

## Reviews and Notices.

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*Sitting of the physico-mathematical section of the Royal Academy of Sciences,  
Berlin, October 18th, 1880. Rammelsberg.*

### ARTIFICIAL GAY-LUSSIT.

**O**BLIQUE crystals, consisting of one molecule of soda carbonate, one molecule of calcic carbonate, and five molecules of water, are found in nature. Bauer showed 50 years ago, that this compound crystallized from a solution of sodic carbonate, at a temperature near that of freezing. It does not, however, appear to be known that this double carbonate is produced in considerable quantity in the manufacture of sodic lyes. These crystals, more or less impure and discoloured, are deposited at a temperature of about 40° in the vessels containing crude soda lye. Smaller white crystals are formed in the towers in which carbonate dioxide is passed through the lyes, for the conversion of caustic into commercial soda.

Dr. Arzrum has made a crystallographic and optical examination of these crystals occurring—

- I. In the carbonized lye.
- II. In the clear crude soda lye.

They belong to the oblique system.

$$a : b : c = 1.4918 : 1 : 1.4471.$$

$$\beta = 78.46.$$

I. The type of these crystals is determined by the fairly equal development of faces  $\bar{1}12$ ,  $011$   $110$ : the faces  $001$  occur very seldom, and then always as slight truncations of the edges  $011$ ,  $0\bar{1}1$ . Faces of the first three forms are of equal lustre.

II. The predominant forms are  $110$ ,  $011$ ,  $001$ :—the faces of the last are frequently quite small, those of  $\bar{1}12$  always so. The faces of  $110$  are characteristically striated parallel to the edges of  $110$ ,  $011$ , and  $\bar{1}12$ : the basal plane  $001$  is generally unstriated.

The percentage composition of the compound  $(\text{Na}_2\text{CO}_3 + \text{CaCO}_3) + 5\text{Aq}$  is 33.8  $\text{CaCO}_3$ , 35.8  $\text{Na}_2\text{CO}_3$ , 30.4  $\text{H}_2\text{O}$ ; while the purest crystals yielded 32.2, 34.2, 35.1, per cent of sodic carbonate. Not only do most of the crystals, the under parts of which are grey, yield a residue containing

silica, when treated with acids, but the solution so obtained gives with ammonia a gelatinous precipitate of alumina and lime, free from phosphates.

Loss of soda in the process of manufacture has long been recognised, and this loss, due to formation of insoluble compounds, is proportional to the quantity of ash in the coal used. As this ash is mostly silica, alumina, and lime, silicates of alumina, lime, and soda must be formed in the furnace, and remain in the residues. Scheurer-Kestner considers the residues are richer in soda the greater the quantity of lime used in the manufacture, and attributes this to the formation of calcic sodic carbonate. The actual existence of this compound in the soda lyes is now proved.

T. W. D.

*On the optical characters of the plagioclase feldspars.*—(MAX SCHUSTER)—*Min. a. Petr. Mitth. G. Tschermak. Vol. III. p. 117.*—This paper contains an exhaustive examination of the optical behaviour of the triclinic feldspars—albite, oligoclase, andesite, labradorite, bytownite and anorthite. The author, starting with Tschermak's theory that all the plagioclase feldspars are mixtures of the two isomorphous feldspars, *albite* and *anorthite* (soda and lime feldspars respectively), has investigated them for the purpose of discovering whether this theory is borne out by their optical characteristics; and concludes that "the soda-lime feldspars form, with respect to their optical properties, a series similar to that of all their other properties, and every mixture, consisting of definite proportions of the ultimate terms, has corresponding optical properties, which approach either those of albite or of anorthite, according to the proportion of these constituents."

It follows from this proposition, that, given the optical behaviour of any plagioclase feldspar, its chemical composition can be at once ascertained therefrom. The character upon which the author mainly relies is the angle, which the direction of maximum extinction, in plane polarised light, forms with the planes P. and M. (001 and 010). The relations between these angles and the chemical compositions of the various feldspars (in terms of molecules of albite and anorthite) are exhibited in a diagram, and from the curves thus obtained the author deduces the following equations.

