chemistry

MATERIALS

Graphite fiber process

A team of Canadian scientists at the University of British Columbia, Vancouver, has made high-performance graphite fibers from pitch in the laboratory. At present, the fibers have a Young's modulus, a measure of elasticity, of 60 million to 70 million pounds per square inch and a tensile strength of 300,000 to 400,000 pounds per square inch, comparable to fibers produced by other processes.

Until now, scientists believed that high-performance graphite fibers could be made only from synthetic high polymers, such as rayon or polyacrylonitrile (SN: 6/21/69, p. 601). By making the fibers from pitch, which includes petroleum residues, asphalt and coal tar, the Canadians have shown that they can be made from low-cost materials.

MINING

Mercury through gold

Thanks to a process designed to recover gold from low grade ores, the U. S. Bureau of Mines has found a way to extract 90 to 98 percent of mercury from its low grade ores. Chemists at the bureau's metallurgy research center in Reno, Nev., found that electrolysis of the gold ore in brine also converted insoluble mercuric sulfide present into soluble mercuric chloride. This key step paved the way for mercury extraction from its own ores.

In the new process, the ore is put into a salt-water slurry and electrolyzed. The mercuric sulfide is converted to mercuric chloride, and iron or zinc is then added to precipitate out the mercury.

ATOMIC ENERGY

Run on isotopes

Australia is being hit by a radioisotope rush. The demands of hospitals for isotopes for diagnostic and other purposes has strained the capacity of Australia's radiochemical laboratories.

The new laboratories opened by the Australian Atomic Energy Commission in 1967 were supposed to satisfy Australian and Asian isotope demands for seven or eight years; they have already reached their limits and substantial enlargements are being planned. At present, 1,500 doses of diagnostic radiopharmaceuticals are being delivered. By 1972, the estimated weekly total will reach 2,700 doses and by 1975 the target is 3,300.

AIR POLLUTION

Putting clay in the car

Two Michigan State University scientists are looking into a new way to control nitrogen oxide emissions from automobiles. Drs. Max M. Mortland and Thomas J. Pinnavaia hope that a common clay impregnated with cobalt can be incorporated into a workable pollution control device. This hope is based on the fact that the clay absorbs large quantities of nitric oxide.

Specifically, it is the metal in the clay's lattice network of silicate sheets that reacts with the nitric oxide. The lattice-work comprises a large internal surface area; one pound of clay contains about 100 acres of surface area, thus making it an efficient vessel for the reaction.

FOOD

Protein from cottonseed

A process developed by the U. S. Department of Agriculture to make protein from the cotton plant (SN: 2/22/69, p. 189) will come to fruition with the construction of the first commercial plant by Plains Coop Oil Mill Co., Lubbock, Tex. The plant, expected to cost $600,000 to $700,000, will produce 25 tons of protein a day. Construction will start in four or five months, production within a year.

The major problem was getting rid of gossypol, a toxic pigment in cottonseed. The liquid cyclone process, which the plant will use, accomplishes this by suspending finely ground flakes of cottonseed in a hydrocarbon (hexane) solvent and then centrifuging so that the gossypol granules can be separated out and removed.

CHROMATOGRAPHY

Polymer separation principle

A principle of fluid mechanics has provided researchers at the National Bureau of Standards with a potential method for separating polymers of different sizes. If fluid is passed through a capillary tube, the velocity toward the middle of the tube will be greater than that toward the sides. Any polymer molecule placed in the tube will have an average velocity greater than that of the fluid since the radius of the molecule acts to prevent the molecule's center from getting close to the sides. The larger the molecule, then, the closer to the center it will be and, hence, the faster it will go.

Drs. E. A. DiMarzio and C. M. Guttman believe that a separation technique based on this principle, can be developed using flow alone to separate out distinct groups of different-sized molecules. They also believe that this principle forms the basis for gel permeation chromatography, a separation method in which larger molecules move faster than smaller ones through a thick gel.

PULSE RADIOLYSIS

Working in picoseconds

What is billed as the most powerful and versatile linear accelerator devoted to pulse radiolysis has been successfully operated at the Atomic Energy Commission's Argonne National Laboratory. Pulse radiolysis is a technique for studying intermediate chemical species that exist only for trillionths of a second.

The new 22-million-volt electron accelerator produces a pulse of energetic electrons lasting trillionths of a second. They bombard a reaction cell containing the substance to be studied. This produces unstable chemical species (free radicals, ions, excited molecules). The disappearance of these species in different chemical reactions can be followed by the change of light absorption in the cell, thus giving information about the nature and reactivity of the intermediate species.