ROTATIONAL RAMAN SCATTERING IN BENZENE.

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A series of experimental investigations by Weiler (1931), Ranganadham (1932), Bhagavantam (1933), Rao (1934) and others have shown that the rotational Raman bands in liquids start with a maximum intensity at the centre of the Rayleigh line contrary to the case of gases. In the latter the bands start with zero intensity at the centre of the Rayleigh line and exhibit a maximum intensity only at some distance from it. In these investigations, although instruments of very different dispersions and optical qualities have been used on different occasions, the results were always reproduced in a most satisfactory manner. Recently, however, Sirkar and Maiti (1935) claimed to have obtained different results with liquid benzene by using improved experimental technique. These authors used a Fuess glass spectrograph and after employing a correction for the broadening of the Rayleigh line, obtained an intensity distribution similar to that obtained in gases. It is apparent from the microphotometric curves reproduced by these authors that the instrument which they have employed is not of a very high dispersion and the exposure conditions are such that the procedure adopted by them for eliminating the line broadening is hardly likely to yield any reliable results.

About the same time as that of the publication of these results, the author had obtained some very good photographs of the Raman spectrum of benzene in another connection using a high dispersion instrument (Hilger E. I. with glass parts) placed very kindly at his disposal by Sir C. V. Raman, at the Indian Institute of Science, Bangalore. The dispersion of this instrument (about 5 A.U. per mm. in the blue) is so great and the Rayleigh lines so sharp that if there existed a maximum intensity in the rotation wing at a distance of 18 wave-numbers it should at once have been apparent in the photographs themselves but no such thing was seen. Intensity marks have been recorded in the usual way on the same plate by the method of varying slit widths and a quantitative investigation made of the distribution of intensity within the wing. The results agree so perfectly with those obtained earlier using instruments of much lower dispersion and optical quality that ordinarily there would

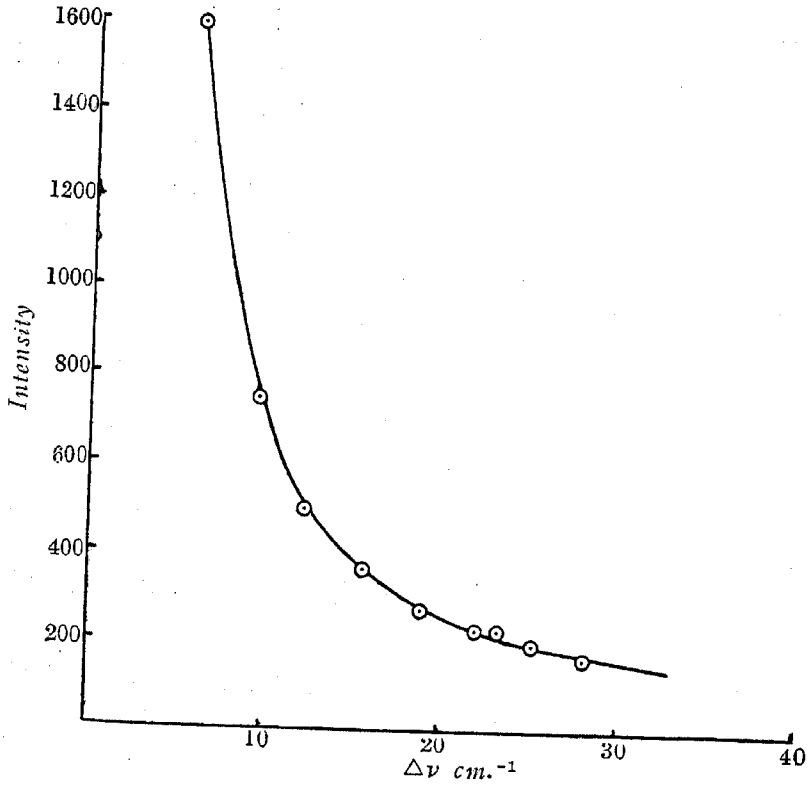
1600
1400
1200
1000
800
600
400
200
Intensity
10
20
30
40
Δν cm.⁻¹

FIG. 1.

