Solar energy stored efficiently

Pilot solar power-plant delivers promising results

For the first time solar energy has been successfully used in a pilot-plant to create storable energy from a metal ore. In a project funded by the EU, the Paul Scherrer Institute (PSI) with the Swiss Federal Institute of Technology Zurich (ETHZ) together with other research institutes and industrial partners, have reached an important milestone.

A 300-kilowatt pilot installation to create zinc using solar temperatures of over 1200 degrees Celsius successfully came into operation in Israel. The solar-reactor technology is Swiss developed, by the PSI and ETH Zurich, and forms the heart of the plant.

Reducing zinc oxide to zinc is a useful way of chemically storing the sun's energy in a transportable form, for later use. Zinc can be used in zinc-air-batteries or be used to produce hydrogen by reacting it with water vapor. In both cases the zinc recombines with oxygen and zinc oxide is produced, which can be reused in the solar reactor to produce zinc once more.

"After extensive trials with reactor-prototypes at the PSI solar-oven we have, with our project partners from Sweden, France and Israel, begun to successfully operate a 300-kilowatt pilot-plant at the Weizmann Institute of Science (WIS) in Rehovot near Tel Aviv", explains Christian Wieckert from PSI, Scientific Coordinator of the project.

The aim is sixty-percent efficiency

The first trials of the solar power-plant have used thirty-percent of available solar energy and produced forty-five kilos of zinc an hour, exceeding projected goals. During further tests this summer a higher efficiency is expected. Industrial size plants, for which this is a prototype, can reach efficiency levels of fifty- to sixty-percent. The success of this solar chemistry pilot project opens the way for an efficient thermo-chemical process whereby the sun's energy can be stored and transported in the form of a chemical fuel. In this process the zinc is combined with coal, coke or carbon biomass which acts as a reactive agent, yet in this reactor only a fifth of the usual amount of agent is used. The sun's rays are concentrated on this mixture by a system of mirrors and the zinc forms as a gas which is then condensed to a powder.

The research into high-temperature solar-chemistry at PSI and ETHZ combines fundamental physics and chemistry research with solar-chemical reactor technology. The long-term goal is the development of fuels by means of clean, universal and sustainable energy sources. "Solar fuels can be used as an environmentally friendly energy provider and thereby be part of the solution to climate change", says Aldo Steinfeld, Professor from the Institute of Energy Technology at the ETH Zurich and leader of the Solar Chemistry Laboratory at PSI.

Source: Paul Scherrer Institut