by Bhagavantam[6] that these lines are due to hindered rotation of individual molecules in the crystal lattice. In the case of the cubic crystals of CO_2, this frequency of *rotational oscillation* could be calculated according to the method of Pauling.[7] Thus, the absolute temperature at which the heat capacity of CO_2 is 5 cal./mol. per degree is 122°·4 A.[8] This is equal to $h\nu_0/k$ or $(hc/k)\ \Delta\nu$, where $\Delta\nu$ is the oscillational frequency in cm.$^{-1}$ hc/k is the well-known radiation constant, equal to 1·4317 and therefore, $\Delta\nu = 82 \cdot 5$ cm.$^{-1}$ The agreement between this value and the experimental frequency is not so good as is the case with lattice frequency; but considering the approximations involved in the above calculation, they may be considered as of the same order of magnitude.

This correspondence between the observed and the calculated lattice frequency on the one hand and the frequency of rotational oscillations on the other, suggest that these two modes of oscillation of molecules in a crystal are *interdependent*. The lattice oscillation in the crystal is probably not one in which one group of molecules vibrates against another as in a valence oscillation, (which we may call 'symmetric oscillations'), but one akin to flextural oscillations of the crystal in which two systems of molecules execute rotational oscillations against each other. In the case of a simple cubic crystal, this latter kind of oscillation may be illustrated as in Fig. 1. In this oscillation we assume

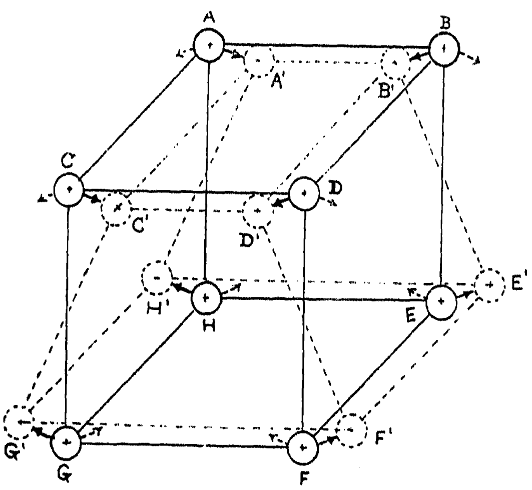

Fig. 1.

Showing flextural oscillations in a cubic crystal. The circles represent molecules, the arrows indicate rotational oscillations of the molecules and the dotted lines show the relative positions of two opposite molecular planes during an oscillation.

that each individual molecule executes a rotational vibration along with its neighbours. The following characteristic of the flextural oscillations of the lattice may be qualitatively deduced:—(1) The frequency of this oscillation will be approximately the same as but always less than the frequency of hindered rotation of the individual molecule, a fact which is verified by the data given above.* (2) Unlike the 'symmetric oscillations of the lattice,' this flextural oscillation involves an asymmetric restoring force and is, therefore, favourable for exciting intense Raman lines. (3) The Raman lines arising from these oscillations will be completely depolarised. (4) Their intensity will be determined by the anisotropy of the molecule. (5) As melting sets in, this flextural or tipping oscillation of the crystal involving rotational oscillations of the molecules will tend to be replaced by the complete rotation of molecules themselves, and will give rise to the 'wing'. The relative intensities of these lines due to the crystal and the vibrational lines of the molecule remain to be worked out theoretically.

