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Note

A Modified Synthesis of Methyl-d_3 Bromide

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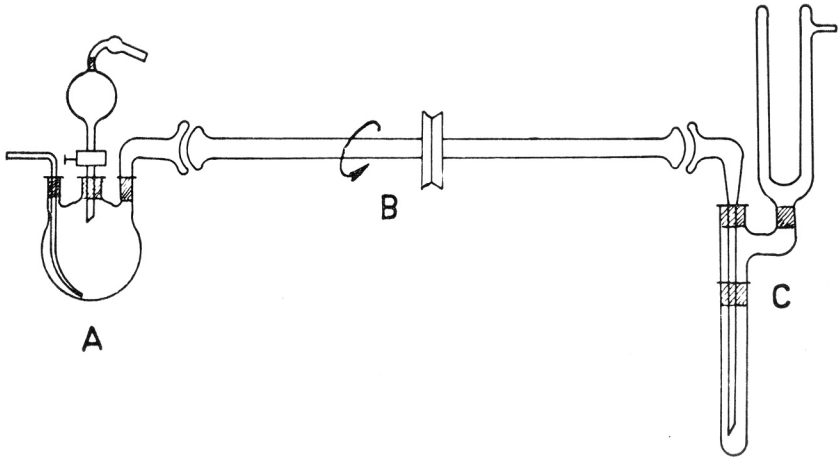
In the course of our work on secondary hydrogen isotope effects considerable quantities of methyl-d_3 bromide were needed. However, the published methods for the synthesis of methyl-d_3 halides were either small scale preparations or exchange reactions requiring substantial amounts of deuterium oxide[1,2].

The synthesis of methyl-d_3 bromide is a four-step process. Briefly outlined the procedure is: (a) reaction of carbon suboxide with deuterium oxide to give malonic-d_2 acid-d_2; (b) decarboxylation to acetic-d_3 acid-d; (c) preparation of the silver salt; and (d) conversion of silver acetate-d_3 to methyl-d_3 bromide by a modification of the Hunsdiecker reaction. When the reaction is carried out on a 0.25 mole scale the yield of methyl-d_3 bromide is 60% based on deuterium oxide.

EXPERIMENTAL

Malonic-d_2 acid-d_2 was prepared from carbon suboxide (0.1 mole) and the theoretical amount of heavy water[3] in the closed vessel of a Parr low pressure hydrogenation apparatus. The product of five consecutive runs was isolated in a nearly quantitative yield.

Acetic-d_3 acid-d obtained by decarboxylation of deuterated malonic acid[3] in 90 per cent yield contained at least 3.8 atoms of deuterium per molecule. The acid was converted into silver acetate-d_3 according to the published procedure[4].



Methyl-d_3 *Bromide*

The apparatus used for the synthesis is presented in Fig. 1. *A* is a 250 ml. three-necked Pyrex flask equipped with a dropping funnel, a gas inlet tube and an adapter with a sealed-on female 35/20 spherical joint. *B* is the reaction tube 750 × 30 mm. i.d. which has on both ends male 35/20 spherical joints and in the centre a wooden pulley. The tube is connected to receiver *C* provided with a dry-ice cooled reflux condenser.

An intimate mixture of dry silver acetate-d_3 (42.5 g., 0.25 mol.), Hyflo Supercel (15 g., analytical grade, Light & Co. Ltd., dried at 100°), and about 150 g. of coarsely ground glass was placed into the reaction tube *B*. Flask *A* was heated with a Glas Col mantle to about 80° and a slow stream of dry nitrogen was passed through the apparatus. Dry bromine (40 g.) was added from the dropping funnel while tube *B* was slowly rotated by means of an electric motor. The spherical joints were lubricated with Dow Corning 200 silicone fluid. The progress of the reaction, which starts immediately, was easily followed by the change of color of silver acetate and the evolution of heat. Methyl-d_3 bromide was condensed in trap *C* cooled with a dry-ice bath. The reaction was completed in about 5 hours and the crude product, which usually contains some dissolved bromine, was purified by distillation over copper turnings. The yield was 18 g. (74%) and the compound contained at least 2.8 atoms of deuterium per molecule.

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IZVOD

Modificirana sinteza metil-d_3 bromida

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Opisana je metoda i aparatura za preparaciju većih količina metil-d_3 bromida Hunsdieckerovom reakcijom bez upotrebe otapala.

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