

Absorption Spectra of Single Crystals of Polynuclear Hydrocarbons.

THE absorption spectra of single crystals of a number of polynuclear hydrocarbons have been studied by us using incident linearly polarised light. Among the crystals studied are anthracene, phenanthrene, 1, 2-benzophenanthrene, 1, 2, 5, 6-dibenzanthracene, fluorene, fluoranthene and pyrene, for which the orientations of the molecular

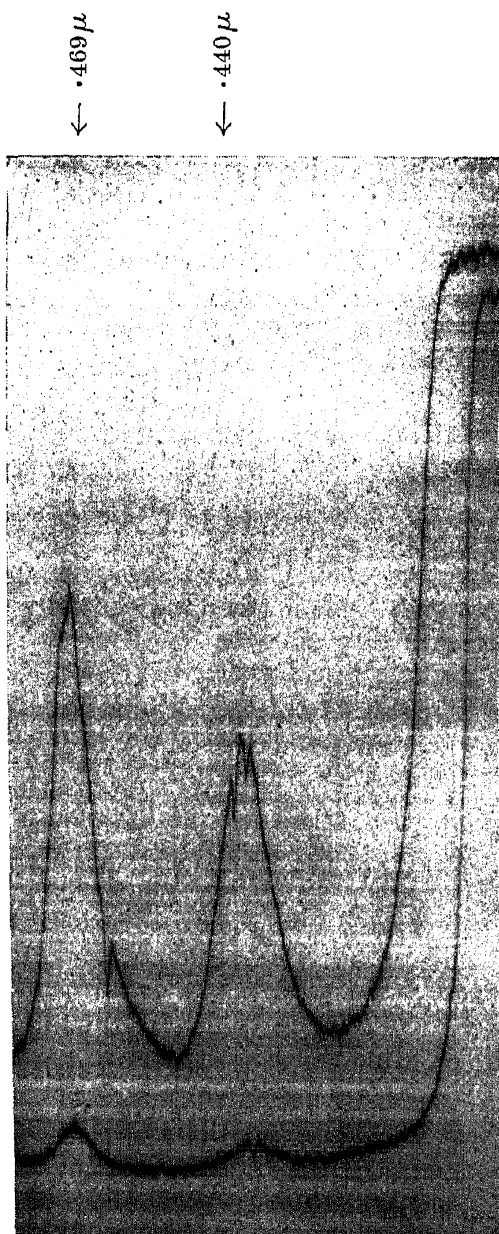


Fig. 1.

benzene planes in the crystal lattice are known either from X-ray analysis or from the magnetic measurements on the crystals. In all cases, it is found that *the absorption of the crystal is much more intense when the incident light vibrations are parallel to the plane of the benzene rings in the molecules than when the vibrations are along the normal to the benzene planes.*

As an example, we may take the case of 1, 2, 5, 6-dibenzanthracene. It crystallises in the monoclinic system in the form of thin flakes parallel to the c (001) plane. Recent X-ray measurements on this crystal by Iball and Robertson, and magnetic measurements by Banerjee in this laboratory, show that the benzene rings in the molecules of the unit cell are nearly parallel to the b (010) plane, and that the long axes of the molecules are nearly perpendicular to the