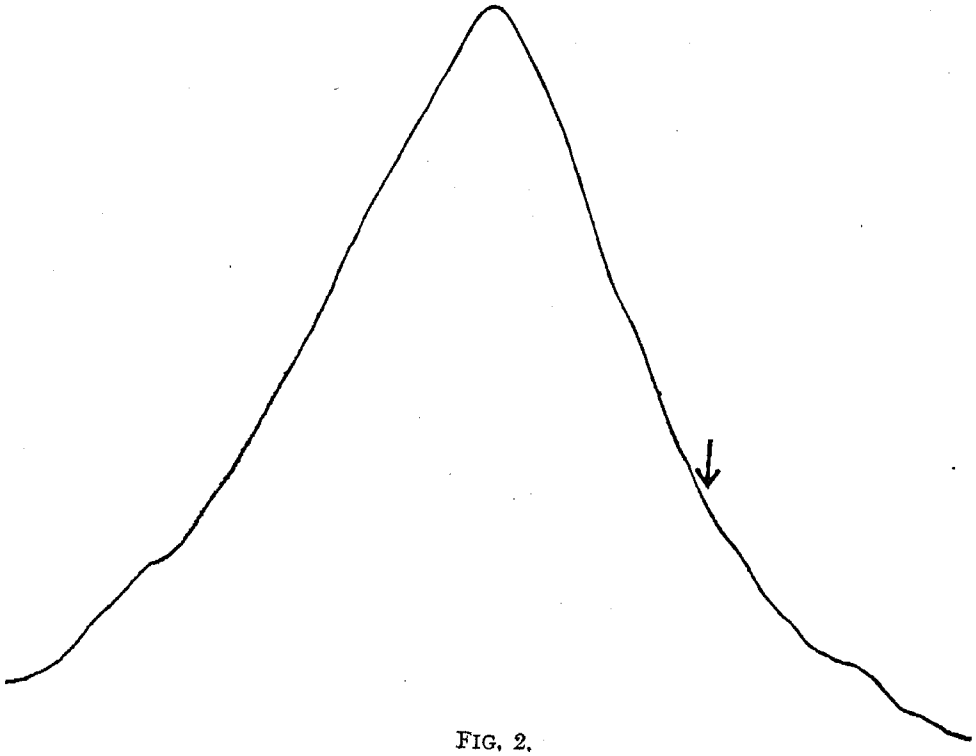

FIG. 2.

have been no necessity of publishing the same. In view of the recent work of Sirkar and Maiti, a publication of these results is however sought here.

The continuous curve in Fig. 1 is taken from Rao (1934) and the circles with dots inset represent the values obtained in the present investigation. Fig. 2 is a microphotometric record of the wing on either side of the λ 4358 line and the arrow indicates the position at which one should expect the maximum intensity in the wing to occur. The large dispersion of the instrument renders this position to be distinctly separated from the centre and direct exposures show that the line never broadens to such an extent. The perfect agreement between the results obtained with this instrument where questions of background correction do not arise at all in regions further than about 8 wave numbers from the centre and the older results cannot be fortuitous. If we are to accept Sirkar and Maiti's results, the absence of a maximum or a discontinuity in the microphotometric record in the position of the arrow can only be explained by saying that the Rayleigh line itself has broadened due merely to overexposure to the extent of about 18 $cm.^{-1}$ or more on either side, *i.e.*, has a breadth of 1·5 mm. excluding the wing. Such is certainly not the case for this instrument. Figs. 1 and 2 which have been obtained under conditions which eliminate altogether the necessity of correcting for a background are to be regarded as much more reliable than the results obtained with a Fuess spectrograph after applying a correction for the broadening of the Rayleigh line which itself forms a good part of the recorded wing.

In conclusion the author desires to express his grateful thanks to Sir C. V. Raman for his kind interest in the work.

Summary.

A study of the intensity distribution in the rotation wing accompanying the Rayleigh lines in liquid benzene is made using a high dispersion spectrograph. The results are in perfect agreement with those obtained on earlier occasions using instruments of lower dispersion.

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