Solar energy project at the Weizmann Institute promises to advance the use of hydrogen fuel

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Innovative solar technology that may offer a "green" solution to the production of hydrogen fuel has been successfully tested on a large scale at the Weizmann Institute of Science in Israel. The technology also promises to facilitate the storage and transportation of hydrogen. Results of the experiments will be reported in August at the 2005 Solar World Congress of the International Solar Energy Society (ISES) in Orlando, FL.

The solar project is the result of collaboration between scientists from the Weizmann Institute of Science, the Swiss Federal Institute of Technology, Paul Scherrer Institute in Switzerland, Institut de Science et de Genie des Materiaux et Procedes - Centre National de la Recherche Scientifique in France, and the ScanArc Plasma Technologies AB in Sweden. The project is supported by the European Union's FP5 program.

Hydrogen, the most plentiful element in the universe, is an attractive candidate for becoming a pollution-free fuel of the future. However, nearly all hydrogen used today is produced by means of expensive processes that require combustion of polluting fossil fuels. Moreover, storing and transporting hydrogen is extremely difficult and costly.

The new solar technology tackles these problems by creating an easily storable intermediate energy source form from metal ore, such as zinc

oxide. With the help of concentrated sunlight, the ore is heated to about 1,200°C in a solar reactor in the presence of wood charcoal. The process splits the ore, releasing oxygen and creating gaseous zinc, which is then condensed to a powder. Zinc powder can later be reacted with water, yielding hydrogen, to be used as fuel, and zinc oxide, which is recycled back to zinc in the solar plant. In recent experiments, the 300-kilowatt installation produced 45 kilograms of zinc powder from zinc oxide in one hour, exceeding projected goals.

The process generates no pollution, and the resultant zinc can be easily stored and transported, and converted to hydrogen on demand. In addition, the zinc can be used directly, for example, in zinc-air batteries, which serve as efficient converters of chemical to electrical energy. Thus, the method offers a way of storing solar energy in chemical form and releasing it as needed.

"After many years of basic research, we are pleased to see the scientific principles developed at the Institute validated by technological development," said Prof. Jacob Karni, Head of the Center for Energy Research at Weizmann.

"The success of our recent experiments brings the approach closer to industrial use," says engineer Michael Epstein, project leader at the Weizmann Institute.

The concept of splitting metal ores with the help of sunlight has been under development over the course of several years at the Weizmann Institute's Canadian Institute for the Energies and Applied Research, one of the most sophisticated solar research facilities in the world, which has a solar tower, a field of 64 mirrors, and unique beam-down optics.

The process was tested originally on a scale of several kilowatts; it has been scaled up to 300 kilowatts in collaboration with the European

researchers.

Weizmann scientists are currently investigating metal ores other than zinc oxide, as well as additional materials that may be used for efficient conversion of sunlight into storable energy.

Source: Weizmann Institute of Science