chemistry

Gathered at the national meeting of the American Chemical Society last week in Chicago

NUCLEAR CHEMISTRY

Fission induced by antiprotons

The fission of various atomic nuclei can be induced by bombarding them with energetic neutrons or protons. This is the way the chain reactions of bombs and nuclear reactors proceed: Fissions produce neutrons, which induce further fissions, and so on.

If the two kinds of nuclear particles can induce fissions, their antiparticles should be able to do likewise. But, according to Drs. Liaquat Husain, Sydney O. Thompson and Seymour Katcoff of Brookhaven National Laboratory, few investigations of fission induced by antiprotons have been carried out because the available beams have very low intensities and therefore a low probability of inducing enough fissions for a worthwhile study with reasonable experimental effort.

Nevertheless the three Brookhaven chemists used a beam of antiprotons of 1.7 billion-electron-volts energy from the Brookhaven alternating gradient synchrotron to study both the transformation of carbon 12 to carbon 11 and the fissions of uranium, gold and bismuth. In all cases the cross section, or probability that the reaction will occur, comes out higher for antiprotons than it does for protons of the same energy.

INDUSTRIAL CHEMISTRY

A better desalinating membrane

One of the ways to remove salt from water is reverse osmosis, passing the water through a filtering membrane that traps the salt. To be practical the membrane must both efficiently remove the salt and permit a reasonable flow of water.

Drs. H. K. Lonsdale, R. L. Riley and C. R. Lyons of Gulf General Atomic, Inc., in San Diego, Calif., have developed a membrane two millionths of an inch thick that will remove over 99.5 percent of the salt from seawater in a single pass.

The new film is made by casting a thin desalinating film onto a strong support film that contains a network of interconnected pores. Its developers say that it is both thinner and more impermeable to salt than other desalination films, yet its water flow compares to those of films now used commercially to desalt brackish water, which has less salt than seawater.

To make potable water from seawater with the new film will require two passes, however, since the salt content of potable water can be no more than 0.05 percent.

POLYMER CHEMISTRY

Attempt at an organic superconductor

All known superconductors, substances that pass electric current without resistance, possess that property only at very low temperatures. Above a critical temperature, which ranges from nearly absolute zero to slightly more than 20 degrees K. depending on the substance, superconductors become ordinary conductors or even nonconductors.

Yet the most popular theory of superconductivity predicts that a substance whose molecules had the proper structure would be superconducting at room temperature or higher (SN: 6/20, p. 602).

Dr. W. A. Little of Stanford University has evolved a theoretical model of an organic macromolecule that ought to be superconducting. So far no one has synthesized Dr. Little's molecule, but a group of chemists and physicists from North Carolina have made and tested a slightly different structure.

Drs. Raimond Liepins and C. Walker of Research Triangle Institute in Research Triangle Park, N.C., and Drs. Henry A. Fairbank, Peter Lawless and C. Moeller of Duke University synthesized polymers of substances called cyanine-, diazo- and merocyanine-substituted 1,2 dinitriles. All the resulting polymers were virtually nonconductors at room temperature. Tests at 4.2 degrees K. and 1.5 degrees K. also failed to show superconductivity.

BIOCHEMISTRY

Carbon 11 as a tracer

The radioactive isotope carbon 11 has obvious advantages as a biochemical tracer. It can be substituted for ordinary carbon in organic compounds. Its radiation can be detected outside the body and its location determined with high precision. It decays rapidly so that the patient gets a minimum dose of radiation.

The rapid decay poses a problem for researchers: whether carbon 11 can be incorporated rapidly enough into large enough amounts of organic compounds to make trace operations feasible.

Drs. Harry S. Winchell and J. F. Lamb of the University of California, M. B. Winstead of Bucknell University and W. G. Myers of Ohio State University report that they have succeeded in synthesizing appropriate quantities of carbon monoxide, carbon dioxide and hydrogen cyanide using carbon 11 made in a cyclotron.

Carbon monoxide combines with hemoglobin and can be used to study blood. Organic acids can be made from the carbon dioxide and amino acids and amines from the hydrogen cyanide, and all these can be traced through the body.

LUNAR CHEMISTRY

Little radiation damage

Because the moon has no atmosphere, scientists expected that rocks from its surface would show evidence of heavy damage by cosmic rays, which can strike the surface without inhibition. One form of such damage is the displacement of atoms in the rocks by the passage of particles of the radiation. The atoms remain out of place till the rock is heated to a certain temperature. Then they pop back into place and give off additional heat as they do. Dr. J. L. Kardos of Washington University in St. Louis says that studies of Apollo 11 samples reveal surprisingly little of this kind of damage.