

## ADDITIONAL DATA ON PETARASITE FROM MONT ST. HILAIRE, QUEBEC

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### ABSTRACT

Petarasite crystals from Mont St. Hilaire, Quebec, show the following forms in decreasing order of importance:  $b$  {010},  $m$  {110},  $c$  {001},  $t$  {201},  $r$  {111},  $l$  {120} and  $a$  {100}; the indices refer to the structural cell  $P2_1/m$ ,  $a$  10.791,  $b$  14.505,  $c$  6.626 Å,  $\beta$  113.21° (Chao *et al.* 1980). The strong  $C2/m$  pseudosymmetry noted by these authors accounts for the observed order of forms, which should be symbolized 020, 110, 001,  $\bar{2}01$ ,  $\bar{1}11$ , 240, 200. A new microprobe analysis, on brown petarasite, shows a greater Cl concentration (2.5% versus 2.04% for original petarasite) and  $2V_z$  (43° versus 29°).

**Keywords:** petarasite, morphology, Mont St. Hilaire, Quebec.

### SOMMAIRE

Les cristaux de pétarasite du mont St-Hilaire (Québec) montrent les formes simples suivantes en ordre d'importance décroissante:  $b$  {010},  $m$  {110},  $c$  {001},  $t$  {201},  $r$  {111},  $l$  {120} et  $a$  {100}, où les indices se rapportent à la maille structurale:  $P2_1/m$ ,  $a$  10.791,  $b$  14.505,  $c$  6.626 Å,  $\beta$  113.21° (Chao *et al.* 1980). La pseudosymétrie  $C2/m$  notée par ces auteurs se reflète dans l'ordre d'importance observé des formes simples, lesquelles reçoivent les indices multiples suivants: 020, 110, 001,  $\bar{2}01$ ,  $\bar{1}11$ , 240, 200. Une nouvelle analyse à la microsonde électronique, sur pétarasite brune, montre une augmentation de la teneur en Cl (2.5% contre 2.04%) et de l'angle  $2V_z$  (43° contre 29° pour la pétarasite originale).

**Mots-clés:** pétarasite, morphologie, mont St-Hilaire, Québec.

### INTRODUCTION

Shortly after the announcement of the new

mineral species petarasite,  $\text{Na}_5\text{Zr}_2\text{Si}_8\text{O}_{18}(\text{OH},\text{Cl}) \cdot 2\text{H}_2\text{O}$ , crystals of remarkable quality were found at the De-Mix quarry at Mont St. Hilaire, Quebec, by Professor J.C. Sisi (Ecole polytechnique). A new microprobe analysis and new measurements of the optical properties of petarasite have been performed. These new data add to our understanding of this mineral.

### FORMS

The three crystal groups in the Sisi collection and one specimen in the Ecole polytechnique collection (EP-13191) contain crystals up to 3 cm long. The forms and crystal faces for this material are shown in Figure 1;  $\rho$ - $\phi$  angles are given in Table 1.

In their original description, Chao *et al.* (1980) found that systematic extinctions on X-ray photographs are consistent with the space groups  $P2_1$  and  $P2_1/m$ ; furthermore, the crystal-structure analysis of Ghose *et al.* (1980) shows that  $P2_1/m$  is the correct space group. Chao *et al.* (1980) also noted "a strong pseudo- $C2/m$  symmetry".

Our morphological observations certainly favor the centrosymmetric space group; doubly terminated crystals are common. As for the order of importance, the strong pseudosymmetry seems to prevail; with a  $C2/m$  cell, the order of importance of crystal faces would be (110), (010), (001), ( $\bar{1}11$ ), ( $\bar{2}01$ ), (100) and (120). Based on our few observations, the order of importance of crystal forms is (010), (110), (001), ( $\bar{2}01$ ), ( $\bar{1}11$ ), (120) and (100). The three inversions (110) and (010), ( $\bar{2}01$ ) and ( $\bar{1}11$ ), (100) and (120) are benign, as for each of these three pairs, the reticular densities are nearly equal, as is the importance of oc-

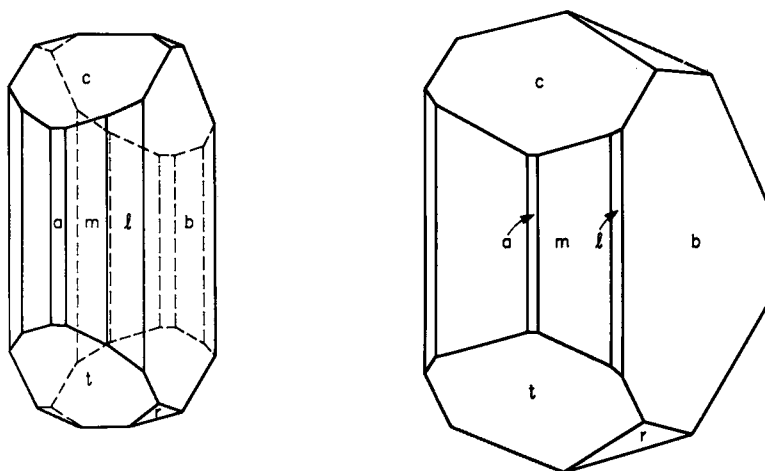


FIG. 1. Crystal forms of petarasite from Mont St. Hilaire, Quebec.

