the chloroplasts may be due to nucleic acids. The grana of the stroma in Fig. 11 were stained by methylene blue. In other preparations, the grana seemed also to be stained by pyronine. This would indicate that the ribonucleic acid of the chromoplasts of carrots is located in the grana.

The author previously compared the carotene bodies of carrots with the inclusion bodies of virus-infected cells (*8, 12*). The present study further corroborates the possibility of this relationship. If our interpretation of the structure of the chromoplasts is right, the grana of the plastids can be compared to the chromomeres of chromosomes and to the chromidia which, according to Monné (*13*), form basic units of cytoplasmic fibrils.

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The Preparation of High-Purity Hydrogen Deuteride

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In connection with a project at the National Bureau of Standards on the precise measurement of properties of H_2, HD, and D_2 at various pressures, it was found necessary to prepare about 10 l of high-purity hydrogen deuteride. The reported purity (99%) of even the best preparation described in the literature (*1*) was deemed inadequate for the purpose, particularly since one series of experiments involved the measurement of the vapor pressures of binary mixtures of the isotopes; very high purity was needed in order to avoid the complication of having to deal with ternary mixtures. Accordingly, it was necessary to further purify the "crude" hydrogen deuteride as prepared.

A number of methods have been reported for preparing high-concentration hydrogen deuteride, all involving the decomposition of a deuteride or hydride with water or deuterium oxide, respectively. Thus, Beutler, Brauer, and Jünger (*2*) decomposed lithium hydride with deuterium oxide *in vacuo* and obtained a gas mixture rich in hydrogen deuteride, as determined by absorption spectrum measurements. Norton (*3*) prepared B_2D_6 from B_2H_6 and deuterium and decomposed the deuteride so obtained with water in sulfuric acid. This yielded a mixture containing 85% hydrogen deuteride. Wender and co-workers (*1*) decomposed lithium aluminum hydride with deuterium oxide at 0° C, yielding a product containing 99% hydrogen deuteride.

For this work, the last method discussed above was chosen, because of the ease of operation and the yields obtainable. The product of this reaction was then fractionated at liquid hydrogen temperature. The latter operation was conducted substantially by the technique used by Scott and Brickwedde in their separation of hydrogen deuteride from equilibrium mixtures of hydrogen, hydrogen deuteride, and deuterium (*4, 5*). A similar technique has recently been described by Clusius and Starke (*6*).

The crude hydrogen deuteride was prepared in an apparatus comprising a 250-ml, 2-necked (Claisen) flask connected by a ground-glass joint to a reflux condenser, which was in turn connected through cold traps to a diffusion pump and a bulb for collecting gas. Suitably placed stopcocks permitted evacuation or admission of air, or nitrogen, to any part of the system. Stirring was effected by means of a magnetic stirrer, thereby avoiding the possibility of leaks through a packing gland. Deuterium oxide was admitted to the apparatus by inserting a hypodermic syringe through a rubber septum attached to the free opening of the Claisen flask.

With this apparatus, the operative technique was as follows: About 150–170 ml of refractionated *n*-butyl ether was distilled from sodium into the Claisen flask. The theoretical quantity of lithium aluminum hydride required to make the desired amount of hydrogen deuteride was calculated from the equation for the hydrolysis (*7*):

$$LiAlH_4 + 4D_2O \longrightarrow LiOD + Al(OD)_3 + 4HD.$$

A 30–40% excess was used. The septum was fitted to the flask, the latter was attached to the reflux condenser, and the contents were frozen by means of liquid nitrogen. The system was then evacuated, and the reaction mixture heated to reflux under its own vapor pressure for about 1.5 hr. After this time, the mixture was again frozen, the system again evacuated, and the deuterium oxide added through the rubber septum, in 3 portions. In order to keep the reaction going at a reasonably fast rate, it was found necessary to use about 150% excess of deuterium oxide over that calculated from the above equation. The temperature of the reaction mixture was controlled by means of a liquid nitrogen bath. The bath was applied intermittently, the time of application being determined by the melting of the frost on the outside of the Claisen flask. In this manner, the temperature was held at about 0° or lower throughout the course of the reaction.

