

We may state the inverse of the first of the operational relations of Theorem (b) as:

Theorem (c).—Let $f(x)$ be a function of bounded variation in every closed sub-interval (α, β) and

$$\int_a^\beta f(x) \omega(x) dx = 0 = f_1(0, n).$$

Let

$$R \equiv \frac{1}{\omega(x)} \left(\frac{d}{dx} \right) \left[\omega(x) \left(X(x) \right)^{m-n+1} \left(\frac{d}{dx} \right) \right]$$

If

$$R[g(x)] = f''(x),$$

then

$$T_1\{f(x)\} = T_1\{A(x) R^{-1}[f(x)]\}$$

and

$$T_1^{-1}\{f_1(m, n)\} = A(x) R^{-1}[f(x)]$$

$$= A(x) \left[\int_0^x \frac{ds}{(X(s))^{m-n+1} \omega(s)} \times \int_a^s \omega(t) f(t) dt + C \right]$$

where C is a constant determining $R^{-1}[f(x)]$ when $m = 0$.

In conclusion, it is a great pleasure to record here the author's grateful thanks to Prof. R. S. Krishnan for his keen interest in the work and for his constant encouragement.

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POTENTIAL CONSTANTS OF VOCl_3

Using Wilson's¹ F-G Matrix method the potential constants of Vanadium Oxytrichloride are calculated. The Infra-red and Raman data of the molecule determined and assigned by Miller and Cousins,² and electron diffraction data taken from Landolt and Bornstein tables³ are used.

Type A_1 : 165, 408, 1035 cm.^{-1} (Polarised).

Type E: 129, 249, 504 cm.^{-1} (Depolarised).

$V=O=1.56 \text{ \AA}$, $V-Cl=2.12 \text{ \AA}$,

$O=V-Cl=108^\circ 12'$, $Cl-V-Cl=111^\circ 17'$.

The following force constants are obtained:

$$f_D = 7.85 \times 10^5 \text{ dynes cm.}^{-1}$$

$$f_{Dd} = 0.390 \times 10^5 \quad "$$

$$f_d = 1.409 \times 10^5 \quad "$$

$$f_{dd} = 0.741 \times 10^5 \quad "$$

$$f_\alpha + f_\beta = 0.451 \times 10^5 \quad "$$

$$f_{\alpha\alpha} + f_{\beta\beta} = -0.118 \times 10^5 \text{ dynes cm.}^{-1}$$

where f_D, f_d, f_α and f_β are the $V=O$ stretching constant, $V-Cl$ stretching constant, $Cl-V-Cl$ bending constant and $Cl-V=O$ bending constant respectively while $f_{Dd}, f_{dd}, f_{\alpha\alpha}, f_{\beta\beta}$ are interaction constants.

The frequencies of vibration are calculated using these force constants and are listed below:

Type A_1 : 165, 408, 1036 cm.^{-1}

Type E: 129, 251, 503 cm.^{-1}

The agreement between observed and calculated frequencies is quite satisfactory. The $V=O$ stretching constant $f_D = 7.85 \times 10^5$ dynes cm.^{-1} compares favourably with the value $f_D = 7.36 \times 10^5$ dynes cm.^{-1} calculated from Molecular spectral data.

Details will be published elsewhere.

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THERMAL EXPANSION OF CAESIUM IODIDE BY X-RAY DIFFRACTION AND THE GRÜNEISSEN'S PARAMETERS

THE thermal expansion of Cæsium iodide has been attempted by very few workers and no reliable data are available for it up to its melting point. Johnson, Agron and Bredig¹ have determined the cell constant and hence the thermal expansion but their value at 25°C . differs by about 20% from the precision X-ray determination of Rymer and Hambling.² The latter workers have given the value of the thermal expansion only between 22°C . and 36°C . It was thought desirable therefore to measure with all the usual precautions the above constants for CsI up to its melting point. The measurements were taken by employing a diffractometer, Geiger counter and a rate meter and verified by taking the pattern on an automatic chart recorder. The furnace used