Beryllium, a Probable Aircraft Metal

Chemistry

New Method of Manufacture Among Reports to Chemists

TO TUNGSTEN, aluminum and the other metals formerly laboratory curiosities that have now come into wide commercial use may soon be added beryllium. Before long we may be riding in airplanes made of alloys with this metal as a main constituent, or wearing jewelry made of it alloyed with copper. At the meeting of the American Chemical Society in Cincinnati, Dr. Harold S. Booth, professor of chemistry at Western Reserve University, told how he and Miss Gilberta G. Torrey had discovered a new method for making this metal in the pure metallic form.

Berryllium, which is a chemical element like iron or copper, is the lightest metal that does not corrode when exposed to the air. Dr. Booth declared that he had a piece which remained bright after being exposed to the fumes of his laboratory for years.

Strong, Light, Non-Tarnishable

"Alloys of beryllium with aluminum have the strength of steel and the lightness of aluminum," he said. "They should be of value in aircraft and other places where light weight and strength are more important than low cost. Alloyed with copper, beryllium produces a beautiful bronze which can scarcely be told in appearance from gold. It is said to produce a non-tarnishable silver when alloyed with silver. There is immediate need for a thorough study of all the beryllium alloys."

Previously, he said, the metal had only been obtained in the form of impure flakes which could be melted into ingots only with great difficulty. Dr. Booth obtains the metal from the mineral beryl, which is chemically called beryllium aluminum silicate and contains about seven per cent. of beryllium. From this he obtains beryllium oxide, and this is soluble in liquid ammonia. From the ammonia solution of this, or from other water free salts of the metal, it can be deposited by means similar to those used in electroplating.

Dr. Booth stated that his discovery had come as the result of fifteen years of study and said that beryllium is the last important metal to be conquered in a commercial way, and so has been a real challenge to chemists.

High Pressure in Industry

At another session of the Society there was held a symposium on "Industrial High Pressure Reactions," where the chemists heard how chemical reactions under pressures of as much as seven tons to the square inch are the latest tools to be placed at their disposal. Such pressures are regularly employed in the manufacture of synthetic ammonia from air, and have made the United States declare its independence of the nitrate deposits of South America for raw materials for fertilizers.

More moderate pressures, only two or three tons to the square inch, have caused a revolutionary improvement in the preparation of petroleum and its derivatives. By enabling the raw materials to be used to the full limit of their value, the effect has been equivalent to an increase of nearly a third in the world's supply of petroleum.

The value of high pressure comes from the fact that it forces together the substances involved. Gases, for example, may become as dense as liquids and even the molecules and atoms themselves are compressed. Electrical resistance of some materials is altered, and even new forms of matter, about which little is yet known, have been developed. Under the magic touch of high pressure, with high temperatures to help, substances which will not ordinarily react with each other can be made to behave. The use of these methods has required the development of special alloys and metals to stand the strain, such as chromium nickel steels.

Pressure Produces Methanol

Dr. B. F. Dodge, of Yale University, told of the researches that he and his colleague, Dr. E. F. von Wettberg, have made on what is termed the "methanol equilibrium." He explained that methanol, commonly known as methyl, or wood alcohol, is made from carbon monoxide gas and hydrogen. The former gas which is the coal gas that sometimes causes death when it comes from defective stoves, consists of oxygen and carbon, while methanol consists of these two elements, and hydrogen as well. But even when mixed the gases do not combine at ordinary temperatures.

With the use of a catalyst, a chemical substance that hastens a chemical change without itself being altered, the two gases may be combined to form wood alcohol. But all known catalysts require temperatures of several hundred degrees to make them work, and at this temperature, as fast as the methanol is formed, it is decomposed back into its original constituents. Under a pressure of some three thousand pounds to the square inch, however, the decomposition of the methanol is greatly reduced, and the method becomes commercially practicable.

Methanol is important in its own right in many industries, and it is also of value as an intermediate product from which can be obtained the whole family of alcohols.

It is in the hydrogenation of petroleum to make gasoline that some of the most important applications of high pressures are found. Dr. R. T. Haslam reported on researches made by him and Dr. R. P. Russell for the Standard Oil Co. By the addition of hydrogen to fuel oil, such as petroleum, it can be converted to gasoline and other of the so-called higher hydrocarbons.

Lead and Arsenic Cause Baldness

The society heard that there is some hope for people afflicted with the variety of baldness known as alopecia areata. Speaking before the Division of Medicinal Chemistry, Dr. C. N. Myers, of the New York Skin and Cancer Hospital, told of the work he has performed in collaboration with Drs. Binford Throne and Herman Feit.

