

CRYSTALS OF BERYL FROM TACHINGSHAN MOUNTAIN,

SUIYUAN PROVINCE.

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OCCURRENCE.

In 1918 Dr. W. H. Wong heard of the occurrence of beryl crystals in Tachingshan, north of Kueihua, from where the crystals were sent to Peiping, but he did not find the exact place of occurrence. Mr. H. T. Chang mentioned in his "Lapidarium Sinicum" that some of the Piyase in the Peiping market is not tourmaline but beryl and, this mineral was said to come from Tachingshan of Suiyuan. In 1930, I found one large crystal of Beryl from the local shop of precious stones. Almost at the same time, Mr. C. C. Sun, my colleague of the National Geological Survey, travelling in the area north of Kalgan discovered a locality where beryl crystals occur *in Situ*.

The locality found by Mr. Sun as shown in the accompanying map is near the ridge which serves the boundary line between Hsinho (興和) and Changpei (張北) districts, and is on the Hsinho side (Fig. 1). It is situated at about 20-25 li NE. of the Hsinho district city. It is equally distant from the two villages of Taliangshang on the SW. and Ertaopei on the NE. The geographic position is approximately long. E. $113^{\circ} 47'$, Lat. N. $41^{\circ} 14'$. The general name of the mountains is also Tachingshan, but it is not the Tachingshan proper north of Kueihua which has been geologically studied by Dr. W. H. Wong and subsequently by Mr. C. C. Wang.¹ The district of Hsinho formerly was under Chahar province, but only recently incorporated into Suiyuan province. This locality in Hsinho district is thus clearly a new one and can not be the same as the Suiyuan locality from which Mr. Chang and I have seen crystal specimens in Peiping.

1. 2nd edition p. 75.

2. C. C. Wang, geology of the Tachingshan and its coal fields Bull. Geol. Surv. China, No. 10, 1928 with map.

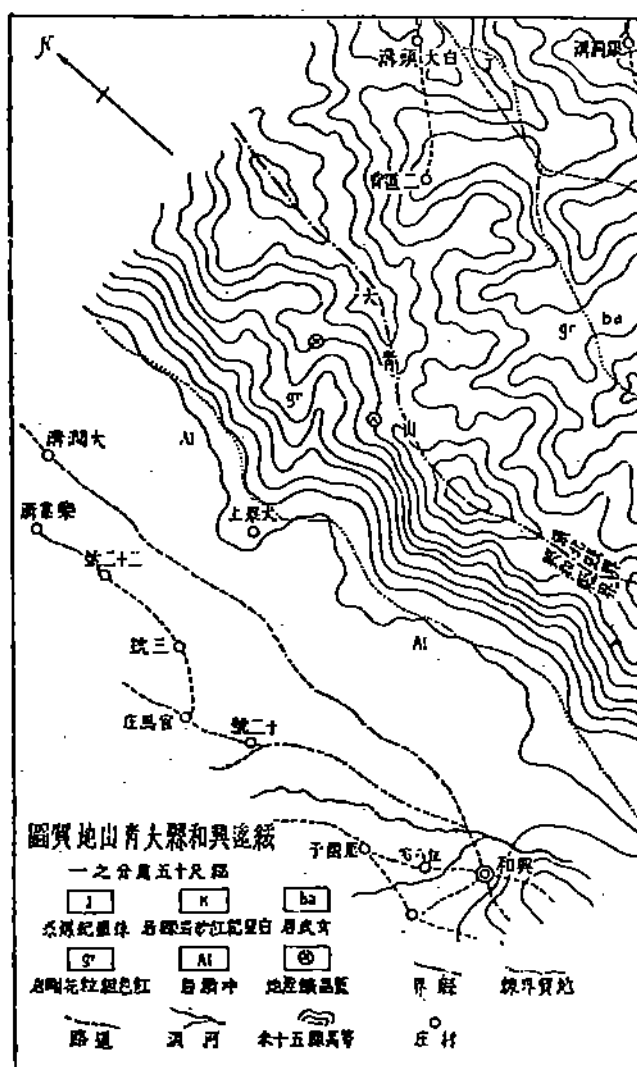


Fig. 1. Geological map of Tachingshan of Hsinho Hsien, Suiyuan Province.

From the above mentioned facts, it seems clear that there exist several localities in the Tachingshan of Suiyuan and that part of the same name which formerly belonged to Chahar. As however the easternmost beryl locality is now

incorporated in Suiyuan province, all the area from where beryl is known to occur can be covered by the general name Tachingshan of Suiyuan.

From Mr. C. C. Sun's observation, the region where he discovered beryl crystal largely consists of coarse grained biotite granite which is partly covered on the NE. by Mesozoic sediments and basalt lava of Tertiary age. The granite contains irregular "geoid" like cavities varying from a few inches to two or three meters in size. These cavities are filled up partly or entirely with red clay. Crystals of quartz and beryl grow on the inner surface of the cavities and are only visible when freed from the covering clay.

