CHEMISTRY

ACS Reports Marvels

Chemists tell of research that resulted in the "discovery" of fluorine during the war, the speeding up of penicillin production and the dehydration of garbage.

➤ A NEW CHEMICAL element, not one of the excessively rare fissionable metals of atomic bomb fame, but a light non-metal, as common as carbon, nitrogen or chlorine, has in effect been discovered during the war years and is the subject of a number of papers given at the meeting of the American Chemical Society in Chicago. The element is fluorine, actually known as a curiosity for nearly 200 years, but so corrosive, dangerous and difficult to handle that until now chemists have let it alone as much as possible.

Separation of the uranium isotopes was accomplished by using uranium fluoride, the only gaseous compound of that heavy metal. For its production, quantities of the element fluorine had to be made and stored ready for use. Since the only common use for fluorine up to that time, the etching of glass, depends upon fluorine's ability to eat glass and make it disappear in the form of a gas, the first problem was to find materials which would make satisfactory containers for this extremely active element.

Carbon Steel Containers

Chemists from university laboratories and industrial plants who took part in the cooperative researches which solved the most immediate problems on handling fluorine on a large scale reported to the American Chemical Society meeting that tanks and pipes of carbon steel were found practical, with electrodes of carbon to lead the electric current into the solution from which the fluorine is to be extracted and nickel electrodes at the poles where the corrosive gas is drawn off. The employment of modern automatic gas-handling machinery using high pressures and low temperatures, sometimes as low as that of liquid nitrogen, made possible the production of this new chemical. One of the subjects of research had to be methods for disposal of waste fluorine.

Out of the new interest in this active element have come new lubricants for airplanes and automobiles which are much less sensitive to temperature changes than the natural oils and greases formerly available. Many other new compounds are available whose properties will fit them for uses not satisfactorily filled by present-day materials. To the chemist, these offer an exciting field for new experiment, for they nearly double the already enormous array of compounds, both organic and inorganic, with which he works.

To the chemist, fluorine belongs to the family of halogens, or salt-formers. Other members of the family are chlorine, familiar as antiseptic and bleach; bromine, now mined from sea-water for use in making anti-knock compounds for gasoline; and iodine, heaviest and most metallic of the group, which is dissolved in alcohol to make the familiar antiseptic tincture. Besides etching glass, fluorine commonly appears as sodium fluoride, a household insecticide.

Penicillin Production

Penicillin production by molds can be speeded in essentially the same way shipbuilding by men was speeded during the war—the subassembly method. Subassembly in shipbuilding meant bringing to the shipyard a whole bow, a whole stern, a whole cabin, already put together elsewhere and letting the workers weld them into place. Subassembly in penicillin production means putting into the molds' culture solution chemical compounds containing groups of atoms already arranged in patterns known to exist in penicillin.

Success with this method was reported before the meeting of the American Chemical Society by Dr. F. G. Jarvis and Dr. M. J. Johnson of the University of Wisconsin. They were able to increase the production of penicillin G by adding phenylacetic acid, which contains a ring of atoms characteristic of this particular penicillin variety. For a different penicillin, designated as X, the best subassembly molecule was that of p-hydroxyphenylacetic acid.

Two other University of Wisconsin scientists, Dr. Kiyoshi Higuchi and Dr. W. H. Peterson, reported on a bacterial assay for the various kinds of penicillin. Three bacterial species respond differently to each of three different penicillins, so that their behavior in the presence of a mixture of penicillin "unknowns" gives an index to what is in it.

Coming Up: Dehydrated Garbage

Dehydrated foods we all heard plenty about during the war. New, however, is the idea of dehydrated garbage, presented before the chemists by Dr. W. A. Bush of the California Flaxseed Products Company of Los Angeles.

After the 82% or so of water is removed, the speaker stated, the remaining dry matter contains materials that can be used to advantage as fertilizers. And if the garbage can be collected in sufficiently fresh condition, as would be the case at hotels, hospitals, etc., it can be made to yield greases suitable for soap-making and other technical uses,

AAF photograph

MAN-MADE ANTENNA — The Army Air Forces uses radar antenna such as this to measure the height of thunderstorms. This antenna rocks back and forth, recording on a scope the echoes returned by the thunderstorm and giving valuable data on the storm's structure. Part of the equipment is being used in the joint AAF-Navy-Weather Bureau at Orlando, Fla.