PHYSICS

Weighing Spots Impurity

An electronic device speeds up the detection of impurities in metals from a matter of days by chemical methods to from five to 15 minutes.

➤ IMPURITIES in a metal, as little as one part in a million, are detected and weighed by an electronic device revealed by Westinghouse Research Laboratories. It does in from five to 15 minutes a job for which days are required by chemical methods.

The detector is an adaptation of what is known as a mass spectrometer, an electronic tube which sorts out materials in mixtures according to their atomic weight. William M. Hickam, Westinghouse physicist credited with its development, says it spots an impurity by weighing it. The telltale weight of its atoms gives it away.

A tiny but powerful furnace, an electron beam and a curved metal tube are the main elements of the device. In use, the instrument is set so that it records only the presence of an impurity with a specific atomic weight.

The furnace is used to vaporize a tiny sample of the metal of known weight. The atoms that boil off enter a cube-shaped enclosure where they are bombarded with electrons from the electron beam. This bombardment knocks off particles from the atoms and thus leaves them electrically charged. These are sent careening down the metal tube at a rate of a million feet a second. The tube is fixed between the poles of a powerful electromagnet.

As the atoms speed down the tube, the electromagnet "pulls" at them in such a way that only those having a certain mass, or weight, complete the path around the tube and pass through a tiny slit in a metal target at the end, Mr. Hickam explained.

The atoms passing through the slit are collected on a metal plate, where they give up their charges. The charges are amplified and counted by electric meters, which show how many atoms of a certain weight are present in the sample. The curvature of the tube is important. Atoms weighing less than those hitting the target are pulled to its inner lining before they can get around the bend, and heavier ones strike the outer wall of the tube as they try to make the curve.

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ELECTRONIC DETECTOR — Capable of ferreting out metal impurities weighing as little as one-tenth of a billionth of an ounce, the device is shown being prepared for action by William M. Hickam of the Westinghouse Research Laboratories, who is credited with its development.

CHEMISTRY

Synthetic Rubber Treads

➤ SYNTHETIC RUBBER for tire treads, soon to be available and claimed to increase wear more than 30% over the best natural rubber treads, will help make America independent of the natural imported product in case of another emergency. Synthetic rubber inner tubes, a wartime development, are now widely used and are generally acknowledged to be superior to the tubes of natural rubber.

These new treads have been announced by the United States Rubber Company. The key to their manufacture is the fact that they are produced at zero Fahrenheit temperature. Formerly Buna S (GR-S) rubber was made at a standard temperature of 122 degrees. Much research has been conducted in the United States to make the rubber at a lower temperature, in the conviction that a low-temperature product would be better.

The superiority of the new rubber is due to the fact that its molecules are more uniform than those in other rubbers, according to chemists of the University of Minnesota who developed a low-temperature process. The uniformity results from effecting the process of polymerization, a molecule changing action, at the lower temperatures, they said.

In making Buna S rubber, the standard ingredients are 70 parts butadiene, derived from either petroleum or alcohol, and 30 parts styrene, chiefly a coal derivative. When the mixture is put into a container, the top layer is made up of these two ingredients, while below is a layer of water containing a dissolved emulsifier such as soap and usually a dissolved catalyst, an activating chemical agent. In the Minnesota process an organic peroxide is used as a catalyst instead of the inorganic salts usually employed. When the mixture is stirred, polymerization takes place.

The quality of Buna S and similar rubbers seems to go up as the temperature of the mixture goes down, Prof. Carl Shipp Marvel, of the University of Illinois, recently explained. He described the so-called redox process in which the compounds are first emulsified with a soap, and the reaction started with a type of sugar. This method makes it possible to manufacture rubber at freezing or sub-freezing temperatures.

Details of the process used by the United States Rubber Company in making its zero-temperature product are not announced. The rubber in the treads, however, contains furnace black, a carbon black made from natural gas or petroleum products in a furnace. The rubber developments were carried out in a plant at Borger, Texas, which the company operates for the federal government.

Science News Letter, August 7, 1948

ZOOLOGY

Baby Box Turtles Are Little Stinkers

➤ BABY TURTLES temporarily playing the role of skunks are the phenomena reported by Wilfred T. Neill, biologist at Augusta Junior College, Augusta, Ga.

They are the young of the common box turtle, the kind that has a hinge across the middle of the lower plate of its armor. While they are very small—less than one and one-half inches in shell length—this hinge does not work; and it is during this stage of their growth that they give off a powerful stench when disturbed.

Comments Mr. Neill: "The odors of these and other reptiles are usually considered to serve some protective function. It would be interesting to know whether or not this is true, and if true, how the odor protects, and from what enemies. It seems unlikely that many predators would be discouraged by a mere stench, as such."

Mr. Neill reports his observation in the scientific journal, *Copeia* (June 30).

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