A study of the interference figure and a correlation of the orientation with measurable rotations and phase changes[4] indicated that the anisotropy was due to the presence of a uniaxial crystal on the surface of the metal, the c-axis and therefore the extinction position of which always lay within $1 \cdot 5°$ of the plane containing a cube pole of the monel. The inclination of the c-axis to the specimen surface within this plane was also that of the cube pole, that is, minimum intensity of reflexion when the c-axis is vertical and maximum when it is horizontal. By polishing electrolytically, and using the etching solution as the electrolyte, the thickness of this film, as well as the measurable rotation and phase change, can be increased appreciably without removing the orientation relationship. A chemical spot test showed the increased presence of a chromate. The anisotropy of etched monel is therefore attributed to a layer of hexagonal copper chromate. We feel that the fact that the minute etch pits and troughs, observed on the surface of monel by Perryman and Lack, can be compensated for as to phase change and rotation, must mean that their faces are crystallographically quite planar.

Single-grain specimens of hexagonal beryllium, which is optically active after mechanical or electrolytic polishing, show a reproducibility of extinction position[3]. In this case, there is extinction within a range of $\pm 2°$ when the intersection of the basal plane with the surface of the specimen is parallel or perpendicular to the plane of vibration of the incident light, regardless of the method of polishing. As the specimen is rotated through 360° from the extinction position, two symmetrical sets of unequal peaks are observed. The intensities of any two successive peaks are at a maximum when the basal plane is perpendicular to the surface, and a minimum when it is parallel. The graph of the measured angle of rotation of the plane of polarization versus the angle of inclination of the basal plane is linear and when extrapolated becomes 0 at 0° inclination; that is, there is no rotation when the basal plane is parallel to the surface.

The measurable anisotropy varies with temperature and on exposure to oxygen. This effect is attributed to the time-dependent development of a 'chemi-sorbed' layer at the beryllium – beryllium oxide interface[3].

Metallographically, it is of interest to note that the extinction position, in all cases studied, is reproducible and bears a definite relationship to the orientation of the grain under observation. When several orientations are prepared in a similar manner, as in a polycrystalline aggregate, the relative maximum intensities of the grains are a function of the orientation.

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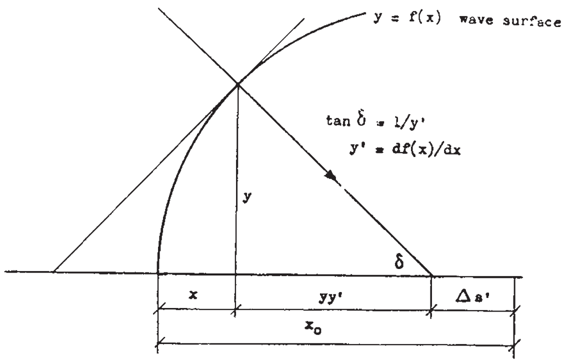
A Formula for determining the Wave-Surface if the Spherical Aberrations are Known

If the spherical aberrations of a cylindrical symmetrical optical system are known in the form of a series:

$$\Delta S' = a \tan^2\delta + b \tan^4\delta + c \tan^6\delta + \ldots, \quad (1)$$

it is possible to deduce the equation of the orthotomic wave-surfaces to the rays defined by (1), as has been shown by Picht[1]. Picht gives a recursion formula proceeding from the higher terms to the lower, which is very inconvenient if the constants $a, b, c, \ldots$ increase rapidly, as is ordinarily the case. It is possible, however, to obtain a recursion formula proceeding from the lower terms to the higher, which has been found very useful for practical purposes while analysing the concentration of light near the geometrical focus[2] by the Debye–Picht method.



From the accompanying diagram we obtain the relation

$$x_0 = x + yy' + \Delta S', \quad (2)$$

which gives the differential equation of the wave surfaces:

$$yy' + \frac{a}{y'^2} + \frac{b}{y'^4} + \frac{c}{y'^6} + \ldots x - x_0 = 0. \quad (3)$$

This can easily be solved by a Legendre transformation, and by introducing the unknown variable in the transformed equation in the form of a series of the powers of the parameter $\tan^2\delta$ and determining the constants by putting the sum of them for each power equal to zero. In this way we get the meridional co-ordinates of the wave surfaces:

$$x = -A \tan^2\delta - 3B \tan^4\delta - 5C \tan^6\delta \ldots \quad (4)$$

$$y = -2A \tan\delta - 4B \tan^3\delta - 6C \tan^5\delta \ldots \quad (5)$$

with the recursion for the constants:

$$A = -\frac{x_0}{2};\ B = \frac{a-A}{4};\ C = \frac{b-3B}{6};\ D = \frac{c-5C}{8}. \quad (6)$$

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[1] Picht, J., "Optische Abbildung", 164 (Braunschweig, 1931).
[2] A paper dealing with this subject is to appear in *RAD Jugoslavenske Akademije, Zagreb*.