The dispersion phenomena of Albite from Alp Rischuna, Switzerland.

(*With Plate VII, fig.* 4.)

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Dispersion of the three principal refractive indices.

THE refractive indices of this mineral for different wave-lengths were determined by the Abbé-Pulfrich total-reflectometer. The dispersion of the glass hemisphere of the instrument was determined by the aid of a highly polished glass prism, the dispersion of the latter being found by the method of minimum deviation. In order to obtain light of definite wave-length Hilger's wave-length spectrometer was used with a Nernst lamp or an electric arc as the source of illumination.

The three principal refractive indices for sodium-light—α_{Na}, β_{Na}, γ_{Na}—were determined in the usual way, and I carefully noted the azimuths in the plate along which the corresponding critical angles were measured. These same azimuths then served for measuring the corresponding critical angles for all other wave-lengths, because in albite the dispersion of the elasticity-axes is very small and may be neglected so far as this method is concerned.

The critical angles and corresponding refractive indices for sodium-light, given in table I, were determined on seven different dates (ranging from November 1914 to January 1915). Adopting the arithmetic means, we have:—

$$\alpha_{Na} = 1{\cdot}5289$$
$$\beta_{Na} = 1{\cdot}5330$$
$$\gamma_{Na} = 1{\cdot}5392.$$

The optic axial angle computed from the above values is:—

$$2V_{\gamma} = 78^{\circ}\ 30{\cdot}5'$$

By direct observation:— $2V_{\gamma} = 78^{\circ}\ 39{\cdot}0'$.

Table I.

Observed critical angles and the corresponding Refractive Indices for sodium-light.

(Temperature 18°—20° C.)

	θ_α	α	θ_β	β	θ_γ	γ
1	53°59′25″	1·5289	54°12′ 5″	1·5330	54°31′ 7″	1·5391
2	53 59 15	1·5289	54 12 18	1·5331	54 31 51	1·5394
3	53 59 0	1·5288	54 12 15	1·5331	54 31 38	1·5393
4	53 59 7	1·5289	54 12 2	1·5330	54 31 31	1·5393
5	53 59 3	1·5289	54 12 13	1·5331	54 31 31	1·5393
6	53 59 7	1·5289	54 11 51	1·5330	54 31 15	1·5392
7	53 59 10	1·5289	54 12 1	1·5330	54 31 20	1·5392
Mean	53 59 9	1·5289	54 12 6	1·5330	54 31 29	1·5392

The critical angles for other wave-lengths were measured on two different days, and the values are given under I and II of table II.

Table II.

Observed critical angles.

(Temperature 17°—20° C.)

λ in $\mu\mu$	θ_α		θ_β		θ_γ	
	I	II	I	II	I	II
455·5	52°40′50″	...	52°54′15″	...	53°12′37″	...
486	53 6 41	53° 6′ 5″	53 19 26	53°19′33″	53 38 22	53°38′29″
508·5	53 21 22	53 21 34	53 34 30	53 34 41	53 53 7	53 53 15
527	53 32 44	53 32 21	53 45 4	53 45 5	54 4 4	54 4 3
535	53 36 37	53 36 27	53 48 54	53 49 34	54 8 26	54 8 3
554	53 45 34	53 45 16	53 58 7	53 58 2	54 17 37	54 17 1
589 (Na)	53 59 9	...	54 12 6	...	54 31 29	...
610	54 7 11	54 6 43	54 19 49	54 19 34	54 39 19	54 38 35
644	54 16 45	54 16 16	54 29 34	54 29 46	54 49 0	54 48 1
671	54 23 32	54 22 52	54 35 56	54 36 7	54 55 23	54 54 43
700	54 29 41	...	54 42 7	...	55 1 19	...

The two series of observations agree very closely; the greatest differences in the values of θ_γ occurring for the wave-lengths of 610, 644, and 671 $\mu\mu$, and in the values of θ_α for 610 $\mu\mu$. These differences do not, however, exceed one minute, which corresponds to a variation in the refractive index of about 0·0003. The arithmetic mean of each pair in the two sets of critical angles was employed in the calculation of the corresponding refractive index. The mean critical angles and their variation from those for sodium-light are given in table III; and the refractive indices and birefringencies computed from them in table IV.

Table III.

Observed critical angles (means of I and II).