I wish to express here my thanks to Mr. Sun for his verbal communication on the occurrence of the beryl crystals which we have found for the first time in field. The following will be a crystallographic description of the crystals collected by Mr. Sun and the one which I bought in Peiping.

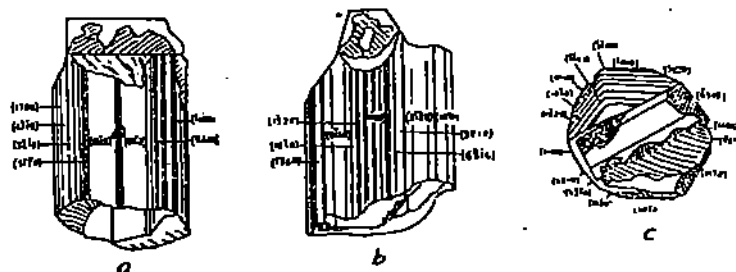


Fig. 2.

No. 1 Beryl crystal bought at Peiping.

This is a large crystal which probably came from the Tachingshan proper of Suiyuan in the old sense and not exactly from the same locality as following ones.

It is a beautiful crystal 43 mm high and 25 mm in diameter with vitreous to adamantine luster. The specific gravity is 2.66. It is bluish green in color. Basal cleavage distinct.

The crystal shows three forms of prisms viz: M ($10\bar{1}0$), I ($51\bar{6}0$) and E ($21\bar{3}0$). The association of the several forms of prismatic faces and the presence of vertical striations made the goniometric measurements not very easy. No pyramidal faces are present, but on the top of the large crystal is associated a smaller one at right angle one with the other. The latter is in hexagonal prism about 25 mm in length (fig. 2).

The following measurements have been taken from the main crystal.

$M M^I$	$(10\bar{1}0) \wedge (01\bar{1}0)$	$60^\circ 15'$
$M^I M^{II}$	$(01\bar{1}0) \wedge (\bar{1}100)$	$59^\circ 49'$
$M^{II} M^{III}$	$(\bar{1}100) \wedge (1010)$	$60^\circ 24'$
$M^{III} M^{IV}$	$(\bar{1}010) \wedge (0\bar{1}10)$	$60^\circ 16'$
$M^{IV} M^V$	$(0\bar{1}10) \wedge (1\bar{1}00)$	$60^\circ 25'$
$M^{II} E^{III}$	$(\bar{1}100) \wedge (\bar{5}6\bar{1}0)$	$9^\circ 15'$
$M^{II} E^{IV}$	$(\bar{1}100) \wedge (\bar{6}510)$	$9^\circ 3'$
$M^{III} E^{VII}$	$(\bar{1}010) \wedge (\bar{1}\bar{5}60)$	$51^\circ 10' (60^\circ - 51^\circ, 10' = 8^\circ 50')$
$M^{IV} E^{VIII}$	$(0\bar{1}10) \wedge (1\bar{6}50)$	$8^\circ 57'$
$M^V E^{IX}$	$(1\bar{1}00) \wedge (5\bar{6}10)$	$9^\circ 2'$
$M^{III} I^V$	$(\bar{1}010) \wedge (3120)$	$19^\circ 32'$
$M^{III} I^{VI}$	$(\bar{1}010) \wedge (2\bar{1}30)$	$19^\circ 5'$
$M^V I^{VIII}$	$(1\bar{1}00) \wedge (1\bar{3}20)$	$42^\circ 38' (60 - 42^\circ 38' = 17^\circ 22')$
$M^V I^X$	$(1\bar{1}00) \wedge (32\bar{1}0)$	$18^\circ 58'$
$M^I I^{XI}$	$(10\bar{1}0) \wedge (31\bar{2}0)$	$19^\circ 38'$

No. 2. *Beryl crystal from N. of Hsinho district.*

This is the largest one among the beryl crystals collected by Mr. C. C. Sun from N. of Hsinho district. It is of a beautiful blue color, but not so transparent as the one above described. The prismatic faces are much corroded though still easily recognized. The crystal is 42 mm high and about 15 mm in diameter.

The crystal is broken at the two ends and therefore only prismatic faces are preserved including all the six faces of the hexagonal prism M ($10\bar{1}0$) almost equally developed with only one face A ($11\bar{2}0$) in a narrow band between M ($10\bar{1}0$) and M^V ($01\bar{1}0$). All the four faces M ($10\bar{1}0$), M^I ($01\bar{1}0$), M^{II} ($\bar{1}100$) and M^{III} ($\bar{1}010$) are still brilliant with a vitreous to adamantine luster, but the two other ones M^{IV} ($0\bar{1}10$) and M^V ($1\bar{1}00$) are more corroded. The angles between the faces of the first hexagonal prism are all measured by goniometer are all about 60° . The measured angle between M and A or ($10\bar{1}0$) ($11\bar{2}0$) is $31^\circ 40'$, (See fig. 3).

