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MELANTERITE AND ROZENITE FROM ALLCHAR MINE, MACEDONIA

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Zebec, V. & al.: Melanterite and Rozenite from Allchar Mine, Macedonia. Natura Croatica Vol. 2, No 1, 1993, Zagreb.

In the old mine Allchar, situated near village Majdan, Macedonia greenish-blue crystals of melanterite were found. They are rich in crystal faces and following forms were measured by two circle reflecting goniometer: {001}, {010}, {110}, {103}, {$\bar{1}$01}, {111}, {121}, {$\bar{1}$23}, {$\bar{1}$12} and {$\bar{1}$21}. Crystal form {$\bar{1}$23} is new for melanterite. Crystal habit is shown on Fig. 1. Chemical content is determined by ICP AES and gravimetric analysis (for SO_3). Dehydration of melanterite to rozenite is observed on natural samples as well as in dry conditions of laboratory. Both minerals are determined by XRD powder method.

Key words: melanterite, rozenite, crystal morphology, chemical content, Allchar, Macedonia.

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U starom rudniku Allchar, koji je smješten kraj sela Majdan u Makedoniji, pronađeni su zelenkasto plavi kristali melanterita. Oni su bogati kristalnim plohama i slijedeće forme su određene mjerenjem dvokružnim refleksnim goniometrom: {{001}, {010}, {110}, {103}, {$\bar{1}$01}, {111}, {121}, {$\bar{1}$23}, {$\bar{1}$12} i {$\bar{1}$21}. Kristalna forma {$\bar{1}$23} je nova za melanterit. Habitus kristala je prikazan na **Slici 1**. Kemijski sastav je određen ICP AES i gravimetrijskom analizom (za SO_3). Zabilježena je dehidracija melanterita u mineral rozenit, kako na prirodnim uzorcima tako i u laboratorijskim uvjetima. Oba su minerala utvrđena difrakcijom rentgenskih zraka metodom praha.

Ključne riječi: melanterit, rozenit, kristalna morfologija, kemijski sastav, Allchar, Makedonija.

INTRODUCTION

Allchar mine is situated about 110 km SSE of Skopje, Macedonia close to the Greece border, near village Majdan. Name Allchar is combination of two names: **All**atini and **Char**teaux. First one was bank owner from Thessaloniki who gave money for exploitation and another was mining engineer worked on that project. It is As and Sb mine with unique paragenesis of Tl-minerals. It is type locality for some Tl-minerals: vrbaite, $Tl_4Hg_3As_8Sb_2S_{20}$ (KRENNER, 1894 and 1895), lorandite, $TlAsS_2$ (JEŽEK, 1912), raguinite,

$TlFeS_2$ (LAURENT & al., 1969), picotpaulite, $TlFe_2S_3$ (JOHAN & al., 1970), parapierrotite, $TlSb_5S_8$ (JOHAN & al., 1975), rebulite, $Tl_5As_8Sb_5S_{22}$ (BALIĆ-ŽUNIĆ & al., 1982), simonite, $TlHgAs_3S_6$ (ENGEL & al., 1982), unnamed Tl_3AsS_4 (PAVIČEVIĆ & EL GORESY, 1988) and bernardite $TlAs_5S_8$ (PAŠAVA & al., 1989).

Melanterite was found in Allchar for the first time by BARIĆ (1958) who described green crusts and stalactitic aggregates without observed crystals. He measured optical axial angle to be 2V=+84° and just mean refractive index n_β=1.479 in the yellow sodium light. Author gave data about chemical content of melanterite in the same paper.

METHODS AND RESULTS

During the 1986. field study, in the old work of Allchar mine, new specimens of melanterite were collected (V. Zebec). Most of the samples are greenish-blue trnsparent aggregates and crusts in the clays, where they are deposited in cracks and cavities. They have vitreous luster, with crystals usually 2-3 mm in size. Crystals are unusual for this mineral, but at few localities there are very nice crystals with bright faces. Measurements on 3 melanterite crystals were done on the two circle reflecting goniometer and faces of next forms were identified: {001}, {010}, {110}, {103}, {$\bar{1}$01}, {111}, {121}, {$\bar{1}$23}, {$\bar{1}$12} and {$\bar{1}$21}. For this measurments axial ratio is a:b:c = 1.1828:1:1.5427 and β=104°16′ as PALACHE et al. (1951) gave after Zepharovich. For the first time faces of {$\bar{1}$23} form were measured on the crystals from Allchar **(table 1)**.

Crystal habit is shown on **fig. 1**. Besides that habit crystals are prismatically elongated, but without terminal faces.