TABLE 1.  $\rho$ - $\phi$  ANGLES FOR PETARASITE FROM MONT ST-HILAIRE, QUEBEC

	hkl	$\phi$ calc.(1)	$\phi$ obs.	$\rho$ calc.(*)	$\rho$ obs.
c	001	90.00 <sup>0</sup>		23.21 <sup>0</sup>	23.5 <sup>0</sup>
b	010	0.00		90.00	
a	100	90.00		90.00	
m	110	55.64	55.5	90.00	
l	120	36.21	36.5	90.00	
t	201	-90.00		42.21	42.5
r	111	-27.74		27.30	27.5

\* Calculated from cell dimensions by Chao *et al.* (1980):  $P2_1/m$ ,  $a = 10.791$ ,  $b = 14.505$ ,  $c = 6.626\text{\AA}$ ,  $\beta = 113.21^{\circ}$

TABLE 2. ELECTRON-MICROPROBE ANALYSIS OF PETARASITE FROM ST-HILAIRE, QUEBEC

SiO <sub>2</sub>	42.1 %	Si <sup>4+</sup>	6.00
TiO <sub>2</sub>	n.d.	Zr <sup>4+</sup>	2.09
ZrO <sub>2</sub>	30.0	Na <sup>+</sup>	4.81
Na <sub>2</sub> O	17.4	Ca <sup>2+</sup>	0.08
K <sub>2</sub> O	0.04	K <sup>+</sup>	0.01
CaO	0.49	Cl <sup>-</sup>	0.61
Cl	2.5	(OH) <sup>-</sup>	0.02
H <sub>2</sub> O(*)	5.91	O <sup>2-</sup>	0.37
	98.44	H <sub>2</sub> O	2.8
Cl-0	0.56		
Total	97.88		

\* Weight loss at 1100<sup>0</sup>C less Cl.

currence. In terms of the  $C2/m$  cell, the forms observed should be symbolized 020, 110, 001,  $\bar{2}01$ ,  $\bar{1}11$ , 240 and 200.

#### CHEMICAL FORMULA AND OPTICAL PROPERTIES

Results of a new microprobe analysis (Table 2) shows a significant difference in Cl content compared with the original; this material is brown (the original material was greenish yellow). Standards used are the same as those reported by Chao *et al.* (1980); the previously analyzed petarasite specimen was used as an internal standard. Indices of refraction are  $\alpha$  1.595,  $\beta$  1.600 and  $\gamma$  1.631, all  $\pm$  0.001. The optic angle differs significantly from the original reported value:  $2V_z = 43^{\circ}$  in the present observations versus  $29^{\circ}$  in the original (Chao *et al.* 1980).

#### ASSOCIATIONS

Well-developed petarasite crystals occur in cavities within pegmatitic veins of the nepheline syenite. The following minerals were noted in the same cavity with petarasite crystals: natrolite, rhodochrosite, catapléite, aegirine, calcite, microcline, ancylite, fluorite, astrophyllite, eudialyte, albite and arfvedsonite.

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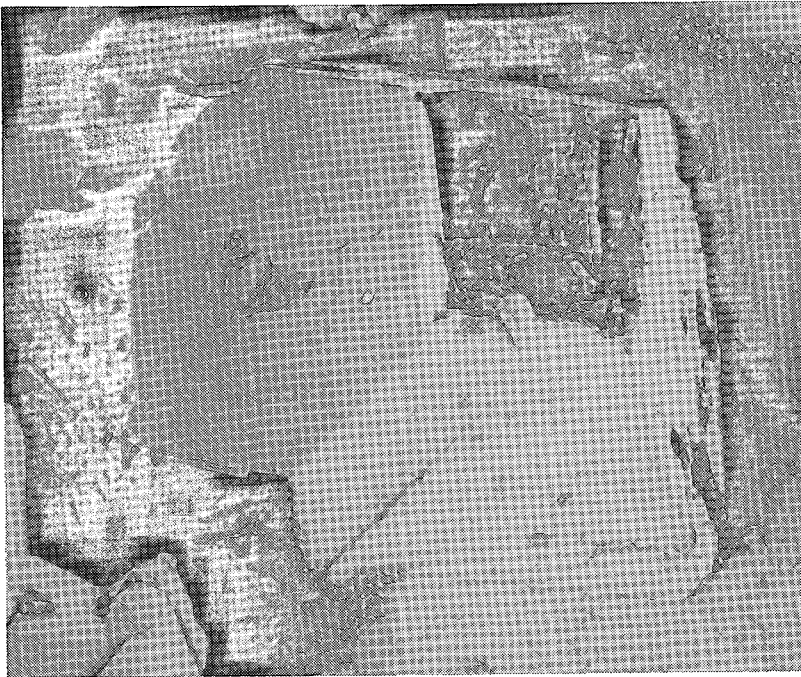
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Pseudotrigonal termination on a weloganite crystal from the Francon quarry, Montreal. Long side measures 2 mm. Photograph by G.Y. Chao.



A four-membered cyclic twin (2 mm); eudialyte, Mont St-Hilaire, Quebec. Photograph by G.Y. Chao.