

physical sciences

CHEMISTRY

Cheaper route to oxygen 18

Up to the present the most used method of obtaining samples of the isotope oxygen 18 has been by the repeated fractional distillation of water to yield high concentrations of water with that isotope in it. But this is expensive owing to the high amount of energy necessary to evaporate water.

The French firm, Compagnie Francaise de Raffinage, proposes in British patent 1,127,648 a cheaper method. Atmospheric oxygen is passed into the cathode chamber of an electrolytic cell that has a solid electrolyte of zirconia doped with controlled quantities of other oxides.

At a temperature of 1,100 to 1,850 degrees F. some oxygen is ionized at the cathode and the relatively mobile oxygen 16 ions pass through the electrolyte at a faster rate than those of the heavier oxygen isotopes.

The mobilities of the ions are inversely proportional to the square roots of their respective masses. In the case of oxygen 16 and 18, they give a relative speed of migration through the electrolyte of 1.06:1.

In practice, a number of cells are arranged in series to give an effective separation and an external source of electricity can be done away with by making some of the cells into fuel cells supplied with a hydrocarbon fuel as well as the feed oxygen.

METEOROLOGY

A net loss

Arguments are now being made that cloud seeding technology is far enough advanced that the Federal Government should finance a widespread program of rainmaking to alleviate droughts.

To test the assumptions on which such arguments are based a statistical team from the University of California at Berkeley, Drs. Jerzy Neyman, Elizabeth Scott and Jerome A. Smith, analyzed the results of the Whitetop experiment, a five-year (1960-64) project for cloud seeding in southern Missouri.

They divided the area up to 180 miles from the center of the seeding into six concentric bands and counted the amount of rain that had fallen in each band on days when seeding was done and those when it was not. The result, they report in *SCIENCE* for March 28, is that the rainfall on seeding days over the whole 100,000-square-mile area surveyed averaged about 21 percent less than on nonseeding days. The rainfall loss ranged from 32 percent for areas less than 30 miles from the center of the experiment to 9 percent for areas between 120 and 150 miles from the center.

The data lead the authors to conclude: "When a five-year experiment, expected to produce a 5 to 10 percent increase, shows a 20 percent decrease in rainfall, the relevant technology does not appear reliable for practical use."

OCEANOGRAPHY

Pacific upwelling

Upwelling of deep ocean water at the equator in the Pacific was observed during five days spent last year

about 400 miles west of the Galapagos Islands.

Dr. James H. Jones of Scripps Institution of Oceanography bases his report, in the March 28 *SCIENCE*, on data taken during the Eastern Tropical Pacific Expedition 75. On two of the five days the expedition made detailed measurements of current speed and direction at 10-meter intervals to depths of 440 meters.

Below 20 meters the current direction, generally east or northeast, agrees with determinations of an Equatorial Undercurrent made in 1958 and 1961. Above 20 meters the older measurements showed a westward surface drift. In contrast to this, in the 1968 measurements, the drift continued to be eastward at the surface.

Dr. Jones concludes that the eastward drift at the surface in 1968 indicates that at that time the undercurrent was coming to the surface because the surface winds had fallen nearly to zero.

GEOPHYSICS

Sea floor spreading

In 1967 the research vessel *Chain* made several crossings of the Lesser Antilles arc, the line defined by the chain of islands southeast of Puerto Rico. Continuous seismic reflection, bathymetric, magnetic and gravity profiles were taken during the crossings.

Analysis of these data is now yielding results, and in a paper in the March 15 *JOURNAL OF GEOPHYSICAL RESEARCH* Drs. Richard L. Chase of the University of British Columbia and Elizabeth T. Bunce of Woods Hole Oceanographic Institution point out that data for two parts of the arc show evidence of sea floor spreading.

Their analysis concentrated on the southeastern end of the Puerto Rico trench and the northern end of the Barbados Ridge. They find that the strata forming the ocean floor dip westward under the flank of the Antilles arc. Evidence from reflection profiles is compatible with magnetic and seismological evidence, and goes to show that the sea floor is spreading west from the Mid-Atlantic Ridge and is being thrust westward underneath the Antilles.

The Barbados Ridge, they say, is a former continental rise that once overlay the oceanic crust along the northern margin of South America. Thrusting of the crust beneath the island arc and westward displacement of South America caused crumpling and accumulation of the continental rise material in its present position east of the islands.

EQUIPMENT

Australian telescope

The Australian Government has awarded the second major contract for the 150-inch telescope that is being built at the Siding Spring Observatory of the Australian National University as a joint project of the British and Canadian Governments (SN: 12/2/67, p. 540).

Malcolm Fraser, Australian minister for education and science, announced that the firm of Sir Howard Grubb Parsons and Co. in England will grind and polish all the optical components, including the main mirror, and construct the telescope tube. The contract is for about 1.4 million Australian dollars (U.S.\$1.5 million).