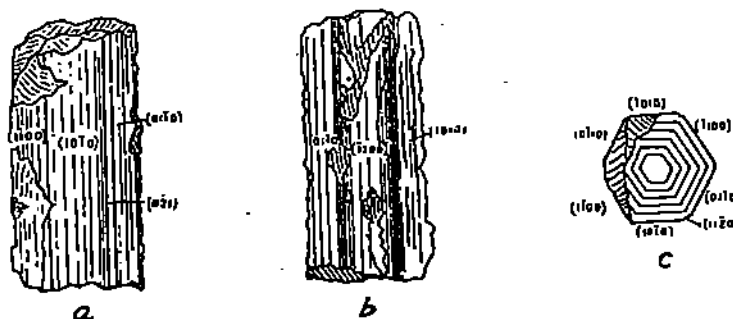


Fig. 3.

On the basal cleavage plane, can be seen the zonal structure resulting from the successive growth of the hexagonal prism. (fig. 3 c).

The specific gravity of this crystal has been determined as 2.61 while all the others studied in this paper have a specific gravity above 2.66. The particular lightness of this crystal is probably explained by its being more deeply corroded and possessing a somewhat porous character.

No. 3. Beryl crystal from N. of Hsinho district.

This is a truncated crystal, 21-25 mm in diameter and 13 mm in height. The prismatic faces (fig. 4 a) are much corroded so that goniometric measurement becomes difficult. However the following faces can be recognized: viz:

$$M (10\bar{1}0) M^I (01\bar{1}0) M^{II} (\bar{1}100) M^{III} (\bar{1}010) M^{IV} (0\bar{1}10) M^V (1\bar{1}00) \\ A^I (\bar{1}210) A^{II} (2110) A^{III} (\bar{1}\bar{1}20) \text{ and } A^{IV} (1\bar{2}10)$$

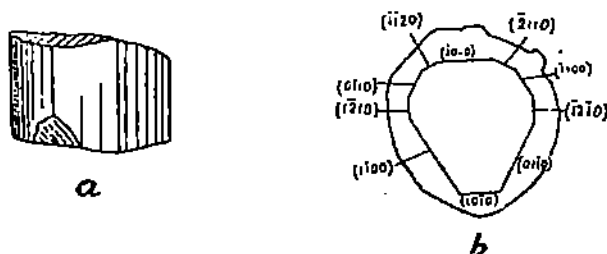


Fig. 4.

The crystal is of light green color and almost transparent. Viewed by transmitted light, the crystal shows a nucleus (fig. 4 b) in irregular hexagonal form. It seems thus that the crystal has been a first a hexagonal prism of first order with its six faces unequal developed. Then it continues to grow with development of the prisms M and A in different direction from the nucleus of crystal.

The specific gravity is particularly high 2.687.

No. 4. *Beryl crystal from N. of Hsinho district.*

This is also a truncated crystal of the same color and with similar corroded prismatic faces as the one previously described under No. 3. It is 18 mm high and 15 mm in diameter. Besides the prisms M ($10\bar{1}0$) and A ($11\bar{2}0$) this crystal has a third prism I ($12\bar{3}0$). The angles measured are as follows.

$$M^{III} I^{IV} (\bar{1}010) \wedge (\bar{3}210) \quad 41^\circ 7' (60^\circ - 41^\circ 7' = 18^\circ 53')$$

$$M^{III} I^{VII} (0110) \wedge (\bar{2}130) \quad 41^\circ 58' (60^\circ - 41^\circ 58' = 18^\circ 2')$$

The complete of the faces present is as follows:

$$\begin{aligned} &M (10\bar{1}0) \quad M^I (01\bar{1}0) \quad M^{II} (\bar{1}100) \quad M^{III} (\bar{1}010) \quad M^{IV} (0110) \\ &M^V (11\bar{2}0) \quad A (11\bar{2}0) \quad A^I (\bar{1}2\bar{1}0) \quad A^{IV} (12\bar{1}0) \quad A^V (21\bar{1}0) \\ &I^{IV} (\bar{3}210) \text{ and } I^{VII} (\bar{2}130) \end{aligned}$$

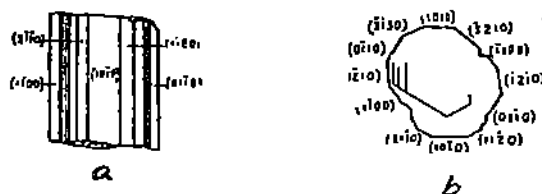


Fig. 5.

