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Vuks M F. *Opređenje optičeskoj anizotropii molekul aromatičeskikh soedinenii iz dvojnogo lucheprlomleniia kristallov.* (Determination of optical anisotropy of aromatic molecules from double refraction in crystals.) *Optika i Spektroskopiya* 20:644-51, 1966 and Engl. Trans. in *Optics and Spectroscopy* 20:361-8, 1966. [Physics Department, Leningrad State University, USSR]

The formula for refraction in anisotropic crystals analogous to the well-known Lorentz-Lorenz formula for isotropic bodies was derived. With the aid of this formula and experimental data on birefringence in crystals, the principal polarizabilities of a number of aromatic molecules were determined [The *Science Citation Index*® indicates that this paper has been cited in over 185 publications, making it the most-cited paper published in this journal to date]

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In the early 1950s, when I started a course of lectures on molecular optics at the Department of Physics in Leningrad State University, I came to the conclusion that a number of problems did not have satisfactory solutions. One problem was the relation between double refraction of a crystal and the anisotropy of polarizability of its molecules. It was clear that large birefringence in such molecular crystals as naphthalene, anthracene, phenanthrene, and some others was due to a high optical anisotropy of their molecules. However, there was no theory that could give this relation and open the possibility for obtaining principal polarizabilities of molecules from experimental data on birefringence in crystals.

At that time, the main polarizabilities of a number of anisotropic molecules were obtained with the help of light scattering and the Kerr effect. I thought it would be good

to develop a new method based on the investigation of anisotropy of the optical polarizability of crystals.

In a paper by Sundarajan,¹ I found the results of measurements of principal refractive indices in a number of organic crystals and also a formula for determination of the anisotropic polarizabilities of their molecules. However, calculations based on this formula gave values too low for the optical anisotropy of molecules, much lower than those obtained from light scattering or the Kerr effect. Besides, they gave obviously low values for the mean polarizability of molecules.

I took into consideration a well-known experimental fact about the constancy of molar refraction, i.e., it doesn't depend on the temperature and aggregate state. Although the constancy of molar refraction is approximate, the principle of constancy of molar refraction does not lose its significance in molecular optics. Taking into account this principle, I derived a new formula for refraction in anisotropic media that was analogous to the well-known Lorentz-Lorenz formula for isotropic media. With the help of this formula and the X-ray data on the orientation of molecules in the crystal lattice, it was possible to calculate the main polarizabilities of a number of molecules and ions that were in good agreement with experimental data obtained by other methods.

The paper has been highly cited because many authors used my formula for the interpretation of experimental results in liquid crystals. It was also used to determine the orientational order parameter. I think that this paper has been cited often because the formula is simple in appearance and based on rather general and clear ideas. The paper also found application in the theories of artificial birefringence phenomena: Kerr,² Cotton-Mouton,³ and Maxwell effects. In all these phenomena, the use of my formula gives better agreement with experimental results than does the previous formula.

1 Sundarajan K S. Optical studies on organic crystals. Part I *Z Kristallogr* 93:238-48, 1936 (Cited 40 times since 1955)

2 Vuks M F. On the theory of double refraction of liquids and solutions in an electric field *Optika i Spektroskopiya* 21 697-707, 1965 and Engl. Trans. in *Optics and Spectroscopy* 21 383-8, 1966 (Cited 30 times)

3 Boyle L L. On the Cotton-Mouton effect of a liquid *Chem Phys Lett.* 1 404-6, 1967 (Cited 3 times)