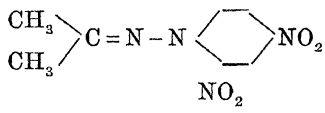
SCIENTIFIC APPARATUS AND LABORATORY METHODS

A NEW METHOD OF DETECTING AND ESTIMATING SMALL AMOUNTS OF ACETONE

AT the recent meeting of the "Medizinischnaturwissenschaftliche Gesellschaft," of the University of Tübingen, Professor Carl Bülow described a new method of detecting and estimating quantitatively small amounts of acetone in urine. The method is based upon the earlier observations of Purgotti[1] and Theodor Curtius,[2] that in boiling alcoholic solutions certain aldehydes and ketones form condensation products with 2.4 dinitro-phenyl-hydrazine. The new product thus obtained with acetone, namely, acetone 2.4 dinitro-phenyl-hydrazon, is quite insoluble in cold water. Its formula is



and its mol. wt. 238.

In the course of a series of researches on monochloracetone and other substituted ketones, Professor Bülow found that the reaction between acetone and dinitro-phenyl-hydrazine goes to completion, even in the cold, in a ten per cent. aqueous solution of muriatic acid. A yellowish, milky precipitate is formed which rapidly changes to fine needle-like crystals, that can readily be filtered off, washed, dried and weighed. These needles are insoluble in hot water as well as in fifty per cent. alcohol. They are consequently washed with hot water, then with alcohol, and finally dried and weighed. 238 grams of the product correspond to 58 grams of acetone.

Bülow's new "acetone reagent" is prepared by dissolving 0.33 grams of 2.4 dinitro-phenyl-hydrazine in 250 cc. alcohol, adding 10 cc. of 10 per cent. hydrochloric acid and heating till the product has completely dissolved.

The test is made by acidifying 10 cc. of urine with 1 cc. of hydrochloric acid, and then adding the "acetone reagent" in sufficient quantity. If the urine contains more than 0.5 per cent. of acetone, a yellowish, milky precipitate forms in a few seconds. By this very simple means every physician can in a short time determine with certainty whether acetone is present or not. Bülow, who is preparing a paper describing the test in greater detail, claims that 0.03 per cent. of acetone may still be estimated quantitatively by this method. It is at his request that I am presenting this report to the readers of SCIENCE at this time.

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1 *Gazetta Chimica Italiana*, 1893.

2 *Jour. prakt. Chem.*, 50, 257.

SPECIAL ARTICLES

MERCURY AND IONIZED HELIUM

Two investigators have recently made preliminary reports that under certain conditions of electrical discharge gaseous helium becomes capable of entering into chemical combination. According to J. J. Manley,[1] mercury and helium, in the presence of electric glow discharge, combine with contraction of volume to form a stable gaseous mercury helide which must be raised to a bright red heat in order to decompose it and to restore the original volume. On the other hand, E. H. Boomer,[2] while finding evidence that helium under electronic bombardment forms solid compounds with mercury, iodine, sulphur and phosphorus, which are stable at low temperature, reports that on allowing the temperature to rise from that of liquid air, the helides of sulphur and phosphorus decompose sharply at $-125°$ C., and those of iodine and mercury at $-70°$ C.

Since in both cases the activation of helium was supposed to take place under conditions where its ionization might be expected, it was interesting to see if combination could be detected with another mode of ionization. We have been engaged in the study of various chemical reactions under the ionizing influence of radon, and therefore were led to carry out the following experiment.

An elongated spherical glass bulb of 5.5 cm^3 volume was carefully evacuated at elevated temperature to 0.0001 mm pressure by means of a mercury vapor pump. Then 191 milli-curies of radon were introduced, at an initial pressure of 0.2 mm which did not change by more than 0.1 mm over a period of 5 hours, as determined by means of a mercury manometer separated from the reaction chamber by a fine capillary to avoid contact with mercury. Having thus established that no gas was evolved from the walls under the alpha-ray bombardment, mercury was run into the vessel up to a mark, so as to occupy approximately one fourth of its volume and to present a surface of about 3 cm^2. Over a period of 22 hours the pressure remained constant within 0.1 mm of mercury, establishing a blank for the vessel containing radon in contact with mercury. The mercury was then withdrawn and 614.1 mm of helium were introduced, which had been purified by passing repeatedly through active charcoal at liquid air temperature, until the nitrogen bands had entirely disappeared. Action of radon on this helium produced no change in pressure of as much as 0.1 mm in 22 hours.

Mercury was then again introduced to the previous

1 *Nature*, 114, 861 (December 13, 1924).

2 *Nature*, 115, 16 (January 3, 1925).