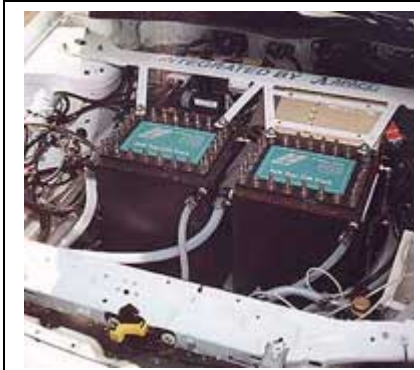


Technion team helping to make hydrogen fuel cells work in cars

By Rick Radin October 28, 2002

Successful research in Israel into improving the efficiency of solar-hydrogen fuel cells has raised the potential for their use in non-polluting cars of the future that could drastically reduce growth in the use of oil.



Auto engines powered by hydrogen fuel cells have already been placed into prototype test cars.

A team of scientists at the Technion - Israel Institute of Technology, led by Prof. Stuart Licht, has been working for several years on producing hydrogen by so-called solar water splitting systems. If the hydrogen production method could be made efficient enough hydrogen fuel cells could be used to power electric cars using energy that would be constantly renewable, overcoming problems with recharging, weight, pollution and short battery life that plague today's electric vehicles.

Early models had predicted that the solar method of producing hydrogen would work, but only with about 15 percent efficiency, not enough to make the technology practical for automobiles. This was later improved to 30 percent, but intensive research by the Technion team has now raised the level even higher.

These breakthroughs have attracted the attention of companies such as Royal Dutch Shell and Daimler, which have already experimented with fuel cells and hydrogen as an alternative to oil, and have been waiting for a more efficient way to create hydrogen at a commercially feasible price.

While the public may have to wait for hydrogen fuel-cell cars, automakers are already working to place prototypes in fleets. Recently, Los Angeles signed a deal with Honda for five fuel-cell cars.

The California Fuel Cell Partnership, a consortium of automakers, government agencies and others, plans to have 60 cars operating in California by the end of next year.

The Technion group improved the efficiency of the hydrogen extraction

process by placing a photovoltaic cell on top of two flat, finger-long electrodes. The combination "is very efficient in converting solar energy into electric current, but also provides nearly the ideal voltage for splitting water" into hydrogen and oxygen, Licht said.

The technique converted sunlight to an electrolysis current with 18.3 percent efficiency. The current, in turn, creates hydrogen gas as it passes through acidic water.

In 1998, the National Renewable Energy Laboratory in Golden, Colo., demonstrated a novel apparatus for solar-to-hydrogen conversion. To achieve unprecedented efficiency, the device used multiple layers of semiconductor materials. The researchers arranged the layers to form two active regions, or junctions that would absorb solar photons that dislodge electrons. Some of the less energetic photons weren't captured in the first junction, but passed to the second, where they generated more current.

The design gained an energy advantage by combining solar electricity and water splitting into one unit. Their cell's efficiency doubled that of any previous solar-to-hydrogen device.

Licht and his colleagues have improved upon that pioneering effort in several crucial ways. The NREL device had to be completely immersed in water to operate. That feature forced the researchers to select semiconductors that wouldn't break down in solution.

By keeping their stack of semiconductor layers dry, Licht and his group were free to optimize them for both converting sunlight to electricity and water splitting. Their design permits a low electrolysis current, which also reduces energy waste.