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paper-iii lecture no-77

Topic: Biot's law of rotatory
polarization

Biot Laws: In 1815 Biot studied the rotation of plane of polarization and proposed the following laws:

(a) Angle of rotation of the plane of polarization of the polarized light of definite wavelength is directly proportional to the distance l covered by the polarized light in optically active medium (solid, liquid, gas or solution),

(b) The angle of rotation (?) of the plane of polarization of polarized light is directly proportional to the concentration (c) of the solution or vapor,

The optical rotation of a given sample varies with its concentration and the light's path length:

$$\alpha = [\alpha] c l$$

The diagram illustrates the equation $\alpha = [\alpha] c l$. Dotted arrows point from the labels 'optical rotation', 'specific rotation', 'concentration', and 'path length' to their respective terms in the equation: α , $[\alpha]$, c , and l .

(c) If $\theta_1, \theta_2, \theta_3, \dots$ are the angles of rotation of the plane of polarization light by different optically active media, then the resultant angle of rotation of the plane of polarization by the mixture (when they are non-reactive) is algebraic sum of the angle of rotations by different components.

For Dextrorotatory substance + sign is to be taken with angle of rotation whereas for Laevorotatory substances opposite sign is to be taken with angles of rotation.

(d) Angle of rotation produced by the optically active substance is inversely proportional to the square of the wave length of polarized light used,

Thus the angle of rotation of red color in white plane polarized light is least and for violet color is maximum. Thus if white plane polarized light is passed along the optic axis of the optically active substance like quartz, the transmitted ray gets dispersed into different colors. This phenomenon is called rotator dispersion.

(e) The angle of rotation of the plane of polarization of polarized light produced by the medium also depends upon the temperature of the medium.