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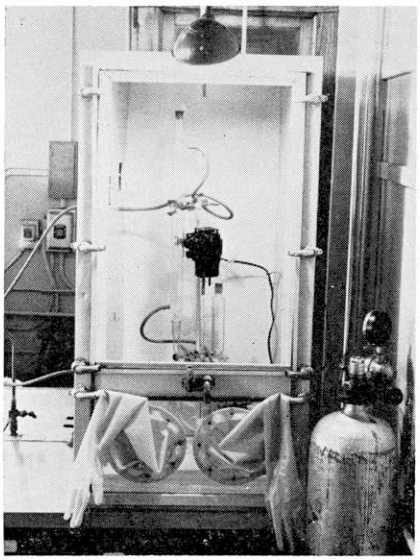
An Inexpensive Dry Box

In working with easily-hydrolyzed materials such as titanium tetrachloride and halides of hafnium and zirconium, it is necessary to exclude all traces of moisture in order to prevent hydrolysis. The high cost of "isolabs" or commercial dry boxes restricts their use in smaller institutions. An exhaustive literature search describes Tyree's[1] box at a cost of $616 in 1954 and Johnson's[2] box probably costing considerably more in 1957. Since our box was found suitable for working with easily-hydrolyzed materials, and its total cost was only $31 (1959), we



should like to describe it here in the hope that it will be of use to undergraduate and graduate students at institutions that have limited funds for research (see figure).

A discarded soda-pop cooler was used for the main construction of the dry box. Discarded refrigerators, iceboxes, or freezers can be utilized similarly. The cooler was already watertight, and little difficulty was encountered in making it airtight. The opening at the front of the cooler was divided into two sections, one being larger than the other. Neoprene weather stripping was cemented to the face openings of the box, and a safety glass pane was firmly held against the stripping of the upper, larger section by means of screen door clamps.

A removable Plexiglas pane was used to cover the lower front opening. Shoulder-length Neoprene gloves, readily obtainable from most scientific supply houses, were sealed to the Plexiglas pane by means of bolts and a Plexiglas gasket, as shown in the figure. The box is entered into directly from the laboratory atmosphere. However, the box could easily be modified to contain an entering chamber.

The inside walls were covered with plyboard to allow for the supporting of stands, racks, etc. The inside was also painted white to aid in good lighting which was provided from an ordinary desk lamp. Epoxy resin paint was used in order to prevent the carbohydrate constituents in the wood from dehydrating. Threaded holes were drilled through the sides, and water, electrical, and gas inlets were screwed in place. The gas inlet, used in our experiments for nitrogen, was fitted with a perforated glass tube which helped to better distribute the gas evenly in the box. The tank nitrogen was dried before entering the inlet by bubbling it through concentrated sulfuric acid and then through a 40-cm tube containing anhydrous magnesium perchlorate.[3]

A $^1/_2$-in. outlet tube was provided in the top of the box which connected to an outside 40-cm column containing anhydrous magnesium perchlorate and anhydrous calcium sulfate. The ends of this tube and the drying tube leading from the nitrogen tank were fitted with stopcocks to preserve the drying agents when the box was not being used.

When an open bottle of titanium tetrachloride was exposed in the dry box for six hours, no titanium dioxide was detected on the mouth of the bottle.

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[1] TYREE, S. Y. JR., J. CHEM. EDUC., **31,** 603 (1954).
[2] JOHNSON, R. E., J. CHEM. EDUC., **34,** 80 (1957).
[3] MORTON, A. A., "Laboratory Technique in Organic Chemisrty," McGraw-Hill Book Co., New York, **1938,** p. 3.