29. *Hemihedry of Zincblende and X-Ray Reflexion.*

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It is known as Friedel's law¹⁾ that the hemihedrism due to the lack of centre of symmetry of a crystal lattice cannot be revealed by the X-ray diffraction method. The law is based on the assumption that the phase change upon reflexion of X-rays is the same for all kinds of atoms. Thus, for instance, a zincblende crystal gives rise to a Laue pattern of holohedral symmetry. The law, however, may not be conformable to the case in which the radiation is of a wave-length very close to that of the critical absorption of some atoms composing the crystal, in consequence of the characteristic phase lag accompanying the selective absorption due to the atoms.

The present experiment was carried out in order to detect, if possible, any difference in the intensity of reflexion from a pair of hemihedral planes, (111) and ($\bar{1}\bar{1}\bar{1}$), of zincblende, using the tungsten L radiation, of which the spectral lines are distributed over a range across the K critical absorption limit of zinc atoms.

The specimens were taken from transparent brownish crystals from Ani, Japan, and of these a number of plates parallel to (111) plane were made, both surfaces of the plate being polished under the same condition as far as possible. Employing each surface of the plate as the reflecting plane, spectra were obtained by means of an X-ray spectrograph of Müller's type with a metal tube of tungsten target.

Among the lines of the tungsten L series, the β components stand close to the K absorption limit of zinc, which, in fact, lies between β_1 and β_4 . Two strong components, β_1 and β_2 , of the shorter wave-length suffered the selective absorption from the crystal atoms and their apparent intensities on the photogram were not much different from the intensity of the weak component, β_4 , so that they could be conveniently compared with the latter. With a breadth of the slit of about 0.05 mm. and an exposure of 20–30 milliampere hours at 30 kV., these lines were well separated and gave a blackening on the plate favourable for the photometric measurement.

1) G. Friedel, C. R., **157** (1913), 1533.

By means of a Moll's microphotometer the intensities of the lines were recorded and it was found that the relative intensities of the above three lines were different in two photograms corresponding respectively to (111) and ($\bar{1}\bar{1}\bar{1}$) reflexions. If it is assumed that the intensity of the β_4 line is the same for both the reflexions, the β_1 and β_2 lines are reflected more strongly from the ($\bar{1}\bar{1}\bar{1}$) plane than from the (111).

It must be noted that the relative intensity of the lines depends to some extent on the smoothness of the polished surface. The surface condition affects the extinction effect of the reflecting plane and accordingly the intensity of the reflected rays. As the planes in consideration have a polarity, the actual states of the surface with respect to the extinction effect may not be equal in the opposite faces, although they are carefully polished so as to give the same appearance. Thus, the apparent difference in the relative intensities of the spectral lines may be accounted for as due to the different extinction effects. Nevertheless, a difference in the definite sense above stated was always retained when apparent states of the surface were slightly varied and this would afford a means of distinguishing between the positive and negative faces.

In order to be free from such an ambiguity caused by the surface condition, the method of rotating crystal were tried using a cleavage face (110) as the reflector and one of the principal axes as the axis of rotation. In this case, the spectra reflected by (111) and ($\bar{1}\bar{1}\bar{1}$) planes appear symmetrically with respect to the principal spectrum due to ($h\ k\ 0$) planes, and they are originated in one and the same surface by the same pencil of incident rays. If, the absorption and other factors being the same for both planes, the above difference in the relative intensities still persists in this case, then it may be pretty sure that we may assign the difference to an effect of phase retardation. The experiment is still in progress, but so far as qualitatively tested, the same difference seems to exist. A further discussion will be postponed until some more quantitative results are obtained.