

NOTE ON THE SYMMETRY OF ORTHOCLASE

BY
TOM. BARTH

Since the pointing out of the triclinic symmetry of microcline by DESCLOIZEAUX¹, the question has arisen, whether the orthoclase were a monoclinic form of potash feldspar, or its monoclinic symmetry were due to submicroscopic, repeated (lamellar) twinning of the triclinic form.

There is till yet no evidence forthcoming, which might permit a definite decision of this matter. Indeed, according to my opinion, the X-ray investigations, carried out by HADDING² admit of no doubt whatever, that the potash feldspar is „poly-synthetical“ (TUTTON)³ and not polymorpheous. His results have, however, been doubted especially by American investigators, and I shall therefore in the following communicate further data, which confirm the conclusion of HADDING.

HADDING has shown that microcline and orthoclase have identical Laue diagrams. This is, however, a truth with a difference. It is true, that the ordinary cross-hatched microcline, gives Laue diagrams being complete similar to those of orthoclase. But when using a simple microcline, that is a microcline consisting of a single crystal individual, and thus without the common crosshatching on (001), we obtain a some what different Laue diagram.

In Fig. 1 there is shown a reproduction of a Laue photograph of a simple microcline. The photographs were produced

¹ A. DESCLOISEAUX, *Ann. d. chim. et physique* (5), 9, 459 (1876).

² A. HADDING, *Lunds Universitets Årsskrift* II, 1921, no. 6.

³ TUTTON, *Crystallography* p. 1263.

by passing the X-rays normal to the (001) plane of the crystal, the axes a and b thus lying in the drawing plane (monoclinic symmetry provided). The distance from crystal to the photographic plate was 4 cm. the tube potential was 67 kilovolt, the exposure 6 milliampere-hours.

As is seen from the figure, the geometrical arrangement of the spots corresponds to a monoclinic symmetry. This might also have been expected, for according to the crystallographic

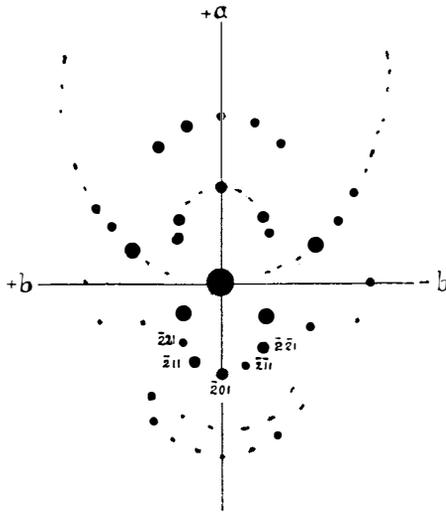


Fig 1.

Reproduction of a Laue photograph of a simple microcline taken with the X-rays nearly perpendicular to the (001) face. The size of the black circles is roughly proportional to the intensity of their corresponding spots on the photographic plate.

measurements, the deviations from a monoclinic symmetry are so small, that they cannot well appear on an ordinary Laue photograph.

Never the less, this photograph exhibits a triclinic symmetry, for corresponding crystal planes, on each side of the monoclinic symmetry plane do not appear with equal intensities on the Laue photograph.

To exemplify this, we shall regard the spots of the zone $\{102\}$ the indices of which have been written in the figure.

Thus the intensities of the reflections of the planes $(\bar{2}11)$ and $(\bar{2}\bar{2}1)$ are greater than those of $(\bar{2}\bar{1}1)$, and $(\bar{2}21)$, consequently the plane $(\bar{2}11)$ is a pinacoid, physically different from the pinacoid $(\bar{2}\bar{1}1)$, for if the crystal had been monoclinic these planes should both belong to a common prism, and thus physically be identical.

On a photograph of a cross-hatched microcline, which inter alia is twinned according to the albite law, the reflection from e. g. $(\bar{2}11)$ must now fall to the right, now to the left of the median plane, because of the opposite orientations of the different crystal individuals. But as the deviation from the triclinic symmetry is very small, the reflection of $(\bar{2}11)$ will almost exactly cover the reflection of $(\bar{2}\bar{1}1)$ ¹ and consequently the Laue photograph must exhibit monoclinic symmetry, as actually has been shown by HADDING.

I conclude therefore:

As each and all of the spacings of microcline, as accurate as they can be determined on an ordinary Laue photograph, are equal to the corresponding spacings of orthoclase, these two minerals cannot be different modifications of potash feldspar.

But as the orthoclase gives a Laue photograph identical with that of a cross-hatched microcline, the former must consist of submicroscopically twinned lamellae of the latter.

For the investigation of the single microcline, material has been placed at my disposal by Mr. OLAF ANDERSEN at Norges Geologiske Undersøkelse.

¹ The discrimination of the two said reflections may in reality easily be made, a fact, to which I shall return in a following publication.

Mineralogical Institute of the University,
Oslo, May 31st, 1927.