TECHNOLOGY

Device Rids Impurities

➤ ABSOLUTE PURITY, long believed impossible to attain, is now possible for industrial products such as naphthalene, the American Chemical Society meeting in Atlantic City, N.J., was told.

The technique has many of the desirable features of conventional purification procedures but is designed to avoid the disadvantages associated with each. In the new method a single stage of purification takes only about one-half hour and reduces the amount of impurity present to less than one one-thousandth of the starting concentration.

Dr. Charles P. Saylor of the National Bureau of Standards Institute for Materials Research, Washington, D. C., reported designing the machine that may revolutionize procedures in some commercial plants. The Government plans to patent the device and use it widely for evaluating production standards, but it is sure to have commercial applications not yet worked out.

The new machine continuously refines a substance by counter-current crystallization, and the procedure is called the "freezing stair-step method," Dr. Saylor explained.

Naphthalene or whatever substance is to be purified is fed into a hollow glass ring in the shape of a doughnut about four inches across. The ring rotates on a tilting axis, and the temperature at all parts of the apparatus can be closely controlled.

When the machine is properly adjusted for tilt, speed of rotation and temperature, the material in the hotter parts of the ring starts to melt, while that in the cooler part crystallizes in highly pure form. The liquid tends to wash down the impurities as the pure crystals are carried upward through a continuous melting and recrystallizing purification procedure.

Dr. Saylor said that the stair-step method has advantages over other leading methods of working toward absolute purity. One method reduces impurities to only about one-tenth for each "pass" but with the new machine the amount of impurity is reduced 1,000 to 10,000 times for each pass through the device, and it seems reasonable that an absolutely pure substance can be prepared.

Dr. Saylor is using a small model of the stair-step device that yields about 12 grams of ultrapure naphthalene or 1, 4 dichlorobenzene in about 12 hours. A 20-inch model is under construction, however.

"Growth of single crystals has always provided greater rectification per stage than any other purification method," the scientist said, "yet this procedure has several drawbacks." The operation is slow and the material is subject to contamination.

In the new method, crystals are grown on an internal surface that moves steadily in one direction toward a point where it melts. A part of the melting material joins the rejected impurities and flows in the opposite direction at the same rate as the crystalline materials advances. The solid is never entirely melted but grows on one edge while it melts on the other. Consequently its purity continually improves to the perfection point.

• Science News Letter, 88:228 October 9, 1965

SPACE

Shadows Aid Apollo Study

See Front Cover

➤ AN OLD SEARCHLIGHT reflector, an electronic computer and some shadows are helping in advance to keep the Apollo spacecraft from frying in the direct heat of the sun during its 1970 lunar flight.

Light bounced off the reflector shines on a scale model Apollo, where the shadow patterns created by protrusions such as antennas, rocket nozzles and landing legs are fed into a computer. The parabolic reflector and the model Apollo are pictured on this week's front cover.

The computer's job is to determine the amount of heat falling on different parts of Apollo as it changes position. Scientists will use the data to devise a control system that will keep the extreme temperatures (from more than 500 degrees F. down to minus 200 degrees F.) from frying or freezing critical parts.

Even between a sunlit area and an adjacent shadow, temperatures could vary as much as 200 degrees F., said Harold L. Finch, in charge of the project at Midwest Research Institute in Kansas City, Mo.

Extreme heat could damage the reliability of electronic instruments such as navigation and communications equipment, while intense cold might freeze, for example, the valves in the reaction control engines used for maneuvering.

Shadow patterns are being taken from every conceivable position of the spacecraft. When the experiment is over, the computer will contain more than a million pieces of data.

The next step will be to "fly" a simulted moon mission on the computer, to determine exactly how much time Apollo will spend in various positions relative to the sun.

Heat will not only come from the sun, however. The earth, the other planets, and even the airless moon all emit thermal radiation.

Among the possible control devices are electric heaters for cold areas, insulative coatings for hot ones, and even venetian blinds to vary the exposure for different spacecraft attitudes.

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Questions

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BIOCHEMISTRY—What effect does the presence of histone have on gene activity? p. 227.

BIOTECHNOLOGY—What is involved in the new technique which reduces the danger of over-exposure to radiation during examination? p. 226.

ICHTHYOLOGY—How are the four eyes of the fish *Bathylychnops exilis* positioned? p. 232.

INVENTION—How are radioactive stronium and cesium removed from milk according to a newly patented technique? p. 239.

PHYSIOLOGY—Why does dark hair seem to gray sooner than blond hair? p. 233.

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