chemistry

DESALINATION

Purification with hydrocarbons

The large amounts of energy required to distill or freeze fresh water from sea water have been the major obstacle to abundant water from the sea, even when nuclear power is used. But Drs. Paul Barton and Merrell R. Fenske of Pennsylvania State University report progress along a new track—liquid extraction using hydrocarbons such as kerosene.

In their system, they mix brine and liquid hydrocarbons at 340 degrees C. and pressures of 2,600 pounds per square inch. A phase change in distillation requires 1,000 British Thermal Units. The equivalent stage in liquid extraction calls for 200 BTUs. The hydrocarbons extract water but not salts from the brine. The brine and water-hydrocarbon phases are then decanted after settling. On cooling, the hydrocarbons release the water from solution, which also settles out and can be decanted.

This water contains only traces of salt and hydrocarbon and is potable without further treatment. It can be purified further with activated charcoal filters.

COMPUTERS

To make a molecule

The deliberate synthesis of new complex organic compounds is a tremendously involved scientific achievement. Two chemists, Dr. E.J. Corey and Dr. W. Todd, Wipke of Harvard University, have now begun to do it by computer.

As with any such synthesis, the computer works backwards. First, the molecule needed for the chemical job planned is manually drawn with a special pen on an electrostatic tablet. An image then appears on a cathode ray tube connected to the computer.

The computer, which has an internal representation of the molecule in it, has been programmed with general rules governing chemical reactions. It then works backward in stepwise sequence to come up with a succession of sub-elements that could lead to the desired molecule.

In this way, the computer prints out a large number of pathways, not all of which are feasible; and the chemist must evaluate them and make the selection.

WATER POLLUTION

Retrieving the salts

The Solvay process produces 90 percent of the world's soda ash, which then goes into the making of glass, soap, paper and a host of other products. One of the by-products is water pollution.

The Office of Saline Water has proposed a way to eliminate the chief pollutants: salt and calcium chloride. The plan, according to director Dr. Chung-ming Wong, is to recover them before they reach the river or lake. This would be done by taking them out of solution; vertical tube evaporators would distill the salt water and water-attracting crystals would precipitate the calcium chloride. As a result fresh water would be produced. The salt can be reused in the Solvay process, and calcium chloride can be more readily disposed.

SOLID WASTES

A chemical lid

Fine-grained ore wastes called tailings pile up in huge heaps and create a pollution problem when blown by the wind. A cheap chemical method to hold the material together is reported by the U.S. Bureau of Mines.

Two chemicals are sprinkled on the waste pile and bind the grains to form a windproof crust. The two chemicals are DCA 70, which forms a rubbery polymer, and calcium lignosulfate. The agents penetrate as deep as two inches to form the crust. The DCA 70 works in the acidic part of the pile while the other works in the alkaline part. Total cost per acre: $335, including chemicals and sprinkling system.

The work was prompted by the radioactivity of a uranium waste pile near Tuba City, Ariz., a sparsely settled area in the north central part of the state. Not only did the pile's radioactivity exceed recommended safe levels but tailings carried by the wind raised radiation levels beyond the pile. The total area treated was 34.5 acres. Other chemicals, such as lime, pyrite and sodium silicate, had been tried unsuccessfully.

ISOTOPES

Out into the world

Earlier this year, the Atomic Energy Commission's Brookhaven National Laboratory in Upton, N.Y., announced development of a combination concrete-plastic construction material (SN: 3/1, p. 215). The stronger and more water resistant material was made by irradiation of the plastic when it was fluid inside the concrete's pores.

The new material is now ready to go into commercial production. It will be made by Radiation Technology, Inc., of Long Island City, N.Y., and marketed by Universal Building Products Co. of Washington, D.C., as wall block for high-rise apartment buildings. As an added touch, the blocks can be colored by the addition of dyes before irradiation.

The material, which is able to withstand three times the strain of ordinary concrete, owes its strength to the cross-linking of the molecular chains that make up the plastic. Cobalt 60 is the radiation source.

MINING

Golden fungus

Soviet scientists are considering mining gold with fungi. Researchers at the Irkutsk Institute of Rare Metals have found that some mold fungi extract gold from solution, becoming covered with the metal in the process.

One variety of extremely active fungus gleaned 98 percent of the gold that was in one solution in 15 to 20 hours. The Irkutsk team believes the method could be extended to mine gold from ore. Experiments have shown that the fungus can convert up to 30 percent of rock gold into solution. And their wages are low: The fungi thrive and proliferate on such simple fare as the waste products of the sugar refining industry.