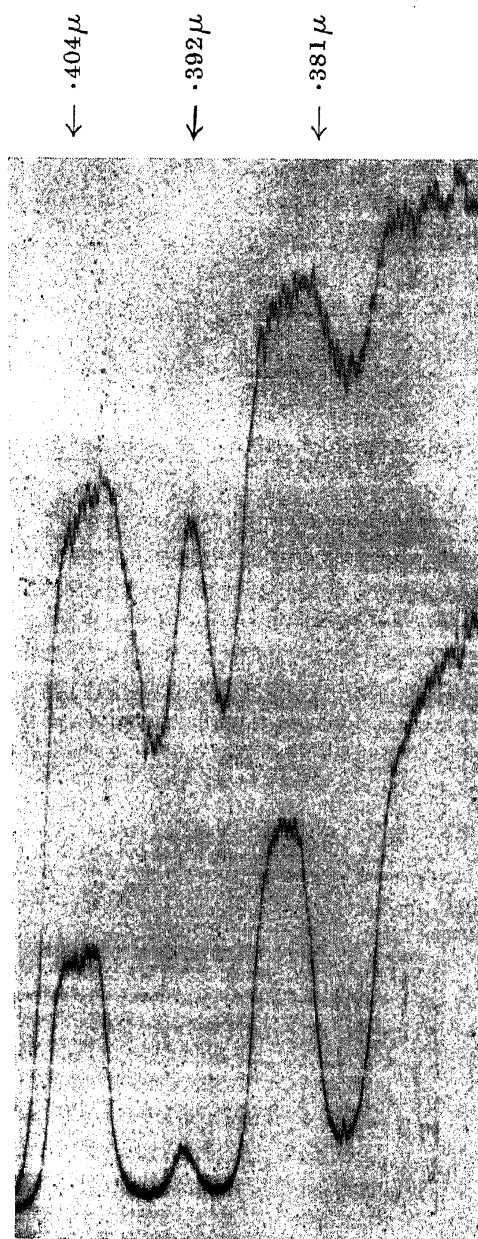


Fig. 2.

a axis. Therefore, one of the extinction-directions in the plane of the crystal flake, namely the a axis, would correspond predominantly to vibrations in the plane of the benzene rings along the width of the molecules, while the other extinction-direction, namely, that along the b axis, would correspond predominantly to vibrations perpendicular to the plane of the benzene rings.

Using one such crystal flake of 1, 2, 5, 6-dibenzanthracene and allowing linearly polarised white light to be incident normally on the flake, its absorption spectra for the above two principal vibrations have been studied by us. Fig. 1 gives a microphotometric record of the absorption spectra in the visible region, the upper curve corresponding to vibrations along the *a* axis, and the lower to vibrations along the *b* axis. It is remarkable that whereas the absorption bands appear prominently when the vibrations are along the *a* axis, they are quite feeble for vibrations along the *b* axis. Thus, these absorptions are practically confined to vibrations in the plane of the benzene rings, the vibrations along the normal to the plane of the benzene rings being almost freely transmitted.

In Fig. 2 are reproduced the microphotometric records (on a different scale from that of Fig. 1) of these two principal absorptions for the *ultra-violet* region. The upper curve corresponds as before to vibrations along the *a* axis, and the lower curve to vibrations along the *b* axis. Here again, the polarisation of the absorption bands is evident.

The absorption by naphthalene, 1, 4-naphthoquinone and *p*-benzoquinone also show a similar striking dependence on the direction of the light vibration with reference to the molecular planes.

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Insect Transmission of Spike-Disease.

IN a recent issue of the *Indian Forester*¹ there have appeared some further communications on this highly controversial and vexed question. As the subject is one of much scientific as well as practical interest, it has been considered desirable to review the present position with special reference to its mere practical bearings.

In October 1933, Dover² announced that *Moonia albimaculata* had three positive transmissions of spike-disease. The resulting symptoms were 'inseparable' from those of typically spiked plants on morphological, biochemical and cytological grounds. The author admitted that the transmissibility of those symptoms by grafting had still to be established.

Sreenivasaya,³ who carried out the grafting tests, failed, however, to obtain any transmission of symptoms to plants grafted with material derived from the *Moonia*-infected plants. He further states that "the three plants alleged to be diseased only represented a stunted condition which was brought on by an impoverished soil, want of a vigorous host and probably aggravated by insect-feeding"; they "after careful nursing with fresh soil and host, have since turned completely healthy."

In his reply to Sreenivasaya's note Dover⁴ does not concur with the claims of his colleague that the *Moonia* plants became healthy and relates his experience of having seen healthier-looking plants recorded as "genuinely spiked" and of markedly reducing "spike-like faces of disease sandal plants" by pruning, nursing or growing in shade.

Literature on the spike-disease of sandal records several instances where such controversial differences of opinion have often been expressed. (See *Proc. Conference on Spike-Disease of Sandal*, 1917.) In fact, the "spike-like new flush bursting in response to certain types of injury to the sandal plant, like fire, has been mistaken for spike." "With regard to the appearance of spike-like growth on trees badly burnt as noted by Mr. Hole, both Mr. H. S. Narayana Rao and Rao Sahib Rama Rao considered that this should be worked upon as a temporary reaction and that later the growth would once more become normal" (*Ibid.*, p. 6). Hearsey referring to the idiosyncracies of sandal, invites attention (*Ibid.*, p. 31) to "the small leafed tree which is invariably found on dry soil in exposed localities, leading a novice to imagine that the tree was spiked". Chatterjee⁵ in the course of his extensive

¹ *Indian Forester*, 1934, **60**, 492.

² *Ibid.*, 1933, **59**, 695.

³ *Nature*, 1934, **133**, 382.

⁴ *Indian Forester*, 1934, **60**, 505.

⁵ *Investigations on Spike-Disease of Sandal*, 1932, **5**, 12.