

BOZIDAR ŠTURMAN

TITANITE FROM THE KIŠELOVEC CREEK IN
THE SOUTH PART OF THE PAPUK MOUNTAIN

With 1 Text - figure

In 1959, as a member of the expedition lead by Professor Dr. Luka Marić and Dr. Branko Crnković, I took part in the elaboration of a geological map of Papuk. In the northern part of the Kišelovec creek area, in the vicinity of Velika, a skarn has formed on the contact between a small lens of limestone and a granitic rock. In the endoskarn, beside the microcline, albite, quartz, diopside and apatite, also well developed titanite crystals were noted, having the characteristic appearance of a letter envelope and reaching up to 3 mm. in size.

The measuring of the mentioned titanite crystals was performed by a large goniometer of the Stoe-Heidelberg make. A close examination has established the presence of the following forms : $y(001)$, $P(100)$, $r(110)$, $a(102)$, $x(205)$, $f(101)$, $k(114)$, $S(3 \cdot 3 \cdot 10)$, $p(113)$, $z(112)$, $n(111)$ and (722) , i. e., 12 forms in all, out of which the form (722) appears to be an absolute titanite novelty.

The measuring was performed on two crystals. With one of them the following results were obtained:

In the two last columns on the right values for single faces have been stated as corresponding to axial titanite ratios $a:b:c = 0,7547 : 1 : 0,8540$ and $\beta = 119^{\circ} 43'$ (Goldschmidt V. 1897, pages 344-346). The appearance of crystals can be seen in Fig. 1.

On the second of the measured crystals the following forms have been found : $y(001)$, $P(100)$, $r(110)$, $a(102)$, and $n(111)$.

Form (722) , entered into the Table under No. 13, has not been described in the so far published literature on the subject; hence, it is novel for titanite. On the crystal it appears on two faces, $(\bar{7}22)$ and (722) .

Face	Symbol	Established by measuring		Calculated values	
		φ	ϱ	φ	ϱ
1	(001)	89° 56'	30° 33'	90° 00'	29° 43'
2	(205)	89° 55'	47° 29'	90° 00'	47° 31'
3	(101)	89° 16'	62° 31'	90° 00'	61° 54'
4	(100)	90° 35'	89° 48'	90° 00'	90° 00'
5	(100)	269° 54'	89° 48'	270° 00'	90° 00'
6	($\bar{1}\bar{1}\bar{1}$)	114° 01'	64° 14'	114° 30'	64° 06'
7	(111)	66° 52'	64° 36'	65° 30'	64° 06'
8	(110)	236° 56'	89° 46'	236° 45'	90° 00'
9	($\bar{1}\bar{1}\bar{4}$)	103° 10'	42° 21'	103° 24'	42° 40'
10	(112)	72° 00'	51° 35'	70° 45'	52° 19'
11	(113)	74° 31'	46° 57'	74° 11'	46° 14'
12	(3 · 3 · 10)	75° 14'	44° 21'	75° 05'	44° 52'
13	($\bar{7}\bar{2}\bar{2}$)	99° 06'	79° 23'	99° 27'	79° 07'

Also angles (100) : ($\bar{7}\bar{2}\bar{2}$) and ($\bar{1}\bar{0}\bar{0}$) : ($\bar{7}\bar{2}\bar{2}$) were directly determined by measuring, and the following values resulted:

$$(100) : (\bar{7}\bar{2}\bar{2}) = 13^{\circ} 26'$$

$$(\bar{1}\bar{0}\bar{0}) : (\bar{7}\bar{2}\bar{2}) = 14^{\circ} 27'$$

$$\text{The mean value } \frac{13^{\circ} 56' + 14^{\circ} 27'}{2} = 13^{\circ} 56'$$

The signals of both newly found faces were clear; it should be pointed out, though, that the signal emitted by one of them was slightly doubled.

Now, if we try to determine the magnitude of this angle from the calculated values φ and ϱ , we shall get the value of

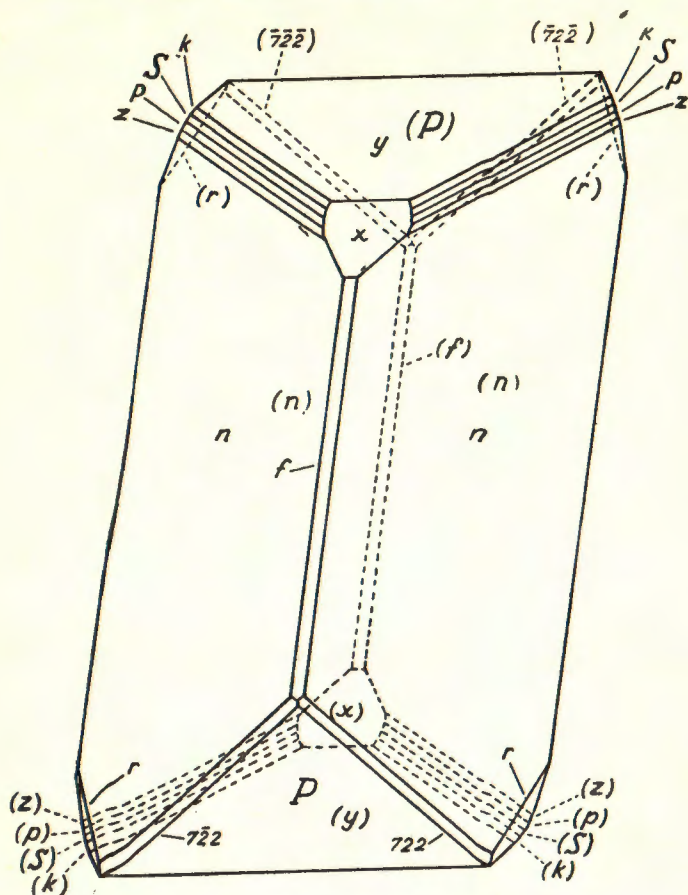
$$(100) : (\bar{7}\bar{2}\bar{2}) = 14^{\circ} 21'$$

