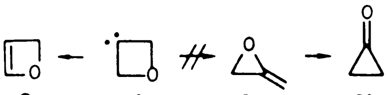
CHEMISTRY

Ode to oxetene

Philip C. Martino spent many an hour synthesizing a molecule with a lifetime of less than one second.



2 1 2a 2b

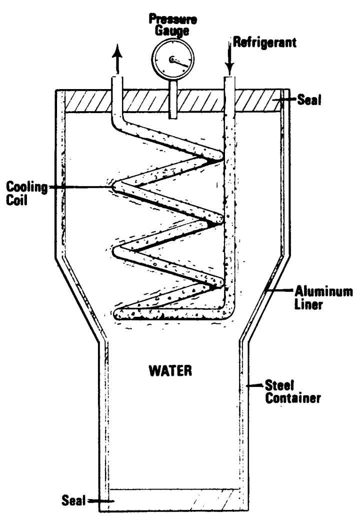
Martino and colleagues at Auburn University in Alabama generated that unstable, high-energy intermediate molecule (1) not to try to prolong its life, but rather to watch it go down "the path of least resistance," rearranging to a more stable form. According to MINDO/3, a computer program that can predict the outcome of unstable molecule metamorphosis, the easiest path for Martino's molecule involves collapse into a three-ringed structure (2a). But Martino's study—reported in the July 30 JOURNAL OF THE AMERICAN CHEMICAL SOCIETY—showed that the unstable intermediate rearranges exclusively to oxetene (2), a unique strained ring compound that never before has been synthesized. Chemists run such tests, comparing chemical reality with computer predictions, to help identify and correct the snags in computer chemistry—a valuable tool for synthesis.

A sandwich for the chemical epicure

Nature knows how to divide and conquer chemistry: Use cellular membranes. The cell is a highly efficient chemical reactor in which membranes act like one-way valves to divide chemical reactants from resulting products, conquering the problem of product purification. Now, John A. Quinn of the University of Pennsylvania and colleagues, taking their cue from nature, have developed a synthetic membrane reactor, consisting of sandwiched together selective and catalytic membranes. Chemical reactants on the outside of the "sandwich" diffuse through the selective membrane and pass to the inner catalytic membrane where reactions are facilitated. Resulting products can diffuse only through the catalytic membrane; they cannot fit through the selective membrane. Separation of product from reactants is therefore accomplished, minus the usual hassles associated with product purification.

Beside cool waters

That water is one of the very few substances whose solid form, ice, is less dense than the liquid form is nothing new to chemists; that this expansive property of freezing water may be exploited as a bonding technique is something new.



Thomas S. Prevender of Sandia National Laboratories in Albuquerque, N.M., recently patented a technique that bonds a thin aluminum liner inside a steel case by using expansion of freezing water to force the liner into intimate contact with the case. It involves cooling water against a loosely fitting aluminum liner. As some of the water freezes, pressure builds, sealing the aluminum firmly against the steel shell. The technique may be used to bind aluminum liners to steel or lead pipes that carry corrosive materials.

BIOMEDICINE

From sea to rocky coast to sty

Fish, sea lions, and pigs don't have a whole lot in common, but veterinary researchers believe they may have found a common thread—a virus that infects all three. It may be the first report of a terrestrial mammal virus with a saltwater fish as a source, they say.

In 1932, California pigs began developing a strange disease marked by blistered snouts and hooves. The condition put them off their feed and cut down on their reproductive capabilities. More seriously, because of its close resemblance to the highly infectious and fatal hoof-and-mouth disease, $30 million worth of pigs had to be killed.

Though its original source remained unknown, the disease-causing virus was traced to raw garbage and a law was passed requiring that garbage fed to pigs had to be cooked first.

In 1972, the viral agent was identified in California sea lions, and to some, the mystery looked solved. But Alvin Smith of the Oregon State University School of Veterinary Medicine found it hard to believe that pigs dined on sea lions often enough to cause so much infection. He continued to look for another source of the virus, and in the Aug. 22 SCIENCE he and his co-workers describe finding it in the opaleye, a fish that shares other pathogens with sea lions, lives in the same area as they do and whose remains may well end up in garbage.

Goodbye to snail fever?

A Johns Hopkins researcher says he will apply to the Food and Drug Administration in the next few months for a permit to begin testing a cure for schistosomiasis, or snail fever, a tropical disease carried by snail larvae that affects up to 300 million persons in parts of Asia, Africa, Brazil, the Caribbean, the Middle East and the Philippines.

The drug, amoscanate, was originally developed as a hookworm treatment. When Ernest Bueding, a biochemist and pharmacologist at Hopkins, tested it in animals, he found that intestinal bacteria were converting the drug to a substance that promotes cell mutations. Bueding thinks he's found an answer—the administration of the antibiotic erythromycin along with the amoscanate to kill the bacteria that would otherwise convert the drug to a mutagen.

Bueding says the Chinese report having used the drug without the erythromycin prophylactic on about 50,000 persons with 90 percent effectiveness. Bueding feels he can get better results.

The disease, though not often fatal, is debilitating. Snail larvae in contaminated water are absorbed through the skin and grow into worms that damage the liver, bladder and intestines, leading to such problems as loss of energy, chronic bladder and kidney infections and intestinal polyps.

Currently, there are several drugs available to treat schistosomiasis, but they require numerous treatments, produce toxic side effects, are not very effective and are expensive.

Pumping iron and lead

Absorption of high levels of iron in humans is mirrored by an increase in lead absorption, report three Scottish researchers in the Aug. 2 LANCET.

The researchers measured iron absorption in 10 volunteers, 5 of whom were found to overabsorb iron in compensation for a latent iron deficiency. When supplied with small amounts of radioactive lead, these 5 absorbed significantly greater amounts of lead than did the normal iron absorbers.

Using their study to extrapolate the effect of iron deficiency, they estimate that iron-deficient persons may absorb about 24 percent of dietary lead instead of the normal level of 10 percent.