λ in $\mu\mu$	θ_α	$\Delta\theta_\alpha$	θ_β	$\Delta\theta_\beta$	θ_γ	$\Delta\theta_\gamma$
455·5	52° 40′ 50″	1° 18′ 19″	52° 54′ 15″	1° 17′ 51″	53° 12′ 37″	1° 18′ 52″
486	53 6 23	52 46	53 19 29	52 37	53 38 31	52 58
508·5	53 21 23	37 41	53 34 36	37 30	53 53 11	38 18
527	53 32 33	26 36	53 45 5	27 1	54 4 4	27 25
535	53 36 32	22 37	53 49 12	22 54	54 8 15	23 14
554	53 45 25	13 44	53 58 5	14 3	54 17 16	14 13
589	53 59 9	0 0	54 12 6	0 0	54 31 29	0 0
610	54 6 56	7 47	54 19 43	7 37	54 39 2	7 33
644	54 16 31	17 22	54 29 40	17 34	54 48 36	17 7
671	54 23 12	24 3	54 36 2	23 56	54 55 3	23 34
700	54 29 41	30 32	54 42 7	30 1	54 1 19	29 50

Table IV.

Refractive Indices and Birefringencies.

(Temperature 17°—20° C.)

λ in $\mu\mu$	α	β	γ	$\gamma-\alpha$	$\gamma-\beta$	$\beta-\alpha$
455·5	1·5373	1·5419	1·5481	0·0108	0·0062	0·0046
486	1·5347	1·5391	1·5455	0·0108	0·0064	0·0044
508·5	1·5331	1·5374	1·5435	0·0104	0·0061	0·0043
527	1·5321	1·5362	1·5424	0·0103	0·0062	0·0041
535	1·5315	1·5357	1·5419	0·0104	0·0062	0·0042
554	1·5305	1·5346	1·5408	0·0103	0·0063	0·0041
589	1·5289	1·5330	1·5392	0·0103	0·0062	0·0041
610	1·5283	1·5324	1·5385	0·0102	0·0061	0·0041
644	1·5268	1·5310	1·5370	0·0102	0·0060	0·0042
671	1·5260	1·5301	1·5360	0·0100	0·0059	0·0041
700	1·5254	1·5294	1·5354	0·0100	0·0060	0·0040

The above refractive indices are plotted in Plate VII, fig. 4, in which the abscissae give the wave-lengths in $\mu\mu$ units, and the ordinates give the corresponding refractive indices of the mineral and the liquid, the latter being the curve passing through black dots. It will be noticed that the dispersions of β and γ are very slightly greater than that of α, the two former being almost equal, though there seems to be a tendency for the dispersion of γ to be the greater. The numerical values of the refractive indices obtained by the method are not, however, accurate enough for much dependence to be placed on the details of the dispersion. Table IV shows also that the dispersion of the principal birefringencies increases as the wave-length diminishes, although, again, no great dependence can be placed on the particular numbers.

Dispersion of the optic axial angle.

The optic axial angle was measured by the universal goniometer modified by Mr. A. Hutchinson, the dispersion of the liquid in which the mineral was immersed being determined by the total-reflectometer. The crystal-section was nearly parallel to the pinacoid (010); and to avoid the error arising from the obliquity of the section to the acute bisectrix, the section was immersed in a liquid—a mixture of cedarwood oil, methylene iodide, and monobromonaphthalene—whose refractive index was adjusted so as to be equal to β_{Na} of the crystal. Owing to the difference of the dispersions of the liquid and the crystal and to the difference in the inclination of the optic axes, A and B, to the crystal face, small errors enter into the observed angles 2H. These and their corrected values, 2V, in determining which the values found for the dispersions of the liquid and of β have been used, are given in table V. The changes in the optic axial angle with the wave-lengths are shown in the curves of Plate VII, fig. 4, marked 2H and 2V respectively.

Table V.

Dispersion of the optic axial angle.

(Temperature 16·2°—17·2° C.)

λ in $\mu\mu$	2H (= A $\wedge$ B)	2V	Liquid	β
486	78° 21·0′	78° 46·1′	1·5460	1·5391
508·5	78 26·0	78 43·3	1·5422	1·5374
535	78 33·0	78 43·2	1·5386	1·5357
589 (Na)	78 39·0	78 39·0	1·5330	1·5330
644	78 40·7	78 32·2	1·5287	1·5310
671	78 42·2	78 31·3	1·5271	1·5301

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