IEA Hydrogen Implementing Agreement (HIA) releases Annex 14's Final Report entitled **Photoelectrolytic Production of Hydrogen.**

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The International (IEA) Hydrogen Implementing Agreement (HIA) has released Annex 14's **Photoelectrolytic Production of Hydrogen**:

Final Report culminating a four and a half year effort by nine research groups from Japan, Sweden, Switzerland and USA focused on the development of materials and systems for the photoelectrochemical production of hydrogen. The report (free download) catalogues many encouraging advances in this emerging research field.

According to Operating Agent Dr. Andreas Luzzi, "The ultimate goal of a stable sunlight-to-hydrogen conversion efficiency of 10% is in sight for PEC based water splitting technologies."
Photoelectrolysis of water is the process whereby light is used to directly split water into hydrogen and oxygen. Photoelectrochemical (PEC) semi-conducting material or devices can be used to activate the process.

Since the 1979 launch of Annex 6 - Photocatalytic Water Electrolysis, Annex 14 is the third HIA task to pioneer collaborative scientific investigation of direct solar-to-hydrogen production routes based on PEC water-splitting.

The overall objectives of Annex 14 were to significantly advance the fundamental and applied science of photoelectrolysis and to evaluate performance data regarding practical system efficiency and device lifetime. The research was conducted within the framework of two coordinated subtasks, material studies and system studies.

Key Annex 14 findings include:

* Development of a world-first water-splitting catalyst powder ($In_{0.9}Ni_{0.1}TaO_4$) for operation under VIS light;

* Encouraging photoelectrode performance enhancement results from successful transiton-metal-oxide (TiO_2), metal-oxide (ZnO) and III-IV compound (GaN, GaInP) doping using either N or C;

* Strong engineering progress with the preparation and characterization of photoanode thin films (WO_3, Fe_2O_3), including doping (Ti, Al, Ni, Sn) using ultrasonic spray-pyrolysis, sputtering or sol-gel;

* Promising conceptual development of novel planar, multi-junction PEC water-splitting cells;

* Completion of deposition and characterization equipment for ultra-fast screening of new electrochemical materials (combinatorial chemistry);

* Development of modeling capability of photo-oxidation based on quantum transition theory;

* Pioneering manufacture of 100 mm x 100 mm demonstrator PEC water-splitting tandem cell (WO3/TiO2) components, with scale-up program toward 300 mm x 300 mm devices. The key challenges to PEC cell innovation lie in the areas of material science and engineering. It is envisioned that hydrogen and electricity, the two major energy carriers, will one day define an energy triangle that builds on the science, technology and engineering of "sister" components -- photovoltaics (PV), fuel cells and photelectrochemical (PEC) cells. The similarity in potential and R&D requirements among these three make a case for PEC cells as a core future hydrogen enabling technology.

Midway through its operating cycle, Annex 14 welcomed observers from Australia, France, the Netherlands, Mexico and the United Kingdom. Their participation is evidence of the growing global interest in photoelectric production of hydrogen.

Photoelectrolytic Production of Hydrogen is featured in the (IEA Open Bulletin Issue 24). Some thirty-five research groups have joined the successor task, Annex 20 - Hydrogen from Waterphotolysis.

In releasing Annex 14's Final Report HIA Chairman Trygve Riis said, "Photoelectric production of hydrogen, reliant on the sun as the energy source, is viewed as a highly promising and sustainable approach to hydrogen production. This HIA research, past and present, will play a vital role in advancing the adoption of a hydrogen economy."

Report: http://www.ieahia.org/tasks/task14.html