

binations have already been prepared and isolated. Whether they form an intermediate step in the process of oxidation cannot be stated at present with certainty. It has also been observed that the oxidation proceeds rapidly even in air, and quite as well in alcohol as in water.

Research is now in progress dealing with the oxidation of hydroquinol, and its homologues toluquinol, xyloquinol, etc., in the presence of various aliphatic amines. The detailed results of this work will be published later in the *Journal of the American Chemical Society*.

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² Wöhler, *Ann.*, **51**, 1844 (145-63).

³ F. Mylius, *Ber.*, **18**, 1885 (467).

⁴ F. Kehrman, *Ibid.*, **23**, 1890 (906).

⁵ A. Hofmann, *Jahr.*, 1863 (415).

⁶ F. Fichter, *Ann.*, **361**, 1908 (397, 400).

⁷ F. Fichter, and A. Willmann, *Ber.*, **37**, 1904 (2388).

⁸ Th. Zincke, *Ibid.*, **14**, 1881 (94).

⁹ R. T. Plimpton, *J. Chem. Soc.*, **37**, 1880 (637).

THE GRATING SPACE OF MICA AND THE INTENSITIES OF THE SPECTRAL ORDERS

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In attempting to determine the reflectivity from its principal cleavage planes, it was found desirable to know the grating space and incidentally the relative intensities of the several spectral orders.

We would like to point out that perhaps the grating space of mica may not be constant. The thickness of a piece of mica may be altered by pressure to a small extent without apparently destroying its crystalline structure. In this case we should expect natural specimens even of the same chemical constitution to show differences due to the variable pressures to which they may have been subjected in their natural positions in the native rocks.

The specimen of mica here reported on was a clear sheet about one millimeter in thickness. It was selected for its smoothness of surface and freedom from flaws. Nevertheless it was not optically plane as shown by viewing a distant straight edge by reflection from the surface. Small local departures from a plane surface were evident.

The measurements were made by an ionization spectrometer, the standards of wave-lengths were the $K_{\alpha_1}(\lambda = .710)$ and the $K_{\beta_1}(\lambda = .633)$ emitted from a Coolidge tube having a molybdenum target. The slit of the ionization chamber was left open wide, the readings of angular position being made only on the crystal verniers.

Measurements were made on the whole spectrum, line and continuous. The relative heights of the peaks of the curves for the two lines after proper correction for the natural leak and the continuous spectrum was taken as the relative intensities of the lines in the several orders. Readings were carefully made on each side, left (L) and right (R) of the zero position of the crystal. The expression $\frac{1}{2}(L + R - 180^\circ)$ is then the mean grazing angle θ for the particular line and order.

The results are given in the table. The spectra of certain orders were so weak and the curve so flat that it was not possible to fix the position of the peak with sufficient accuracy to be of value in the calculation of the grating space.

The relative intensities of the α_1 and β_1 lines are given in the table. The odd orders are stronger than the even orders as observed by de Broglie. The third and fifth orders are stronger than the first. Radiation at higher orders than the 7th was observable.

The grating space d calculated for the two lines is given in the table. The values agree fairly well with those calculated by Seigbahn (*Phys. Rev.*, Sept., 1916) from the measurements made by Gorton (*Phys. Rev.*, March, 1916), for certain lines in the L radiation of tungsten.

It is noticeable that the grating space as here determined increased with increasing spectral order. The results calculated by Seigbahn from Gorton's measurements show the same tendency. This effect has also been noted by W. Stenström (*Untersuchungen der Röntgen Spektren*, Lund, 1919). Stenström attributes this progressive change in the apparent value of d to a very small refraction of the X-rays in the crystal. This is a possible explanation of the effect but not the only one. It may well be due to small curvature or irregularities in the crystal. One can readily show that if the reflecting planes do not line accurately at the center of rotation of the crystal, or if the beam of X-rays from the slits do not pass accurately across this center of rotation, there will be a progressive change in the calculated values of d for the various orders if the crystal planes have even a small curvature. The direction of the change of d with order will depend on whether the crystal is convex or concave.

TABLE I

N	β_1 LINE		α_1 LINE		INTENSITY	
	θ	d	θ	d	β_1	α_1
1	1°-50'-50''	9.87	2°-4'-0''	9.845	100	364
2	3-39-38	9.914	4-7-7.5	9.885	68	221
3	5-3-30	9.891	6-10-15	9.901	154	544
4			8-13-15	9.931	45	175
5	9-8-38	9.957	10-16-38	9.949	136	508
6					9.1	28
7			14-27-0	9.958	32	101