By this technique, 15 l of hydrogen deuteride was pre-

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pared, in 2 runs of 5 l and 10 l. The purity, as determined by mass spectrographic analyses, was 98.1% and 97.0%, respectively.

Thirteen liters of this material was fractionated at liquid hydrogen temperature in 3 batches. The still was that employed by Scott and Brickwedde in their earlier work (Fig. 1). It consisted of a boiler of about 5 ml capacity, a monel helix rectifying section, and a cold-finger type dephlegmating condenser. The boiler and rectifying section were vacuum-jacketed; heat was provided by a constantan heater in the boiler, the leads for which emerged through the top of the still through a wax seal. The entire still was immersed in liquid hydrogen, thereby maintaining a constant temperature throughout the distillation. The progress of the distillation was followed by means of a manometer which registered the pressure of the vapor in equilibrium with the boiling charge at liquid hydrogen temperature. The points at which fractions should be cut were thereby indicated.

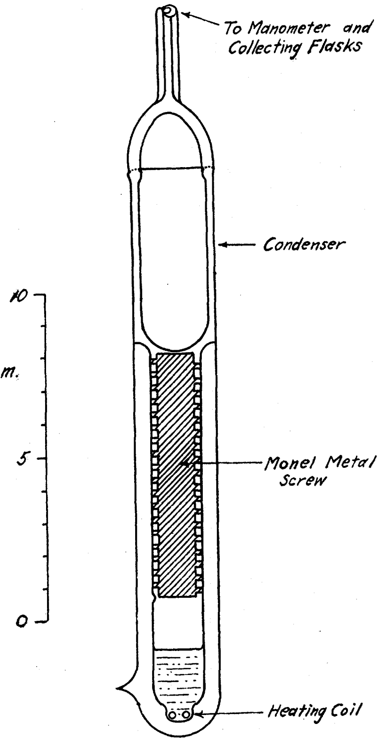

FIG. 1.

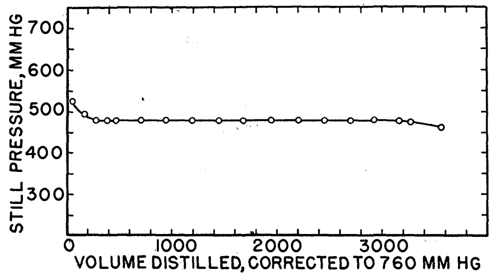

FIG. 2.

This is shown on the accompanying curve (Fig. 2) for the distillation of a charge of about 4,500 ml of crude hydrogen deuteride.

Employing a boil-up rate of 11 ml of liquid per hr and a reflux ratio of the order of 15: 1, there was obtained 10 l of hydrogen deuteride of 99.8% purity in terms of hydrogen isotopes. Because of the difficulties inherent in the mass spectrographic method for measuring trace impurities in hydrogen isotope samples, it is believed that the purity may be even higher. This degree of purity, obtained by means of one distillation of the crude, compares very favorably with that previously obtained from the equilibrium mixture by Scott and Brickwedde in two distillations. This is undoubtedly due to the fact that the starting material used by them was much poorer in hydrogen deuteride than that used in this work.

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The Effect of 2,4-D on Potassium Nitrate Levels in Leaves of Sugar Beets[1]

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As early as 1946 research workers in the U. S. Department of Agriculture showed that 2,4-D in pure form at relatively high levels was not toxic to cattle. They concluded that the amount of 2,4-D that might be consumed by cows or sheep in grazing pastures sprayed with this material to kill weeds would not be injurious (*1*). Extensive grazing trials undertaken at the Michigan Agricultural Experiment Station in 1949 substantiated these earlier observations (*2*), and indicated that cattle grazed 2,4-D-sprayed and unsprayed areas indiscriminately. It has been commonly observed that weeds such as pigweed (*Amaranthus* spp.), ragweed (*Ambrosia* spp.), and even such plants as Jimson weed (*Datura stramonium*), which under normal conditions are not grazed by cattle, are eaten with relish after they have been treated with 2,4-D. A number of cases have been reported of cattle becoming ill, or dying, after eating

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