The specific gravity is also in this case very high 2.699.

No. 5. *Beryl crystal from N. of Hsinho district.*

The truncated crystal has its prismatic faces more brilliant, being free from corrosion. It is 15 mm high and 11 mm in diameter. The color is more distinctly blue. The general shape of the crystal is a simple hexagonal prism (fig. 6) but one of the faces is complicated by the association with two narrow faces of I and E. As orientated in fig. 6 b, the faces would have the following notations with the corresponding measured angles.

$$M^{III} \quad I^{IV} \quad (\bar{1}010) \wedge (\bar{3}210) \quad 41^\circ 48' (60^\circ - 41^\circ 48' - 18^\circ 12')$$

$$M^{III} \quad E^V \quad (\bar{1}010) \wedge (\bar{6}150) \quad 8^\circ 48'$$

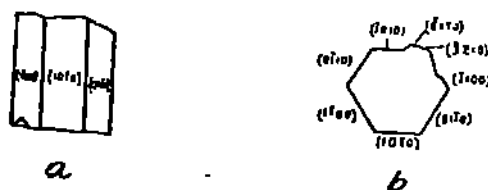


Fig. 6.

The specific gravity is determined as 2.695.

No. 6. *Beryl crystal from N. of Hsinho.*

This is also one of the crystals collected by Mr. C. C. Sun. It is a hexagonal prism 46 mm. long and only 4 mm. in diameter. The slender prism is entirely transparent with a very light bluish green tint, and is of a real beauty.

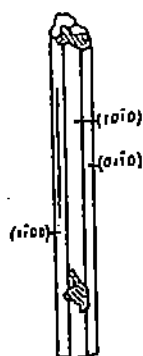


Fig. 7.

The specific gravity is 2.685.

The prismatic faces identified from the above described six crystals of beryl may be summarised (see also fig. 8) by the following table:

Crystal No.		Prismatic faces		
			I ($3\bar{1}20$)	E ($6\bar{1}50$)
No. 1	M ($10\bar{1}0$)			
No. 2	M ($10\bar{1}0$)	A ($1\bar{1}20$)		
No. 3	M ($10\bar{1}0$)	A ($1\bar{1}20$)		
No. 4	M ($10\bar{1}0$)	A ($1\bar{1}20$)	I ($3\bar{1}20$)	
No. 5	M ($10\bar{1}0$)		I ($3\bar{1}20$)	E ($6\bar{1}50$)
No. 6	M ($10\bar{1}0$)			

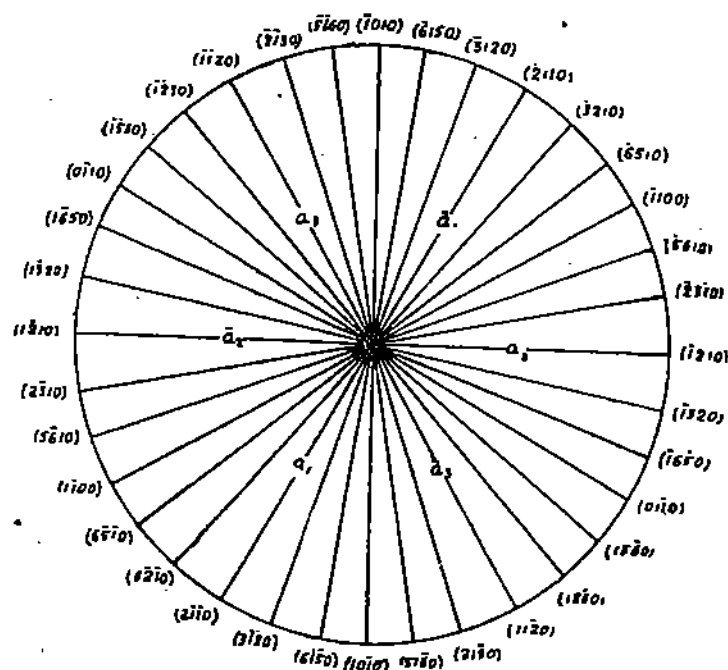


Fig. 8.

As all the crystals found are truncated at both ends, no pyramidal faces have been observed.

The comparison between the measured angles and the calculated angles for the relatively more unusual forms I and E is given in the following table:

Crystal No.	Faces	Measured angles	Calculated angles	Diff.
No. 1	ME	9° 1' 24"	8° 56' 54"	+ 3' 30"
..	MI	18° 55' 00"	19° 6' 25"	- 11' 25"
No. 4	MI	18° 27' 30"	19° 6' 25"	- 38' 55"
No. 5	..	18° 12' 00"	19° 6' 25"	- 54' 25"
..	ME	8° 49' 00"	8° 56' 54"	- 7' 54"