The symmetry of the perturbing crystal field acting on the tetrahedral BH_4^- is thus C_s . Under the action of a perturbing field of symmetry C_s the vibrational levels of the tetrahedral ion transform as follows:

that is, the degeneracy of all the levels is removed and all the levels are infra-red active (only the F_2 levels are infra-red active under T_d).

This means that all four tetrahedral fundamentals should be observable in the infra-red absorption spectrum, as well as all the overtones and combination bands. In addition, all the degenerate bands should show fine structure caused by the removal of all the degeneracy by the perturbing crystal field.

The splitting of the degenerate bands would probably be obscured by the broadness of the bands at room temperature, but ν_1 and ν_2 should be observable. Unfortunately, the band due to the ν_1 vibration lies among ν_3 and its satellite bands (at about 2,300 cm^{-1}) and could easily be obscured by these.

From the spectrum published by Price¹ it can be deduced that ν_2 should occur around 1,280 cm^{-1} (from the frequencies of ν_4 and $\nu_2 + \nu_4$).

The anomalous band reported by Price¹ at about 1,250 cm^{-1} in the spectrum of lithium borohydride can thus probably be assigned to the ν_2 vibration of the BH_4^- ion in the lithium borohydride lattice. This band is normally inactive in the infra-red, but occurs here because of the 'reduction' of the symmetry of the ion by the crystalline field, which is of the type C_s .

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¹ Price, W. C., *J. Chem. Phys.*, **17**, 1044 (1949).

² Schutte, C. J. H., *Spectrochim. Acta*, **16**, 1054 (1960).

³ Waddington, T., *J. Chem. Soc.*, 4783 (1958).

⁴ Schutte, C. J. H., thesis, University of Amsterdam (1960).

⁵ Harris, P. M., and Meibohm, E. P., *J. Amer. Chem. Soc.*, **69**, 1231 (1947).

⁶ Halford, R. S., *J. Chem. Phys.*, **14**, 8 (1946).

Isolation of D-Glycero-D-galacto-heptitol from the Wound Exudate of Avocado Trees

D-GLYCERO-D-GALACTO-HEPTITOL has been isolated from the semi-crystalline exudate of wounds in the bark of *Persea americana* Mill.

The crude material was a pale brown solid which did not reduce Fehling's solution, and gave evidence of only one major component on paper chromatograms. Two recrystallizations of this solid from aqueous methanol afforded a colourless product in the form of needles which had a melting-point of 183–185°, no depression on admixture with authentic perseitol.

A portion of the crude exudate was acetylated with pyridine and acetic anhydride to give a crystalline acetate, which after recrystallization from aqueous

ethanol had a melting-point of 119–120.5°, no depression on admixture with authentic perseitol heptacetate. This derivative also had $[\alpha]_D^{20} - 14^\circ$ (about 2.02 in chloroform); literature value¹ $[\alpha]_D^{20} - 13.3^\circ$ (chloroform).

A further portion of the crude material was treated with benzaldehyde and acid according to Hudson *et al.*². From this reaction mixture a crystalline derivative was isolated, which after one recrystallization from pyridine-ethanol had a melting-point of 276–278° and $[\alpha]_D^{20} - 62^\circ$ (about 1.95 in pyridine). Hudson *et al.*³ give values of $277 \pm 2^\circ$ for the melting-point and $[\alpha]_D^{20} - 58.1^\circ$ (about 0.9 in pyridine) for 1,3 : 5,7-di-O-benzylidene-D-glycero-D-galacto-heptitol.

From these results we have concluded that the chief constituent of *Persea americana* Mill wound exudate is D-glycero-D-galacto-heptitol (perseitol), a compound known to be present in the fruit⁴ and leaves⁴ of this tree.

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¹ Maquenne, L., *C.R. Acad. Sci., Paris*, **107**, 583 (1888).

² Ness, A. T., Hann, R. M., and Hudson, C. S., *J. Amer. Chem. Soc.*, **70**, 767 (1948).

³ Montgomery, E. M., and Hudson, C. S., *J. Amer. Chem. Soc.*, **61**, 1657 (1939).

⁴ Nordal, A., and Benson, A. A., *J. Amer. Chem. Soc.*, **76**, 5054 (1954).

Monosaccharide Sequence in *Pneumococcus* Type XIV Polysaccharide

PREVIOUS work¹ has established that in *Pneumococcus* type XIV polysaccharide there are two non-reducing end groups of D-galactopyranose, one D-galactopyranose residue linked 1 : 3, one D-glucose residue linked 1 : 4 and two 1 : 4 : 6-linked 2-acetamido 2-deoxy D-glucose residues for every six monosaccharide units. Although the majority of these linkages are β -, some α -D-galactose units may be present. The two major disaccharides left after treatment of the type XIV polysaccharide with *N* hydrochloric acid at 100° for 2½ hr. were 4-O- β -D-glucosyl 2-acetamido 2-deoxy D-glucose and 3-O- β -(2-acetamido 2-deoxy)-D-glucosyl D-galactose. Less drastic hydrolysis has enabled other disaccharides to be isolated and the structure of these is the subject of the present communication.

The polysaccharide (3.606 gm.) was hydrolysed with 2 *N* sulphuric acid (430 ml.) at 85–90° C. for 2½ hr. After neutralization with barium carbonate, the hydrolysate was passed through 'Amberlite IR' 120 (H^+), which was eluted with water to yield neutral sugars (1.8 gm.) and with 2 *N* sulphuric acid to remove basic sugars (1.0 gm.). Fractionation of the neutral sugars on a charcoal-'Celite' column² gave a D-galactose-D-glucose mixture (about 1.4 gm.), N-acetylglucosamine (40 mgm.), disaccharides I and II (4 mgm.), III (11 mgm.), V (30 mgm.), VI (3 mgm.), trisaccharides IV and V (30 mgm.), as well as trisaccharide VI and another oligosaccharide (30 mgm.).