PHYSICS

Source of Rare Hydrogen Isotope Made at Princeton

Entire Year's Work by Chemist Yields Ten Drops Of Fluid Rich in Tritium from 75 Tons of Water

BY "boiling down" seventy-five tons of water over a period of a year, ten drops of the precious liquid, richer in the rare "hydrogen three" isotope than any ever made before, has at last been obtained by the chemistry department of Princeton University.

According to Prof. Hugh S. Taylor, chairman of the department, who described the work before the Electrochemical Society, one part in ten thousand of the half gram is fluid in which the hydrogen is of mass three instead of mass one as in ordinary water.

In the drinking variety of water the rare isotope of hydrogen is present to the extent of only one part in ten thousand million (10,000,000,000).

Such extremely minute concentrations are comparable with those encountered by Madame Marie Curie and her husband in their original experiments on the extraction of the element radium from its ores. Radium ore which will yield one-half gram of radium for five tons of ore is considered remarkably rich. Radium ores producing a half gram of radium for 100 tons of ore are worked commercially.

Explaining the work on tritium, Prof. Taylor said:

"In addition to the hydrogen isotope deuterium of mass 2 discovered by Prof. Harold C. Urey of Columbia University, for which he received the Nobel Prize in 1934, it is now known that a third hydrogen of mass 3 also exists. This still heavier atom of hydrogen has been produced artificially in Cambridge, England, and in Palmer Physical Laboratory of Princeton University by nuclear disintegration processes.

"About a year ago by the use of the mass spectrograph designed by Dr. Walker Bleakney, Princeton physicist, it was shown that the 'heavy water' (deuterium oxide) contained small amounts of the third isotope, tritium, but in a concentration estimated at one part in 200,000 of the 'heavy water' examined.

"During the year the same process of concentration by electrolysis has been continued by Dr. P. W. Selwood of the Frick Laboratory. There now remains a residual ten drops (one-half cubic centimeter) from the electrolysis of 75 tons of ordinary water. The tritium concentration has steadily increased until it is now approximately one part of tritium for every 10,000 parts of deuterium water. The experiments show that in ordinary water this type of hydrogen is present to the extent of only one part in ten thousand million parts of water.

"Similar experiments to ascertain whether the electrolytic process concentrates the heavy oxygen of mass eighteen over that of normal oxygen of mass sixteen have shown that this method is much less efficient. A concentration of water by electrolysis from 120,000 volumes to one volume increased the heavy oxygen concentration merely from one part in 500 to one part in 450.

"While such changes in the ratio of the two species are sufficient for many scientific experiments, it will be necessary to utilize other methods of separation if it is desired to produce pure specimens of the two forms of oxygen similar to those already obtained with deuterium, the heavy hydrogen of mass 2."

Commenting upon the effect the knowledge that hydrogen of mass 3 could be produced by the electrolytic process would have upon scientists, Prof. Taylor predicted that it would intensify the interest in this field which was initiated by the discovery of "heavy water."

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ENGINEERING

Study Why Airplane Propellers Break in Air

NEW KNOWLEDGE of propeller vibration and the possible reasons why propellers break in midair is reported by Dr. Walter Ramberg, Paul S. Ballif and Mack J. West of the National Bureau of Standards. (*Journal of Research*, Feb.)

Such propeller failures, while rare compared with the number of propellers in service, usually have serious consequences. Often the flying broken parts rip through the wings of a plane, cause a wreck and sometimes loss of life.

Because it was almost hopeless to try to measure the size of propeller vibrations and the forces in blades while they were whirling rapidly, the government scientists produced a comparable effect by working backward.

Instead of the propeller receiving its vibrations during actual flight the experimental test was performed with a

LEARNING WHY PROPELLERS FAIL

Scientists of the National Bureau of Standards in Washington test airplane propellers to learn what causes the fairly rare, but usually fatal, propeller breaks in midair. Shown above is the testing room where with fixed blades scientists twist propeller shafts to produce vibrations like those experienced during actual flight. Points where greatest stresses were discovered proved to be the places where propellers broke when they were artificially fractured.