chemistry

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PETROLEUM CHEMISTRY

One-step synthesis

Olefins are hydrocarbons deficient in hydrogens; ketones are important compounds which can be made from them by oxidation. But there has never been a one-step method for oxidizing a long-chain olefin to a ketone.

Chemists at the Chevron Research Co., Richmond, Calif., proposed a method. By using sulfur as the oxidizing agent, Drs. Shigeto Suzuki and Derek L. Ransley report they were able to convert linear and cyclic olefins to ketones in one step. The process, carried out in an excess of water to supply the oxygen, produced a very good yield of one pound of ketone for each pound of olefin.

ANALYTICAL CHEMISTRY

Cystic fibrosis detection

At present there is no efficient and reliable method to detect cystic fibrosis in newborn infants. Scientists at Texas A&M University and Baylor College of Medicine have developed a potential candidate. Using neutron activation analysis, a technique which detects trace elements by bombarding them with neutrons so they give off characteristic gamma rays, Drs. L. E. Fite of Texas A&M, G. M. Harrison of Baylor and their coworkers have found that copper and phosphorus in nail clippings may be valid indices of the disease. The copper content in the nails of children with the disease was about six times that in normal children's nails. For phosphorus, it was two to one.

MATERIALS

Making graphite fibers

New insight into the making of graphite fibers (SN: 6/21, p. 601) has been provided by Drs. R. D. Matkowsky and A. E. Standage of the University of Dayton Research Institute. Their microanalytical studies show that when polyacrylonitrile is first oxidized at 200 to 375 degrees C. (before its conversion to pure graphite), it contains about 53 percent carbon, 1.5 percent hydrogen, 20.9 percent nitrogen and 23 percent oxygen.

These results suggest that oxygen is incorporated into the fiber by intramolecular bonding between the head (front end) carbons of a single chain or double bonding between adjacent head carbons and oxygens.

LUNAR CHEMISTRY

Support for a theory

Evidence that the moon and earth were close neighbors during formation was presented by Dr. Edward Anders of the University of Chicago's Enrico Fermi Institute. Comparison of 15 rare elements in lunar material with their concentration in earth rocks shows the elements to be 10 to 100 times as rare on the moon.

These elements, such as bismuth, thallium and indium, are volatile, explains Dr. Anders, and could have condensed on dust particles during the late stages of planetary formation. The moon, because of its rotation around the earth, could have encountered the particles at a greater velocity and thus have been less efficient in sweeping them up, as the concentrations indicate.

WATER POLLUTION

Pesticide detection

Chemists at the Naval Applied Science Laboratory in New York have developed a method for detecting trace amounts of organophosphates in drinking water. These compounds can indicate the presence of toxic pesticides. The method consists of forming microscopic water droplets (aerosols) with ultrasonic energy and examining them with a hydrogen-flame emission detector. This is an instrument that identifies and measures elements by their light emission characteristics.

The method can detect up to 0.1 milligram of organophosphates per liter of water, or 20 parts per billion, says Dr. Joseph L. Kalinsky.

NUCLEAR CHEMISTRY

Mineral exploration

Experiments have demonstrated the feasibility of using californium 252 for undersea mineral exploration. The neutrons emitted by it are absorbed by elements in the seabed, and measurement of the returning gamma rays identifies them.

Two problems with this technique are that the high activity of the salt in the seawater tends to conceal less active elements, and much of the relatively low energy gamma rays are weakened by the water. A solution to the problem is capture gamma-ray analysis, reports Dr. Frank E. Senftle of the U.S. Geological Survey. It employs a lithium-doped germanium detector to measure the gamma rays immediately given off when a neutron is absorbed instead of the later gamma rays resulting from decay.

AIR POLLUTION

Sulfur dioxide control

A process for removing sulfur from stack gas has been developed at the Consolidation Coal Co. in Library, Pa., Dr. Paul M. Yavorsky reports. The key to the process is the conversion of sulfur dioxide to hydrogen sulfide, from which elemental sulfur is then easily recovered by conventional means.

To accomplish this, sulfur dioxide is first absorbed by a concentrated potassium formate solution at 200 degrees F. to produce potassium thiosulfate. The thiosulfate is reacted with additional potassium formate at 540 degrees F. to produce potassium hydrogen sulfide. Carbon dioxide and steam are then added to remove the potassium, leaving the hydrogen sulfide.