research consortium funded under the *Joint Clean Energy Research & Development Center (JCERDC)*

Scientific Achievement:

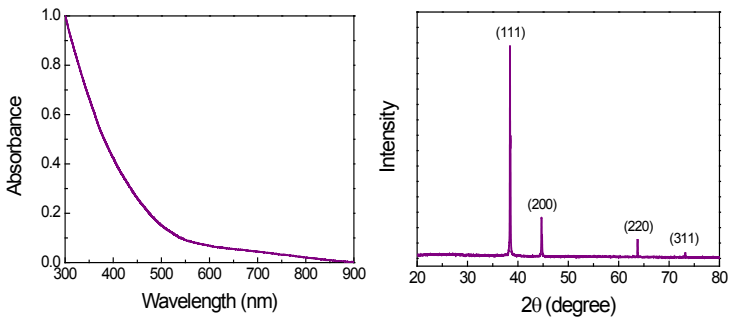
Formation of *pn*-junction solar cells with a layer of *p*-type Cu_2O and a layer of *n*-type SnO_2 nanoparticles. Band-edges of the materials with respect to their Fermi energy from STS measurements were used to derive the energy band-diagram. The all-oxide inorganic heterojunction solar cells have a photo-conversion efficiency in excess to 1%.

Significance and Impact:

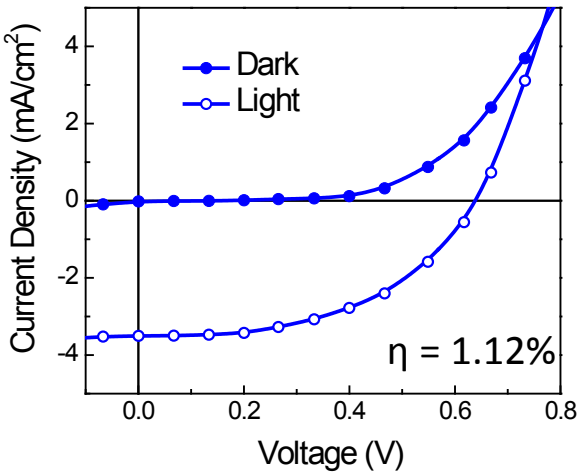
Deposition of uniform, highly crystalline, and single-phase Cu_2O thin films by Successive Ionic Layer Adsorption and Reaction (SILAR). Compared to electrochemical deposition and thermal annealing processes, SILAR produces thin films with comparable quality, at much lower cost.

Research Details:

- Fabrication and characterization of Cu_2O thin films by SILAR.
- Formation of all-oxide heterojunction thin-film solar cells with Cu_2O as the active material.
- In-depth characterization of the photovoltaic devices.



Absorbance spectrum (left) and X-ray diffraction pattern (right) of Cu_2O thin film.



JV profile of heterojunction cells.

Publication: S. Chatterjee, S. K. Saha, A. J. Pal, Formation of all-oxide solar cells in atmospheric condition based on Cu_2O thin-films grown through SILAR technique, *Solar Energy Materials & Solar Cells* **147**, 17–26 (2016). DOI: 10.1016/j.solmat.2015.11.045

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