TECHNOLOGY

The future of bio-solar energy

Within 5 to 15 years, synthetic membranes that can simulate the photosynthetic processes of green plants should become feasible as a major source of energy, concludes chemist Melvin Calvin in the June CHEMTECH. Until then, he says, alcohol made from sugar and gasoline made from tree products should be exploited as a means of saving fossil fuels.

Calvin, who won the Nobel Prize for his work in photosynthesis, has spent several years concentrating on how to synthesize this process. In plants, sunlight is used to break down water into hydrogen and oxygen by means of some very complex catalysts. In a manmade device, the process would probably involve using a special membrane, possibly having catalysts mounted on it. "We are currently in the process of constructing such a synthetic membrane," Calvin says, "and we know what one side [hydrogen-producing] will probably be, but we are still not certain as to the events on the oxygen-producing side."

The advantage of being able to control such photochemical processes, he says, is that they could convert solar energy with 75 percent efficiency, compared with 1 percent efficiency of plants in the field or 16 percent theoretical efficiency for photovoltaic cells. Hydrogen produced by this method could then be used directly as fuel or as a feedstock for other chemicals or fuels.

In the meantime, several conventional biological sources of solar energy should be further investigated, Calvin says. Some petroleum derivatives, such as ethylene (a raw material for many industrial chemicals), should soon be able to be produced economically from alcohol fermented from sugar cane. Also, Calvin calls certain plants related to rubber trees "gasoline trees," claiming that they could be used for "harvesting economic amounts of crude-oil-like hydrocarbons from land ... which today cannot be easily used for food or fiber production."

Tech Briefs

- The Sandia Laboratories Solar Thermal Test Facility, near Albuquerque, N.M., has made a first successful test of what will soon become the world's largest solar furnace. With 71 of 144 projected heliostats pointed at a target on the facility's 120-foot tower, a hole the size of a TV screen was burned through 6.4 millimeters steel in less than two minutes. Completion of the rest of the heliostats is expected later this year.
- The first efficient way to mass-produce individual animal cells for biological experimentation has been developed at the Massachusetts Institute of Technology by David W. Levine and co-workers, under National Science Foundation sponsorship. The cells are grown on microscopic cellulose beads coated with sugar, suspended in a culture medium and stirred to promote gas exchange.
- A smoke detector and humidity meter small enough to be placed on a semiconductor chip one-twentieth of an inch square has been developed at MIT by Stephen D. Senturia Thin films of polymers, sensitive to the presence of smoke or changes in humidity, introduce a time delay between application of a voltage to a transistor and passage of current through it. The National Aeronautics and Space Administration has supported the research.
- The Boeing Co. of Seattle has been selected to build the world's largest windmill under contract to NASA and the Energy Research and Development Administration. With blades 300 feet in diameter, the windmill is designed to produce 2.5 megawatts electricity on an average wind of 14 miles per hour. Site for the new device, which will cost about $10 million, will be announced later. It is supposed to begin operating in 1979.

SPACE SCIENCES

More chances to see Uranus rings

The rings of Uranus, discovered on March 10 when they occulted a bright (magnitude 10) star, did not completely cut off the star's light. Some astronomers have therefore felt that dimmer stars could also be used in occultation studies, thus greatly increasing the number of chances to measure the rings' positions and structure. A check has now revealed that the rings will pass in front of at least 13 possibly eligible stars from now through 1980. And 10 of the 13 occultations will be visible from some part of the United States.

The first one is only weeks away. On the evening of Aug. 25, according to Peter Shelus and Fritz Benedict of the University of Texas, the rings will occult a star of magnitude 13.5 to 14, located at R.A. 14h 23.1m, Dec. −13° 48' (equinox 1950). The event should be visible from much of the United States, particularly the central portion of the country.

A dozen more occultations have been predicted by Arnold R. Klemola of Lick Observatory and Brian Marsden of the Harvard-Smithsonian Center for Astrophysics, two of them later this year. The 1977 events will take place on Dec. 5 (magnitude 15.0) and Dec. 23 (12.2), the latter being the brightest of all those predicted but best visible only in South America and western Europe. In 1978, occultations are predicted for March 25 (15.5), April 4 (14.0). April 10 (12.8) and Sept. 19 (15.0), all visible from the United States. In 1979, the dates are Jan. 8 (13.8, the only one of the year out of sight of U.S. observers), Jan. 18 (13.4), June 10 (14.5) and Sept. 22 (13.6). The two 1980 events will occur on March 20 (15.0) and Aug. 15 (13.6, again invisible from the United States).

The faintness of the occulted stars will make all of these events difficult to observe, but the rings of Uranus are a recent, major, unexpected and perplexing discovery (SN: 7/23/77, p. 52) and should draw many eyes.

Geomagnetic ground net begins

U.S. and Canadian researchers from four universities and two government agencies are about to begin deploying a broad network of magnetometers to monitor changes in the earth's magnetic field from sites as far apart as Brazil, Alaska and several Pacific islands.

The project will join other existing and forthcoming networks of similar sensors as part of the International Magnetospheric Study. Data from the instruments in the U.S.-Canadian array, which will be located at 28 different sites, will be received and relayed by the two U.S. GOES satellites to the Space Environment Services Center of the National Oceanic and Atmospheric Administration in Boulder, Colo.

From there the data will be distributed to researchers working both in applied fields—communications disturbances, mineral prospecting, geothermal resource studies—and in more theoretical areas. One goal, for example, is to seek information related to possible geomagnetic effects on climate. Also, when enough ground stations are in operation, it may prove possible to provide high-resolution detail to global geomagnetic maps that have been produced from satellite data (SN: 5/24/75, p. 340). Chances of linking ground-based and orbital data could also be improved by the launch of the proposed Magsat, which would provide global magnetic-field measurements from altitudes as low as 200 kilometers.

First firing of space shuttle rocket

The huge, solid-propellant rocket motor that will (in pairs) send the space shuttle into orbit was fired for the first time on July 18. Designed to produce 12,232,550 newtons (2,750,000 pounds) of thrust, the rocket is part of a "strap-on" booster that will be detached when the shuttle reaches orbital velocity.