5.30μ (bridge) as well as the bands commonly associated with the triphenylmethyl phosphonium ion. Acidification of III with dilute hydrochloric acid produced immediate decolorization and decaborane was recovered in 50% yield. Air oxidation and hydrolysis of III was not apparent after three months at ambient temperature.

It appears that this material is the triphenylmethylphosphonium salt of decaborane and is the first such material to be isolated as a pure stable

$$(C_6H_5)_3P^+CH_2^- + B_{10}H_{14} \longrightarrow (C_6H_5)_3P^+CH_3B_{10}H_{13}^-$$

substance.

The reactions of other phosphine methylenes with decaborane are under investigation.

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RECEIVED MAY 23, 1958

ISOLATION OF GUANOSINE DIPHOSPHATE FUCOSE FROM AEROBACTER AEROGENES

Sir:

We wish to report the isolation of a new sugar nucleotide, guanosine diphosphate fucose, from a strain of Aerobacter aerogenes[1] that produces a polysaccharide containing L-fucose.[2]

The nucleotides from 150 g. wet weight of bacteria were extracted with boiling 70% ethanol, precipitated with mercuric ion, and chromatographed on a Dowex 1-Cl^- column.[3] Elution with 0.01 *N* HCl and increasing concentrations of NaCl yielded an ultraviolet absorbing peak which was determined to be 75% uridine diphosphate glucose and uridine diphosphate galactose by enzymatic analysis.[4] This peak contained a total of 10 μM. of nucleotides calculated as uridine from spectral data. A minor component of this fraction amounting to 10% of its optical density at 260 mμ could be isolated by paper electrophoresis or paper chromatography. The ultraviolet absorption spectrum of this component was typical of a guanosine derivative. Its mobility during electrophoresis in sodium formate buffer, *p*H 3.5, was less than guanosine diphosphate, but greater than guanosine monophosphate while it had a higher R_f than guanosine monophosphate when chromatographed with ethanol-neutral ammonium acetate solution.[5]

The isolated component was analyzed colorimetrically[6] and found to contain approximately 0.8 μM. of 6-deoxyhexose per μM. guanosine. The absorption peak at 400 mμ given by the guanosine derivative in this test was identical in shape with that given by authentic fucose and also disappeared at the same rate upon dilution with water.[7]

Hydrolysis of the guanosine derivative in 0.01 *N* HCl at 100° for 10 minutes liberated a compound having an R_f identical with that of fucose when chromatographed with butanol–acetic acid–water,[8] phenol–water,[8] or pyridine–ethyl acetate–water.[9] In addition, an ultraviolet absorbing compound was formed which exhibited the same chromatographic and spectral properties as guanosine diphosphate. Longer hydrolysis led to the formation of a second ultraviolet absorbing compound which exhibited the same properties as guanosine monophosphate.

In view of the well-established role of the uridine sugar nucleotides as glycosyl donors in the biosynthesis of many complex saccharides, it is an interesting variation to find fucose occurring in a guanosine nucleotide. The only other guanosine sugar nucleotide known at present is guanosine diphosphate mannose.[10,11]

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(12) U. S. Public Health Service Postdoctoral Fellow.

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ORGANOBORON COMPOUNDS. X. MIXED TRIALKYLBORANES DISTILLABLE WITHOUT DISPROPORTIONATION[1,2]

Sir:

It was suggested recently[1] that mixed trialkylboranes characterized by the presence of a *t*-butyl group may manifest unusual stability to disproportionation. One such substance, diisobutyl-*t*-butylborane, was described previously and its stability to disproportionation was attributed to steric interference with the disproportionation mechanism.[1]

We wish to describe now the first distillable trialkylborane containing *three dissimilar alkyl groups*, namely, *t*-butyl-isobutyl-*n*-amylborane. This substance, b.p. 43.5–44.0° at 0.5 mm., $n^{25}D$ 1.4296, d^{25} 0.7506, was fractionally distilled twice *in vacuo* without decomposition, rearrangement or disproportionation. *Anal.* Calcd. for $C_{13}H_{29}B$: B, 5.52. Found: B, 5.56. MR_D: calcd.,[3] 67.30; obsd., 67.48. Oxidation with alkaline hydrogen peroxide[1] produced equimolar quantities of *t*-butyl, isobutyl and *n*-amyl alcohols in high yield.

t-Butyl-isobutyl-*n*-amylborane was prepared in two ways: (a) in 50% yield by the alkylation of *n*-amyldifluoroborane with *t*-butylmagnesium chloride in anhydrous ether; (b) in 30% yield by the reaction of *t*-butyl-di-*n*-amylborane with isobutylmagnesium bromide.[4] The physical constants and the infrared spectra of the two samples were practically identical. In connection with method (a), it is noteworthy that one *t*-butyl group derived from the Grignard reagent rearranges to isobutyl during the alkylation reaction. Concerning

(1) Previous paper, G. F. Hennion, P. A. McCusker and A. J. Rutkowski, THIS JOURNAL, **80**, 617 (1958).
(2) Contribution from the Radiation Project operated by the University of Notre Dame and supported in part under Atomic Energy Commission Contract AT-(11)-38.
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