

writer and Subrahmanian⁴ to be due to its mosaic structure and the consequent lack of co-operation between the lattice planes of the different mosaic blocks.

Thirdly Sirkar and Bishui report that the Raman reflection for the setting $\theta_i < \theta_n$ appears as a diffuse triangular spot with its apex towards the Laue spot and not circular as required by the theory. The five pictures published in the *Proc. Ind. Acad. Sci., A*, Vol. XIV, Plate XVII, Figs. 5 g, h, i, j, k show the circular spots demanded by the theory.

The original and later theories of Zachariassen^{5, 6} give half-breadths for these Raman reflections which should be of order of the missetting ($\theta_i \sim \theta_n$) when this is more than 1 or 2°. The accompanying pictures are taken with a narrow slit 0.2 mm. wide, 5 mm. high and 130 mm. deep and a diamond plate 4 mm. \times 7 mm. \times 0.76 mm. The Raman reflections take place from the (111) plane of the crystal, ($\theta_i - \theta_n$) being +4°42' and +1°35' for the two figures (a) and (b) respectively.

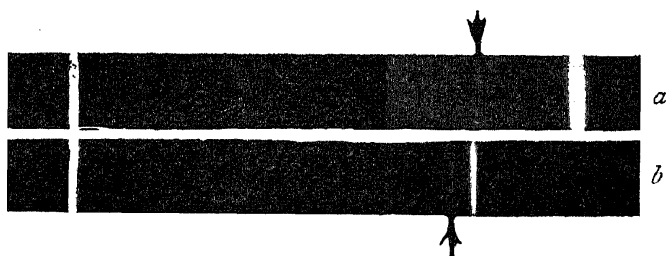


FIG. 2

The sharpness of the reflections clearly shows how Zachariassen's theories are totally inadequate to explain the facts.

The sharpness of these Raman reflections has been emphasised by the Royal Institution workers also.⁷ But they avoid the inevitable conclusion as to the specular character of the new phenomenon by calling these reflections as "secondary phenomena", on the basis that they are absent in mosaic crystals of diamond, in spite of the fact that these Raman reflections are far more intense than the weak diffuse effect they have observed and which they prefer to call the 'primary'. The absence of the Raman reflections in the mosaic type of diamond simply shows the very high degree of coherence necessary between the secondary

radiations from the various individual atoms to make the new phenomenon observable with crystals having large binding forces.

The diffuse effect itself can be accounted for as due to the super-lattice oscillations described and employed in a recent symposium on the Thermal Energy of Crystalline Solids.⁸

Details of this will be published later.

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¹ Pisharoty, *Proc. Ind. Acad. Sci.*, 1941, **14**, 56.

² Lonsdale and Smith, *Proc. Roy. Soc., Lond.*, 1941, **179**, 8.

³ Sirkar and Bishui, *Sci. and Culture*, 1941, **7**, 314.

⁴ Pisharoty and Subrahmanian, *Proc. Ind. Acad. Sci.*, 1941, **14**, 439.

⁵ Zachariassen, *Phys. Rev.*, 1940, **57**, 597.

⁶ —, *Ibid.*, 1941, **59**, 860.

⁷ Lonsdale and Smith, *Nature*, 1941, **148**, 112 and *Phys. Rev.*, 1941, **60**, 617.

⁸ Raman, Norris, Anand, Dayal, Venkateswaran, *Proc. Ind. Acad. Sci.*, 1941, **14**, 459-515.

ADSORPTION AND DISPLAY OF COLOURS

WHEN activated alumina gel is dropped into a mixture of benzene and carbon tetrachloride, the white gel becomes jet black, whereas with either benzene or carbon tetrachloride, the gel develops no such colour. This extremely interesting phenomenon, briefly indicated in a former communication,¹ is found to be of a general character, as revealed by further investigations.

Sulphate in alumina has an important role in this effect. Alumina gel¹ prepared from aluminium sulphate was found to contain some sulphate in it, in spite of prolonged washing. Such a gel, after activation, always showed the colour effect. Gel prepared from aluminium nitrate showed not a trace of the colour. On soaking the above gel in ammonium sulphate

solution and subsequent heating for a short time, to activate it, the colour effect with benzene and carbon tetrachloride mixture was displayed. The gel containing sulphate was strongly ignited to decompose the sulphate. The ignited gel produced no colour. So it is definite that sulphate in alumina has an important role in producing the black colour.

In place of carbon tetrachloride in the mixture several halogen derivatives, such as (1) Methylene chloride, (2) Chloroform, (3) Tetrachlorethene, (4) Chlorobenzene, (5) Benzyl chloride, (6) Bromoform, (7) Ethylene dibromide, (8) Bromobenzene were used in combination with benzene. A mixture containing benzene and a halogen derivative would always show the colour effect. Having a trace of green or violet in some cases, the colours in different mixtures slightly differed from one another. The effect is of a general character, in being produced always in a mixture containing an aromatic nucleus and a halogen derivative.

The development of colour is gradual. The activated opaque gel on being dropped into benzene and carbon tetrachloride mixture first becomes yellow which changes over to orange red, greenish brown and finally black.

When the blackened gel is dropped into water the colour disappears. This is obviously due to the preferential adsorption of water by the gel surface. After treatment with water, the gel is white as before and the supernatant liquid colourless.

The mechanism of the development and the display of the colours is probably the formation of an adsorption complex and a precursor to the well-known Friedel and Crafts' reaction.

It is known that the characteristic absorption, of an aromatic compound shifts, on halogenation of the nucleus, from the ultra-violet towards the visible. This is probably a case of loading of the aromatic nucleus with halogen,² brought about by alumina-sulphate. A study of the absorption spectra of the system at various stages of development of this colour effect

may throw light on the nature of this interesting phenomenon. Investigations on this line are in progress.

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Bangalore,
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¹ Rao, K. S., and Rao, B. S., *Proc. Ind. Acad. Sci.*, 1936, 4, 562.

² Suggestion by Sir C. V. Raman in a private discussion.

RAMAN SPECTRA OF 2-HYDROXY 4-METHOXY-BENZALDEHYDE

THE above substance was isolated as a white solid from the roots of *Decalepis Hamiltonii* (Kannada name, *Makaliberu*).¹ It consists of colourless rectangular platy crystals belonging to the monoclinic system.

As 4-methoxy- β -resorcyaldehyde is highly soluble both in carbon tetrachloride and glacial acetic acid, a study of its Raman spectra has also been attempted. The solutions however turn yellow after a time and the consequent absorption of the HgI λ 4358 A° decreases the efficiency of this radiation in producing Raman lines. Long exposures have however revealed two faint Raman lines at 1655⁽⁴⁾ and 1215⁽³⁾ cm.⁻¹ in a 30 per cent. solution of the substance in carbon tetrachloride. The solution in glacial acetic acid showed a few more lines (even fainter) with frequency shifts of 280⁽¹⁾, 340⁽¹⁾, 715⁽⁰⁾, 820⁽⁰⁾, 1345⁽¹⁾, 1450⁽¹⁾ and 3300⁽²⁾ cm.⁻¹ The lines observed in carbon tetrachloride solution appeared stronger. As the light gathering power of spectrograph employed is small, and the solution is coloured, the Raman frequencies of the substance are, it is felt, necessarily incomplete. The substance exhibits a weak fluorescence in consequence of which the Raman lines are superposed on a continuous background which extends from longer wave-lengths right up to about 800 cm.⁻¹ from λ 4358 A°.