

From the American Chemical Society meeting in Seattle, Wash.

H₂O-splitting reports make waves

Two groups whose solar water-splitting projects were harshly criticized last year by other scientists in the photochemistry field have presented new findings. Again, though, both of their independent projects have met with some unfavorable reviews.

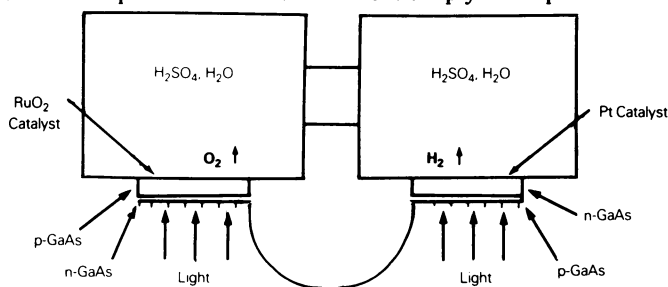
One group, Gabor Somorjai and colleagues of the University of California at Berkeley, last fall announced development of a system that uses iron oxide electrodes to convert solar energy into chemical energy in the form of O₂ and H₂, components of split water (SN: 9/25/82, p. 198). That system was touted as a solar energy breakthrough in newspapers nationwide. But other researchers in the field pointed out that because the system had a low solar energy-conversion efficiency and it mysteriously quit operating after eight hours (unless regenerated with oxygen), it would never be technologically significant.

Now Somorjai and colleagues have discovered that the mysterious deactivation was due to grease, from a component of the system, contaminating the water-splitting process. The contamination problem has been solved, and the cell now operates for up to six weeks with no signs of deterioration. Nonetheless, critics note, the system always will be plagued by a low solar energy-conversion efficiency, because iron oxide electrodes can only utilize a small portion of the solar spectrum.

The other group that made waves in the photochemistry field last year, John O'M. Bockris, Marek Szklarczyk and colleagues of Texas A&M University in College Station, also had reported on a water-splitting system composed of semiconductor electrodes in solution (SN: 10/16/82, p. 246). While this is a popular type of system to study, says Oliver J. Murphy, of Bockris's lab, it does have an obvious problem: corrosion of the electrode material that is exposed to solution. Another approach to splitting water utilizes a series of "solid-state" solar cells—in which generation of the electron flow (electricity) depends on the interaction of different types of semiconductor materials, rather than upon the interaction of a semiconductor with a solution. The "dry" semiconductor component is hooked up to a separate solution-containing component, where the water-splitting takes place. The disadvantage of this system is that a large-scale version would require two separate industrial plants, Murphy says.

Now Murphy and colleagues report the development of a "hybrid" of the two aforementioned water-splitting systems: the semiconductor material does not touch the solution, but the system is not a bulky, two-component one. The electricity for splitting water is generated by the solar-activated interaction of two types of semiconductor material on each electrode: p-type gallium arsenide (GaAs) and n-type GaAs. (Electrons flow out of p-type semiconductors and into n-type semiconductors.) Catalysts separate the semiconductors from a solution of sulfuric acid (H₂SO₄) and water (see diagram). At the ruthenium dioxide (RuO₂) catalyst, water splits into hydrogen ions (H⁺), electrons and oxygen (O₂). At the platinum (Pt) catalyst, hydrogen ions gain electrons to form hydrogen molecules (H₂).

While Murphy says that a further-developed version of the system eventually could be used on residential rooftops to convert solar energy into electricity, other scientists in the field are skeptical. Bruce Parkinson, of the Solar Energy Research Institute, for example, says that materials now available for the solid-state portion of such a device are simply too expensive.



286

Court overturns 'Baby Doe' rule

On April 9, 1982, in Bloomington, Ind., a child was born with Down's syndrome (mongolism) and a surgically correctable blockage of the digestive tract that prevented normal feeding. When the baby's parents refused to consent to corrective surgery, the hospital appealed to the state courts for guidance. But the proverbial slow wheels of justice didn't roll into action. As a result, the infant—now known as "Baby Doe"—died. It was six days old.

Reacting to the publicity surrounding this case, on April 30 of last year President Reagan wrote to the U.S. Attorney General and the secretary of the Department of Health and Human Services (HHS)—"reminding" both that federal law prohibits discrimination against the handicapped. Less than three weeks later, HHS sent notices to the nation's health-care providers, informing them that federal statutes require that hospitals receiving federal assistance must maintain life-sustaining nutrition or treatment for handicapped infants. On March 22 of this year, HHS formalized all this in a new law. Included as part of this interim final rule was creation of a telephone "hotline" to accept tips regarding suspected violations of the infant-protection law.

But the law was overturned 23 days later. Responding to a suit filed by the American Academy of Pediatrics, National Association of Children's Hospitals and Related Institutions, and Children's Hospital National Medical Center, U.S. District Court Judge Gerhard Gesell found HHS "arbitrary and capricious" in its rulemaking procedures, and negligent in its consideration of many important issues.

For example, Gesell noted, HHS appears not to have considered the disruptive effects the hotline posed: "In a desperate situation where medical decisions must be made on short notice by physicians, hospital personnel and often distraught parents, the sudden descent of 'Baby Doe' squads on the scene, monopolizing physician and nurse time and making hospital charts and records unavailable during treatment, can hardly be presumed to produce higher quality care for the infant." What's more, Gesell said, the agency totally ignored consideration of parental wishes, even though parents are often "in the best position to evaluate the infant's best interests." He added that by ignoring the parents, the rule might even prompt parents to remove a child from hospital care entirely. Gesell also faulted HHS on several procedural issues related to the lack of public notice, comment period and consultation permitted before the rule went into effect. Finally, he noted that no consideration was made of whether painful or intrusive treatment was even appropriate for infants whose "clear prognosis is death within days or months."

News capsules

- Hospital workers exposed to ethylene oxide, a gas widely used in sterilizing hospital equipment and medical products, can breathe at least a partial sigh of relief. Prompted by two recent court actions (SN: 3/26/83, p. 202), the Occupational Safety and Health Administration has formally proposed a 50-fold reduction in the permissible eight-hour worker-exposure limit—to 1 part per million in air. Already some hospitals are complaining that they suspect compliance with the new standard—proposed April 15—will be nearly impossible. Many affected unions are countering that the proposed rule doesn't go far enough. High miscarriage rates have already been correlated with hospital-worker exposures averaging half to one-tenth the new proposed standard (SN: 1/22/83, p. 55).
- New York University and several of its faculty—charged with copyright infringement last December by the Association of American Publishers—have settled out of court with an agreement to strictly enforce federal laws on the photocopying of protected works. The case is the first to hold a college and faculty accountable for photocopy provisions of copyright law.

SCIENCE NEWS, VOL. 123