From the forms described in literature so far, nearest to form ($\bar{7}\bar{2}\bar{2}$) would be (311) and (511), determined for the first time by C. Hlawatsch (1918), and A. Bianchi (1916) (see: L. Oberföll, 1931, p. 351). From position angles φ and ϱ of these forms, as stated by L. Oberföll (1931, p. 359), respective angles can be determined:

$$(311) : (100) = 16^{\circ} 26'$$

$$(511) : (100) = 10^{\circ} 31'$$

The stated angles differ from the values obtained by measuring face ($\bar{7}\bar{2}\bar{2}$), respectively ($\bar{7}\bar{2}\bar{2}$), against face (100), respectively ($\bar{1}\bar{0}\bar{0}$), of the titanite crystal found in the Kišelovec creek. These results are a further proof that in the mentioned crystal of titanite (whose measured values are given in the Table), a really new form occurs.



At this place I wish to express my gratitude to Professor Dr. Ljudevit Barić, who enabled me to work with to goniometer, acquainted me with the methods of the work, and often helped me by his expert advice in the course of my study.

Received 4th March 1964.

Institute for Chemistry
and Technology of
Silicates
Zagreb, Srebrnjak 169

REFERENCES

- Goldschmidt V. (1897): Kristallographische Winkeltabellen. Berlin.
 Oberföhl L. (1931): Über Titanit. Neues Jahrb. Miner., Geol., Paläontol., Abt. A. Beil.-Bd. 62, 331-333.

B. ŠTURMAN

TITANIT IZ POTOKA KIŠELOVEC U JUŽNOM DIJELU
 PAPUKA

Godine 1959. sudjelovao sam na izradi geološke karte Papuka u ekipi prof. dr. Luke Marića i dr. ing. Branka Crnkovića. U sjevernom dijelu područja potoka Kišlovec kraj Velike, na kontaktu između male leće vapnenca i granitne stijene nastao je skarn. U endoskarnu se osim mikroklina, albita, kremenca, diopsida i apatita nalaze lijepo razvijeni kristali titanita, koji imaju karakterističan oblik pismovnog omota (oblik kuverte), a veliki su do 3 mm.

Na velikom dvokružnom refleksnom goniometru firme Stoe - Heidelberg izvršeno je mjerenje tih kristala titanita. Na temelju izvršenih mjerenja utvrđene su na njima ove forme: $y(001)$, $P(100)$, $r(110)$, $a(102)$, $x(205)$, $f(101)$, $k(114)$, $S(3 \cdot 3 \cdot 10)$, $p(113)$, $z(112)$, $n(111)$ i (722) . Ukupno dakle, 12 forma od kojih je forma (722) potpuno nova za titanit.

Mjerenja su izvršena na dva kristala. Na jednom od njih dobiveni su rezultati prikazani u tabeli. U krajnja dva stupca tabele navedene su vrijednosti za φ i ρ za pojedine plohe onako, kako to odgovara osnim elementima titanita $a:b:c = 0,7547:1:0,8540$ i $\beta = 119^\circ 43'$ (Goldschmidt V. 1897., str. 344-346). Izgled kristala vidi se iz slike 1.

Na drugom od izmjerenih kristala utvrdio sam ove forme: $y(001)$, $P(100)$, $r(110)$, $a(102)$ i $n(111)$.

Forma (722) navedena u tabeli pod brojem 13 ne spominje se u dosad poznatoj literaturi; ona je dakle nova za titanit. Na kristalu ona se javlja sa dvije plohe (722) i (722) .

Mjerenjem je i direktno određena veličina kuta $(100):(722)$ i $(100):(722)$. Dobile su ove vrijednosti:

$$\begin{aligned} (100):(722) &= 13^\circ 26' \\ (100):(722) &= 14^\circ 27' \\ \text{Srednja vrijednost} &= 13^\circ 56' \end{aligned}$$

Signali obih novih ploha bili su dobri uz napomenu, da je signal jedne od njih bio slabo udvojen.

Pokušamo li iz proračunatih vrijednosti φ i ρ iz tabele, odrediti veličinu toga kuta dobit ćemo vrijednost

$$(100):(722) = 14^\circ 21'$$

Od forma koje se dosad spominju u literaturi, najbliže bi formi (722) bile forme (311) i (511) , koje su prvi puta odredili C. Hlawatsch (1918) odnosno A. Bianchi

(1916) (prema L. Oberföhl 1931., str. 351). Iz pozicionih kutova φ i ϱ tih formi, kako ih navodi L. Oberföhl (1931., str. 359) mogu se izračunati kutovi

$$(311) : (100) = 16^{\circ} 26'$$

$$(511) : (100) = 10^{\circ} 31'$$

Ovi kutovi se razlikuju od vrijednosti dobivenih mjerenjem za plohe $(\bar{7}2\bar{2})$ odnosno $(7\bar{2}\bar{2})$ prema plohi (100) odnosno $(\bar{1}00)$ na kristalu titanita iz potoka Kišlovac. I ovi rezultati potvrđuju, da se na spomenutom kristalu titanita, za koji su rezultati mjerenja dani u tabeli, doista javlja nova ploha.

Na kraju želio bih izraziti svoju duboku zahvalnost dr Ljudevitu Bariću, koji mi je omogućio rad na goniometru, upoznao me sa tehnikom rada na instrumentu i često savjetom pomogao tokom rada.

Primljeno 4. III 1964.

Institut za kemiju i tehnologiju
silikata
Zagreb, Srebrnjak 169