chemistry

PESTICIDES

Arsenic defended

A number of scientists have been up in arms over the possible side effects—mainly soil poisoning—of arensic-containing compounds used in defoliation, weed eradication and as insecticides.

Dr. Edwin A. Woolson, a chemist at the U.S. Department of Agriculture, Beltsville, Md., assured a meeting of the American Society of Agronomy that "repeated applications of arsenical compounds present little or no danger to the growth of subsequently planted crops, provided the soils contain high levels of iron and aluminum." Most heavy soils do contain these elements.

Experiments conducted by Dr. Woolson and his coworkers Drs. Philip C. Kearney and John Axley of the University of Maryland show that inorganic arsenate became chemically fixed to soil particles containing these elements. This reduces or eliminates long-term toxicity to plants thus rendering them safe for human and animal consumption. A built-in safety factor is that the plant dies before the arsenic level gets high enough to endanger humans, he says.

METALLURGY

Feeding the electric furnace

The steel industry has estimated that the electric furnace could account for 17 percent of U.S. steel production by 1975. A development by Midland-Ross Corp. now pushes that figure to 20 percent or more, according to president Harry J. Bolwell.

The new technique allows conversion of iron ore into pellets of 95 percent iron. By feeding the pellets into an electric furnace, steel production can be upped by at least 35 percent. The conventional feed for the furnace is scrap.

The Cleveland-based company has a new plant near Portland, Ore., turning out the pellets. The process starts with an iron ore slurry, which is thickened by removing most of the water and sent to the oxide pellet building, where a balling drum forms pellets one-half to five-eighths of an inch in diameter and containing 69 percent iron. From there they go to the metallizing plant, where they are deoxidized to 95 percent iron.

DESALINATION

Back pressure treatment

In reverse osmosis, water of high salt concentration on one side of a porous semipermeable membrane of cellulose acetate is put under pressure, forcing essentially pure water through the membrane to the other side. Only one side of the membrane works, and if the nonworking side is tried no desalination occurs.

Dr. Srinivasa Sourirajan of the National Research Council of Canada has found that by subjecting the nonworking side to pressure from pure water, before using the membrance for desalting, he can enhance the flow from the working side.

There are different-sized holes in the membrane, says Dr. Sourirajan, and the combination of pressure and pure water increases the size of some of them, allowing greater flow. But only holes that are below the critical size needed to reject salt are opened by the treatment, so that the membrane's salt rejection capability is not reduced, he says.

OIL SPILLS

Before they start

The latest development in the war against oil spills is an inflatable bladder that collects the oil before it goes into the water. Now being tested by the U.S. Coast Guard, the rubber and nylon bladder when empty is about the size of a car. It is parachuted close to a tanker that is leaking oil and automatically inflates to a length of 140 feet.

A pump, flexible piping and other equipment are dropped along with the bladder. A helicopter loads the pump on the tanker, the piping is connected to the accordian-pleated bladder and the filling operation begins. The filled bladders are then towed away by the cutter.

The entire transfer and storage system is designed to handle 5.6 million gallons of oil in 24 hours in a 45-mile-an-hour wind and 8-to-12 foot seas.

FOOD TECHNOLOGY

Pilot plant for proteins

A pilot plant to convert cellulosic waste into protein (SN: 1/4, p. 14) is off the drawing board and in operation at Louisiana State University. The facility uses microorganisms to produce protein from bagasse, a sugarcane cellulose residue.

Project head Dr. Clayton Callihan, a chemical engineer, hopes to apply the process to urban solid waste, which is estimated to contain 50 to 60 percent cellulose. Items that could be converted to protein include newspapers, books, wood and rags.

From about 300 pounds of bagasse, the plant is now producing 40 to 50 pounds of protein a day at a cost of six or seven cents a pound. The hope is to make the final product competitive with its major rival, soybeans, the cost of which is in that range.

FUEL

More slush, less fuss

Liquid hydrogen is the mainstay of fuels for giant rockets. But because it is liquefied, it has certain disadvantages, such as low density requiring large fuel tanks, high volatility and evaporation rate, which mislead fuel gauge readers, and the propensity for sloshing around in tanks.

Dr. D.E. Daney of the National Bureau of Standards and Dr. A.S. Rapial of the International Atomic Agency have found a way to reduce these drawbacks by making a liquid pudding. They combined gelled hydrogen, a gelatinous material, with slush hydrogen, a partially solidified mixture of frozen hydrogen particles in liquid hydrogen.

The result is a viscous, semisolid, gelatinous material that flows but doesn't slosh, has a higher density and heat capacity and is less volatile.