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Far Infrared Spectra of Glucose and Saccharose

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Infrared spectra of sugars have been measured and internal vibrations in the ring have been analysed by Barker *et al.*[1] However, the observed spectra are limited to the mid-infrared region down to 400 cm^{-1}. Absorption bands caused by inter-ring interactions are expected to appear in the far infrared region. To obtain information about inter-ring interactions glucose and saccharose seem to be suitable compounds as considered from their structural formulae. In this note far infrared absorption spectra of glucose and saccharose are reported.

Samples were powdered and suspended in the Nujol null, and were then inserted between thin polyethylene sheets. The samples were checked by measuring infrared absorption spectra from 4000 to 400 cm^{-1}.

Far infrared spectra were measured in the region from 500 to 50 cm^{-1} by using a vacuum single beam grating spectrometer constructed in our laboratory.[2] The results are shown in Figs. 1 and 2. In order to determine the wavenumbers of the far infrared bands precisely, the scale of the logarithm in wavelength is used in the spectral chart of this

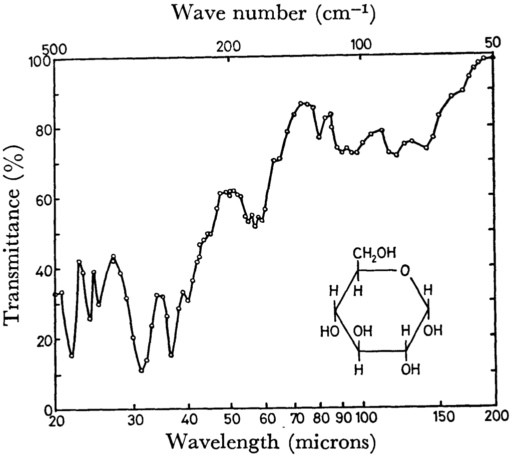

Fig. 1. Far infrared absorption spectrum of glucose in the region from 500 to 50 cm^{-1}.

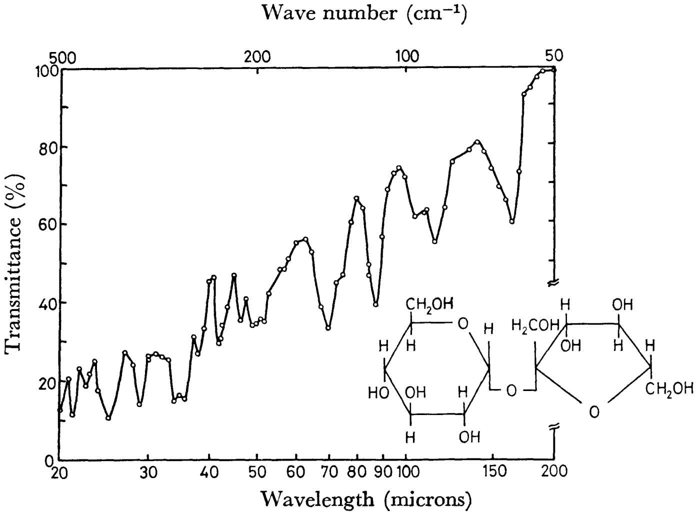

Fig. 2. Far infrared absorption spectrum of saccharose in the region from 500 to 50 cm^{-1}.

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[1] S. A. Barker, E. J. Bourne, M. Stacey and D. H. Whiffen, *J. Chem. Soc.*, **1954**, 171; S. A. Barker, E. J. Bourne, R. Stephens and D. H. Whiffen, *ibid.*, **1954**, 3468; S. A. Barker, E. J. Bourne, R. Stephens and D. H. Whiffen, *ibid.*, **1954**, 4211; S. A. Barker and R. Stephens, *ibid.*, **1954**, 4550.

[2] H. Yoshinaga, S. Fujita, S. Minami, A. Mitsuishi, R. A. Oetjen and Y. Yamada, *J. Opt. Soc. Amer.*, **48**, 315 (1958).

Table 1. Far infrared absorption bands of glucose and saccharose

Glucose cm^{-1} (μm)		Saccharose cm^{-1} (μm)	
459 (21.8) (m)	113 (88.1) (w)	472 (21.2) (m)	215 (46.5) (w)
420 (23.8) (m)	106 (93.9) (w)	444 (22.5) (w)	204 (49.0) (w)
400 (25.0) (m)	84.0 (119) (w)	401 (24.9) (s)	195 (51.3) (w)
320 (31.3) (s)	70.7 (141) (w)	345 (29.0) (m)	143 (70.0) (s)
274 (36.5) (s)		294 (34.0)(m)	114 (87.4) (s)
250 (40.0) (w)		280 (35.7) (m)	94.8 (106) (m)
175 (57.0) (m)		263 (38.0) (w)	87.0 (115) (s)
124 (80.9) (m)		235 (42.5) (m)	61.0 (164) (s)

(s), (m), and (w) indicate strong, medium, and weak in relative intensity, respectively.

spectrometer. In this measurement interference fringes which cause trouble to find weak absorption bands were not observed.

Observed bands of glucose and saccharose are listed in Table 1. Strong absorption bands which are observed in the region below 100 cm^{-1} may arise from inter-ring modes. It is considered that absorption bands of 87.0 and 61.0 cm^{-1} are caused by inter-ring deformation modes such as twisting and bending vibrations between two rings of saccharose, because the bands appear in saccharose but not in glucose.