

Colour and optical anisotropy of organic compounds

I desire to direct attention to a significant and very generally valid relation which emerges from an examination of the data accumulated by eight years of systematic research at Calcutta on the scattering of light. The generalisation may be stated thus: *The types of molecular structure in carbon compounds which favour the development of colour are those which exhibit an exceptionally high degree of optical anisotropy.*

When we compare a series of compounds in respect of their optical anisotropy, and their colour as indicated by the position of their absorption-bands in the spectrum, the parallelism between the development of the two characters becomes evident. Thus, the aromatic series of compounds are generally more anisotropic than the aliphatic series. We have large increases of anisotropy when we pass from pyridine to quinoline, or from benzene to naphthalene and thence to anthracene. The introduction of a chromophore like NO_2 or auxochrome like NH_2 as a substituent in the benzene molecule produces a notable increase in anisotropy. Less striking but perfectly definite increases occur when halogens of increasing atomic weight replace the hydrogen atom in the benzene ring. In the disubstituted benzene derivatives, the relative position of the groups influences the anisotropy appreciably. These and many other instances may be cited to show that an increase in optical anisotropy connotes a development of colour.

That variations of structure in carbon compounds should influence the two optical characters of anisotropy and colour in similar ways need not occasion surprise when we recollect that the element carbon in its two states, diamond and graphite, itself exhibits the same tendency. Diamond is a transparent and isotropic dielectric, while graphite is opaque, conducts electricity, and has a highly anisotropic structure as shown by X-ray analysis and by its diamagnetic behaviour.

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