TECHNOLOGY

Solar cells: Improving CdS

Most solar electric cells now on the market are made from large single crystals of silicon and cost more than $150 a square meter. Cheaper cells can be made by using "thin films" of tiny cadmium sulfide (CdS) crystals, but these have generally been rather inefficient. Scientists at the University of Delaware have now created a CdS cell that costs only $1.12 per square meter and that is claimed to represent the first significant improvement in efficiency since the early 1960s.

The Delaware team is lead by John D. Meakin, working under a contract initiated by the National Science Foundation and now continuing under the Energy Research and Development Administration (ERDA). Meakin told SCIENCE NEWS his group was able to determine that much of the inefficiency of CdS cells was caused by surface reflection and by absorption of photons in the electrical conducting grid. In the new cells, the grid has been rearranged and the surface has been etched to make it less reflective.

The new cells are able to convert 7.8 percent of the sun's energy into electricity. Assistant administrator at ERDA, Robert J. Hirsch says this achievement puts the solar electric program well on its way toward meeting its 1980 target of developing cells with 10 percent efficiency. By 1986, solar cells may compete with fossil fuels in many applications.

Solar cells: Improving silicon

Somewhat less advanced than the research into making polycrystalline CdS cells are attempts to produce cells from thin films of amorphous silicon. The potential advantage is that like the more expensive single-crystal silicon cells, these cheaper versions might have efficiencies of up to 14 or 15 percent. Development of a new, "second generation" of such thin-film silicon cells is announced in the Oct. 7 NATURE.

Semiconductors need to be "doped" with a few impurity atoms in order to become efficient conductors. In thin films of silicon, formed by sputtering, successful doping has just now been achieved. The pioneers include teams at the University of Dundee, Scotland, and at RCA's David Sarnoff Research Center, Princeton, N.J. Although the new silicon cells so far only demonstrate an efficiency of 2.4 percent, because of poor doping, they may open a new field of thin film devices.

Industry briefs

Superbattery. A contract to develop a rechargeable sodium-sulfur storage battery with five times more storage capacity per pound than standard batteries has been awarded to General Electric by the Electric Power Research Institute. Such a battery would allow utilities to store excess electrical energy during periods when full generating capacity is not utilized. Prototypes have already been developed, and by 1981 GE hopes to install a 5-megawatt-hour pilot system.

Microwave lander. A microwave system to replace current instrument landing units could make runway approaches safer and less noisy, but implementation of the new system is being held up by an international squabble over whether British or American versions are better, Rep. Dale Milford (D-Tex.) charges. Microwave systems would allow planes to make steeper, curved approaches to airports, thus creating less noise than the present, straight-line approaches.

Cleaning oily wastes. The General Motors Technical Center has announced development of the first means of separating oil wastes from water effluents without using chemicals or leaving a sludge. An electrolysis cell is used to cause oil particles to migrate to electrodes and coalesce.

PHYSICAL SCIENCES

Neutral weak currents and parity

One of the great historic shocks to theory in particle physics was the discovery, 20 years ago, that the class of force called the weak interaction does not respect parity or left-right symmetry in space. Until then it had been a fundamental belief that nature made no distinction between left and right. The experiment found that products of particle processes that take place under the governance of the weak interaction show a preference for particular directions in space or particular orientations of spin, thus violating space symmetry.

Since then a whole new class of weak interactions has been added. Originally both theory and experiment indicated that weak interactions could take place only if the participants exchanged a unit of electrical charge ("charged-current interactions" is the technical term). A recent revolution in theory and experiment shows that there are also neutral-current weak interactions, in which the participants do not exchange electric charge. So the question arises: Do neutral weak currents also violate parity?

The answer is yes, according to an experiment done at the Fermi National Accelerator Laboratory by 12 physicists from Harvard, the University of Pennsylvania, the University of Wisconsin and Fermilab (Alberto Benvenuti et al. in the Oct. 18 PHYSICAL REVIEW LETTERS). The experiment compared the rates of charged and neutral interactions between neutrinos and antineutrinos and atomic nuclei. It also indicates that the mathematical form in which the neutral current should be written down follows that preferred for the charged current.

A slow pulsar and cosmology

According to theory, pulsars are spinning neutron stars. It is said they spin fast when they are formed and slow down as they age, so the spin rate is often used to estimate the age of a pulsar.

But there's an unusual pulsar that spins extremely slowly, JP 1953+29. According to Victor N. Mansfield and John M. Rankin of Cornell University, writing in National Astronomy and Ionosphere Center publication 64, this pulsar is spinning down so slowly that when the effects of its motion across the sky on its apparent (to us) spin rate are considered, it may actually be spinning up from the point of view of someone riding along with it.

That result is so shocking that the two investigators let it lie there and say they would rather consider the pulsar one with an extremely slow spin-down rate. They then point out that that circumstance could provide a check on some cosmological theories that propose that the force of gravity weakens as the universe ages. If gravity weakens, the pulsar's diameter should increase, and that should affect the spin-down rate. Mansfield and Rankin calculate that the cosmologies proposed by P. A. M. Dirac in 1938 and by Fred Hoyle and J. V. Narlikar in the 1970s, but not Dirac's 1974 proposal, are in conflict with the measured spin-down rate of JP 1953+29.

New millimeter-wave telescope

The largest and most sensitive telescope in the United States designed for studying celestial emanations in the millimeter-wavelength range of the radio spectrum was dedicated at the Five College Radio Astronomy Observatory near Amherst, Mass., on Oct. 15.

The telescope is 45 feet in diameter. An important feature is a high-sensitivity maser receiver for the radio waves, which was developed at the University of Massachusetts. The new installation will be used to study interstellar molecules.