Dr. Myers defined the disorder as "characterized by sharply circumscribed areas of total baldness and disappearance of the hairs from these areas. The falling out of the hair sometimes is gradual, lasting over several days, but sometimes the spots appear within apparently a very few hours. Occasionally marked shock has been (*Turn to page* 206)

New Measures May Reveal Bigger Stars

Astronomy

AFTER eight years of preparation, the fifty-foot interferometer at the Mt. Wilson Observatory in California has been completed. Francis G. Pease, who used the smaller one, twenty feet in length, designed the new instrument and supervised its construction. The smaller one was attached to the 100-inch reflecting telescope at the observatory, and with it the first star diameters were measured, using a principle worked out originally by Prof. A. A. Michelson, University of Chicago physicist.

Antares, the bright red star in Scorpio, the scorpion, was found to have a diameter of 390,000,000 miles, and is the largest yet measured. The new instrument can be used for a number of stars beyond the reach of the old instrument, and it is possible that even larger stars may now be found.

Mr. Pease is shown in our cover illustration as he was recently making final adjustments to the instrument. To his right appears one of the flat mirrors, set at an angle of 45 degrees, which slides along the track. A similar mirror slides along another track that was beside the photographer. These mirrors reflect the light from the star to two other mirrors in the center, thence it is reflected to a 36-inch concave mirror below, which brings the light to a focus.

Under proper conditions, when looking through the eyepiece, the image shows a series of light and dark bands, called "interference fringes." If the star is sufficiently large, these can be made to disappear by moving the outer mirrors, and from their distance when this happens the star's diameter can be computed. All the motions of the instrument are done by electric motors, controlled from the switchboard seen below the flat mirror.

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Chemical Meeting—*Continued*

associated with the production of these bald spots." In some cases, he explained, the patient becomes completely bald, not only on the head, but on all parts of the body.

Dr. Myers announced that they had found the cause to be a retention in the body of arsenic and lead. These metals get into the body, he declared as a result of their use as sprays for fruit and vegetables, from drinking or using water that is supplied through lead pipes, or from the exhaust of automobiles using gasoline containing lead compounds as an anti-knock. Dr. Thomas Midgley, chemist with the General Motors Corp., however, questioned this latter statement, and said that the only hazard in connection with the use of tetraetnyl lead in ethyl gas is among the men who manufacture it, and that its use does not appreciably increase the amount of lead in the city air.

Improving on Castor Oil

Dr. E. Emmet Reid, of Johns Hopkins University, told of a study that he and Dr. Warren M. Cox, Jr., have made of the Japanese "castor oil fish." This fish, zoologically known as Ruvettus pretiosus, is caught at a depth of a half mile. Drinking an oil extracted from it, or even eating its flesh or chewing on its bones, produces a physiological effect similar to, but even more prompt than, that produced by castor oil. The analysis has shown it to consist of fatty acids, chiefly oleic acid, and higher alcohols.

Helping Conquer Tuberculosis

Another paper presented before the medicinal chemists was seen as a further step toward the eventual conquest of tuberculosis. Dr. R. J. Anderson, of Yale University, told of the work of himself and Dr. E. Gilman Roberts in analyzing the tuberculosis bacillus chemically. Several years ago they found that a compound could be extracted from the dead "bugs" that could produce all the symptoms of tuberculosis when injected into the body, and that this contained a very peculiar sugar, the first poisonous sugar to be discovered. Now they have found another new carbohydrate, which they call maninositose. It is what is called a polysaccharide and is said to be the first compound of this kind ever to be found in nature.

"Its discovery will open a new chapter in the study of cell metabolism," Dr. Anderson declared.

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Photo on Copper

PRINTING a photograph on copper from a negative almost as easily as printing it on ordinary photographic paper can be accomplished by a method described in a report to *Nature* by C. J. Smithells, of the General Electric Company's British research laboratory at Wembley. It depends on the fact that cuprous chloride, or chloride of copper, is sensitive to light.

"The process affords a simple and rapid method of obtaining a sharp photographic image on the surface of plates of copper and copper alloys, including white alloys like German silver," states Mr. Smithells.

He gives the following directions:

"The copper or brass surface is polished and cleaned as for engraving, and dipped for ten seconds into a ten per cent. solution of cupric chloride or copper ammonium chloride. A very thin white film, which X-ray examination shows to be cuprous chloride, forms on the surface of the plate. The plate is washed in running water, rinsed in methylated spirit, and dried in the air. The methylated spirit not only accelerates drying, but also makes the film much more adherent, and the wet plate can be wiped with a cloth without the film being destroyed.

"The plate is now light sensitive. On exposure for a few seconds to the direct light from an arc lamp the surface turns black, owing to the conversion of cuprous chloride into cuprous oxide. For contact prints from ordinary negatives an exposure of about one minute to the light of an arc lamp is required. The image (positive) so obtained is about equal in definition and contrast to that obtained in the ordinary three-color and photogravure processes. The image can be 'fixed' by washing in dilute hypo or salt solution, but since this also reduces the intensity of the image the plate should be over-exposed during printing. For many purposes, such as engraving, fogging by diffuse daylight is so slow that fixing is unnecessary."

Photography

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