Nature (*London*) **122** 278 (1928)

Molecular spectra in the extreme infrared

The appearance in the spectrum of monochromatic light diffused by fluids of new lines of modified frequency (*Indian J. Phys.* **2**, pp. 387 and 399; 1928), gives us a powerful, accurate and convenient method of exploring molecular spectra, especially in the near and extreme infrared regions. We have only to photograph the spectrum of the scattered light, and the frequency-differences between the incident light and the new radiations excited by it give us the molecular frequencies. As an illustration of what the method is capable of, we may mention the case of carbon tetrachloride, the spectrum of the mercury arc scattered by which is reproduced as figure 1 B, 1 A being the incident spectrum. The 4358 A line, which is the principal exciter, is accompanied by three sharp lines close to it on the right, from which we deduce 45·4 μ, 31·8 μ and 21·7 μ as wavelengths of three hitherto unknown infrared lines in the spectrum of the carbon tetrachloride molecule. In addition, we have a doublet 13·0 μ and 12·6 μ, the position of which as an unresolved line was approximately known from the work of Coblentz.

Figure 1 C shows the nebulosity or continuous spectrum accompanying the 4358 line when it is scattered by benzene. The existence of a continuous radiation accompanying the lines and bands in the scattered spectrum from liquids has

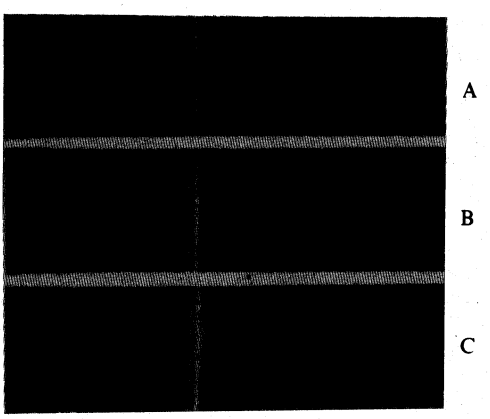

Figure 1

been pointed out by us earlier and is indeed visible in our published photographs. Its natural explanation would appear to be that it arises from a combination of the rotational frequencies of the molecule with the frequencies of the incident or scattered radiations, the impedance to the free rotation of the molecules in a dense fluid being the reason why such combination results in a continuous spectrum instead of discrete lines. The unmodified lines being the strongest, the nebulosity accompanying them appears very conspicuous. Incidentally, with reference to a recent interesting paper by Cabannes and Daure (*Comptes Rendus*, June 4, 1928), we may direct attention to the distinctly imperfect symmetry of the nebulosity on the two sides of the 4358 line appearing in figure 1 C.

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5 July