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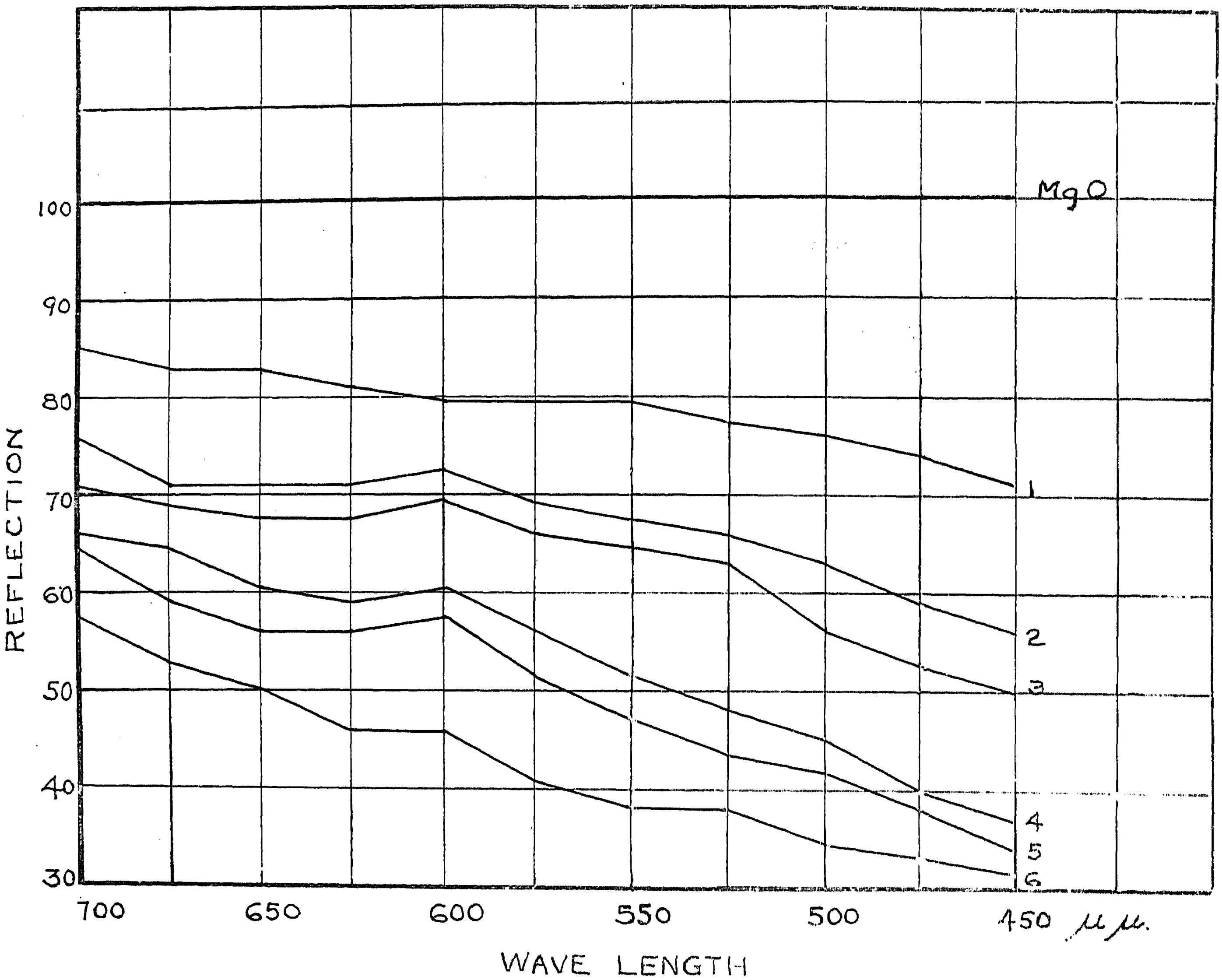
* A similar lowering of the oscillational frequency has been observed for nitrogen (see Pauling, L., *loc. cit.*).

Colour Measurement on Natural Cotton.

We had recently an opportunity of examining six samples of natural cotton which ranged in colour from white to brown. The samples were reported to be confirming to the Lint Colour Standards I–VI and were designated as follows:—

Sample No.	Standard	Name
1	Lint Colour Standard I	K-546
2	,, II	Comilla
3	,, III	A Segregate
4	,, IV	Nanking
5	,, V	Buri Khaki
6	,, VI	Buri Khaki



The reflection of light incident at an angle of 45° and viewed at right angle to the surface of the sample, was compared on a visual spectrophotometer with a standard white surface of magnesium oxide, the light source being a 500 watts Osram projection lamp. Reflection curves given in Fig. 1, show quantitatively the increase in the depth of colour from sample 1 to 6. It would be seen that the whitest sample examined (No. 1) reflects on the average 80 per cent. of the light reflected by magnesium oxide, while its deficiency in blue-green and blue colour is obvious. In the rest of the samples the quantity of grey and deficiency in blue increase giving them a brown appearance.

Incidentally, it may be observed here, that the colour measurement of nearly white surfaces is of great importance in textile industry for the assessment of bleached goods. In such cases the visual spectrophotometric method mentioned above would appear to form a useful addition to the methods employing light filters and a photo-electric cell.

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