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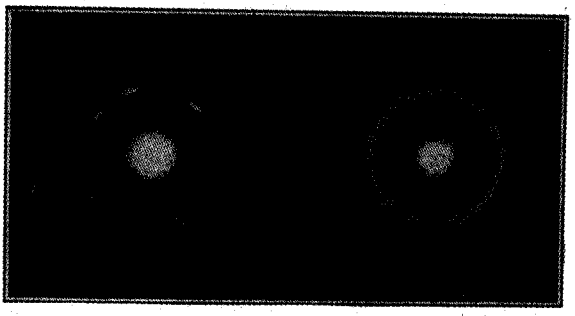
# X-ray diffraction in liquids

In order to find experimental support for the theory of X-ray diffraction in liquids put forward some three years ago by C V Raman and K R Ramanathan (*Proc. Indian Assoc. Cultiv. Sci.*, 1923 **8**, p. 127), extensive studies have been undertaken in the authors' laboratory of the phenomena observed when a pencil of monochromatic X-rays passes through a layer of fluid, particularly with the view of determining how the effects are influenced by the physical condition and the chemical nature of the substance under investigation. The photographs reproduced here (figure 1*a* and *b*) were obtained in the course of work on this line by one of us (C M Sogani) and represent the X-ray liquid haloes of hexane and cyclohexane respectively. The fluids were contained in cells with very thin walls of mica and the *K*-radiation of copper from a Shearer X-ray tube was used.



*a* *b*

**Figure 1.** X-ray diffraction haloes of liquids.
*a*, Hexane; *b*, cyclo-hexane.

The differences between the two patterns are sufficiently striking; cyclohexane shows a bright and sharply defined halo with a very clear dark space within, while hexane, on the other hand, shows a less intense and relatively diffuse halo, the inner margin of which is not sharply terminated but extends almost up to the direction of the incident rays. These differences indicate very clearly the effect of the geometrical form of the molecules on the X-ray scattering by a liquid. From an X-ray point of view, cyclohexane consisting of ring-formed—through arbitrarily orientated—molecules has a nearly homogeneous structure, while on the other hand the elongated shape and varying orientations of the molecules in hexane cause it to be much less homogeneous in X-ray scattering. This

explanation is supported by the observation that the diffraction halo of benzene resembles very closely that of cyclohexane.

It is very interesting to contrast these facts with the optical behaviour of the three liquids with regard to the scattering of ordinary light. Optically, hexane and cyclohexane are far more nearly similar to each other, and differ strikingly from benzene, the depolarisation of the scattered light being small for hexane and cyclohexane and relatively large for benzene. Here, evidently, the geometrical form of the molecule is of much less importance than its chemical character.

Further studies of the liquid-haloes for various organic, substances of the aromatic and aliphatic series, and specially with the long-chain compounds, are in progress.

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