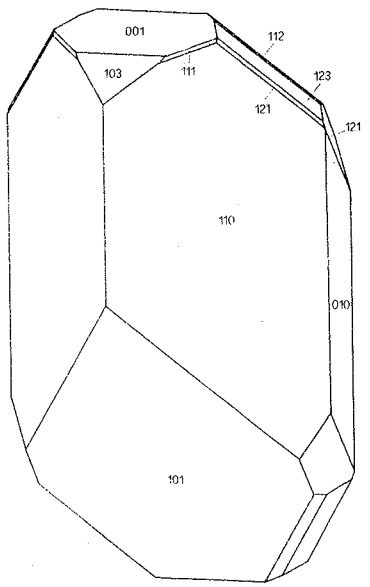

Fig. 1. Melanterite, Allchar

Table 1.: Measured φ and ρ for {$\bar{1}$23} form for melanterite crystals from Allchar

crystal	measured		calculated	
	φ	ρ	φ	ρ
1	349°13′	46°07′		
2	349°17′	46°06′		
average	349°15′	46°06.5′	349°00′	46°19′

Melanterite was also determined by x-ray diffraction on powdered sample.

In atmospheric conditions very fast, after 2-3 weeks, melanterite decomposes by loosing water. It transforms to white powder, determined by XRD to be rozenite ($FeSO_4$ $4H_2O$). Rozenite is present also in the nearby dry clay.

Chemical analysis is combination of ICP AES and gravimetric method (for sulphur).

The most important results is that even fresh melanterite loose water very fast.

Table 2.: Chemical analysis of melanterite from Allchar.

	I		II
	%	apfu	%
FeO	24.36	0.90	24.21
MgO	0.82	0.05	
ZnO	0.04		
MnO	0.06		
CaO	0.01		
CuO	0.01		
SO_3	30.02	1.00	30.07
P_2O_5	0.02		
H_2O	44.32	13.09	44.18
insoluble in water			1.23
Total	**99.70**		**99.69**

Analyst: V. Bermanec

apfu - Atoms per formula unit
I melanterite this work,
II melanterite, BARIĆ (1958)

Formula is calculated on the basis of P+S=1. Dificiency of the water is result of easy dehydration process. This is reversible process:

$$FeSO_4x7H_2O \Leftrightarrow FeSO_4x4H_2O + 3H_2O$$

melanterite $\Leftrightarrow$ rozenite + 3 water molecules

This process is strongly depending on wet and dry seasons in the Allchar deposit.

CONCLUSION

Melanterite $FeSO_4x7H_2O$ crystals are found in the well known Tl-mine Allchar, Macedonia. Faces of 7 forms are determined and form $\{\bar{1}23\}$ is observed for the first time on melanterite. X-ray investigations and chemical analysis are in the agreement with comparable data for melanterite.

Drying of the melanterite during dry season (or in the laboratory) results in mineral rozenite

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SAŽETAK

Melanterit i rozenit iz rudnika Allchar u Makedoniji

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Melanterit iz rudnika Allchar navodi već BARIĆ 1958. Tom prilikom spominje zelene prevlake, kore i sigaste nakupine, bez prisutnih kristala. Od optičkih konstanti daje

vrijednosti za $2V=+84^{\circ}$ i $n_{\beta}=1.479$, određene u Na-svjetlosti. Dana je kemijska analiza (FeO - 24.21%, SO_3 - 30.07%, H_2O - 44.18% i netopivo u vodi - 1.23%; suma - 99.69%).

Godine 1986. u starim radovima u rudniku Allchar kod Majdana sakupljeni su novi uzorci minerala melanterita, koji se dosta obilno javljaju u obliku zelenkastoplavih bistrih nakupina i prevlaka. Nađeni su u glinovitom materijalu, gdje popunjavaju nastale pukotine i šupljine. Obično su staklastog izgleda. Na nekoliko mjesta nađeni su i kristali, vrlo sjajnih ploha i bogati formama, što je inače velika rijetkost za ovaj mineral.

Izvršena su goniometrijska mjerenja i na kristalima je utvrđena prisutnost ploha sljedećih formi: {001}, {010}, {110}, {103}, {$\bar{1}$01}, {111}, {121}, {$\bar{1}$23}, {$\bar{1}$12} i {$\bar{1}$21}. Pritom smo se služili osnim odnosom a:b:c = 1.1828:1:1.5427, $\beta=104^{\circ}16'$, kako ga prema Zepharovichu donose PALACHE et al. (1951). Kristalići su veliki 2-3 mm, a njihov izgled predočen je na **Slici 1.** Pored toga češće se nađu i prizmatski izduljeni kristali, ali bez terminalnih ploha.

U normalnim sobnim uvjetima vrlo brzo, već nakon 2-3 tjedna melanterit gubi vodu i prelazi u bijelu praškastu masu, za koju je rentgenografski utvrđeno da odgovara mineralu rozenitu ($FeSO_4x4H_2O$). Rozenita se može naći i u suhim dijelovima gline koja nosi i melanterit.

Snimljeni rentgenogram praha plavičastozelenih kristala odgovara melanteritu.

Također je načinjena i kemijska analiza (kombinacijom plazma emisione spektroskopije i gravimetrije; (gravimetrijski je određen sumpor), čiji rezultat se vidi iz **Tablice 2.**

U formulu nisu uračunati elementi koji u sadržaju sudjeluju sa manje od desetinke postotka. Također je vidljivo da u formuli postoji manjak kristalne vode u odnosu na idealnu formulu, što je rezultat dehidratacije.