Let  $x$  be the percentage of molecules of anorthite present, and  $y$  the inclination of the direction of extinction, above referred to, expressed in degrees. Then  $y = a + bx + cx_2 + dx_3$ , where  $a$ ,  $b$ ,  $c$ , and  $d$  are constant. When  $y$  is the angle between the direction of extinction and P, the equation becomes,

$$y - 5 = 0.1752x + 0.001457x_2 - 0.00003905x_3.$$

whereas when  $y$  is referred to  $M$  it becomes

$$y = 20 - 0.5062x - 0.008121x_2 + 0.00007483x_3.$$

It is thus possible, given  $x$  to find  $y$  or *vice versa*, and thus the chemical composition of any plagioclase felspar is determinable from its optical behaviour; it is merely necessary to procure cleavage plates or sections parallel to  $P$  and  $M$ , to determine in them the direction of extinction, and  $y$  being thus known, to calculate from it and from the above equations the percentage of albite and anorthite which it contains.

The author finally concludes that his observations prove the truth of Tschermak's theory, and also confirm the view of Senarmont, that the optical characters of a composite salt are variable, and approximate to those of its predominating constituent.

H. L.

**MINERALOGICAL OBSERVATIONS.**—*On the crystallographic and optical properties of Piedmontite*—(H. LASPEYRES,) *Zeitsch. f. Kryst. un. Min. P. Groth*, vol. IV, 5. p. 435,—The author devotes the present paper to an examination of the physical properties of the Piedmontite (Manganiferous epidote) from St. Marcel, the chemical composition of which he has previously communicated in vol. III., p. 525 of the *Zeitschrift* for 1879.

The conclusions he arrives at are:—

1. Piedmontite is a true epidite.
2. Its crystallographic and optical characters approach very closely to those of pistacite, excepting only the absorption of light, which is, generally speaking, complementary to that exhibited by pistacite.

*Crystallographic characters*—From a number of determinations the author deduces the following axial relations for piedmontite :

$$a : b : c = 1.6100 : 1 : 1.8326 \quad \beta = 64^\circ 39'.$$

The prismatic crystals are bounded by the planes  $\frac{1}{2}P \infty (102)$ ,  $\infty P \infty (100)$ , which predominate; and  $oP (001)$ , less extensively developed. All the planes are rounded and striated by oscillatory combinations,  $oP$  being the smoothest and the most brilliant.

*Optical characters*—In a section of piedmontite, cut perpendicularly to the axis of symmetry, and in which the two cleavages form an angle of  $64^\circ 46'$ , the angle, which one of the axes of elasticity, lying in the obtuse angle between the crystallographic axes  $a$  and  $c$ , makes with the clinaxis  $a$  is

32° 47' for the Lithium flame

32° 2' for the Sodium flame.

The second axis of elasticity therefore makes with the vertical axis  $c$  an angle of

7° 26' for the Lithium flame.

6° 41' for the Sodium flame.

and it lies in the acute angle between the crystallographic axes  $a$ , and  $c$ , at least for light rays of low refrangibility. The dispersion is thus unusually strong, the difference between the lithium and sodium flames amounting to 0°45'.

*Pleo-chroism*.—A section perpendicular to the axis of maximum elasticity [a] is dark-bluish red in ordinary daylight, and shews the maximum amount of absorption of light. In polarised light, this color is decomposed into a dark amethyst, for vibrations parallel to the axis of medium elasticity [b]; and a dark blood-red, parallel to the axis of minimum elasticity [c].

The section perpendicular to [b] is of a bright orange-red in day-light, and shows the least absorption of light. In polarised light parallel to [c] the section shews the above-named dark bluish-red colour; and, parallel to [a], bright orange.

The section perpendicular to [c] is dark yellowish red in ordinary daylight, with medium absorption. In polarised light parallel to [a] it appears bright orange, and parallel to [b] dark amethyst.

Moreover the directions of the "axes of absorption" (*i. e.* the directions in which the differences of colour attain a maximum) do not coincide with the axes of elasticity, except in the case of the axis of symmetry; and in the plane of symmetry the axes of absorption are perpendicular to each other, and form with the axes of elasticity an angle of about 20°.

Piedmontite is positively birefringent, the angle between the optic axes, and the index of refraction being both very great.

With respect to the twinning of piedmontite, the twins are always polysynthetic and lamellar, analogous to those of the plagioclase feldspars; the twin plane being mostly  $\infty P\infty$  (100).

H. L.