Errata

Str.	Wiersz		Jest	Powinno być
	góra	dół		
4		18	$n_{\gamma} - n_{\alpha} - 0.080 - 0.079$	$n_{\gamma} - n_{\alpha} = 0.080 - 0.079$
9	13		(Ch) transformed	(Ch) partially transformed
15	9		16.4	16.4%
19	11		Fig. 1 *12*	Fig. 1, *12*
19	12		$MgCo_3$	$MgCO_3$
22		7	burmed	burned
46	2		by activation	activation by
47		13	CZENKO N. S.	CHENKO N. S.
plansze kredowe po str. 100			WOŁOSIŃSKI	WŁOSIŃSKI

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STILPNOMELANE FROM GRANITE PEGMATITES OF THE STRZEGOM—SOBÓTKA MASSIF

UKD 549.623:552.322.2'321.1:548.73 (433-14 Masyw Strzegom—Sobótka)

A b s t r a c t. Stilpnomelane in paragenesis with chlorite, tourmaline, cleavelandite and zeolites has been found in granite pegmatites near Strzegom. It is presumably the first recorded occurrence of that mineral in granite pegmatites. This paper presents the results of field investigations, optical examinations, SEM studies, as well as X-ray, DTA, IR spectroscopic and electron microprobe analyses. The origin of stilpnomelane from Żółkiewka has been discussed, emphasizing the role of silica-rich boron-bearing hydrothermal solutions which were responsible for the transformation of Fe chlorite into stilpnomelane.

INTRODUCTION

Stilpnomelane was first described in 1827 from Zlate Hory by Glocker. It is generally regarded to be a metamorphic mineral particularly widespread in the rocks of the greenschist facies (Winkler 1967, Chauvel 1973). Stilpnomelane frequently accompanies iron ore deposits and may be also encountered in skarns. It is rather uncommon in igneous rocks, being usually the product of secondary alterations (Chauvel 1973). A stilpnomelane occurrence in gabbro pegmatites of Greenland has been so far an exceptional find (Deer, Howie, Zussman 1964). Therefore, worth noting is the fact of finding that mineral in typical igneous pegmatites near Strzegom (Lower Silesia).

Stilpnomelane appearing in the form of peculiar, glittering coating on microcline, quartz and albite I crystals (Phots 1, 2) has been found in the Andrzej and Krakowski granite quarries at Żółkiewka near Strzegom. It occurs in greater amounts on Fe (metasomatic) chlorite. Its characteristic feature is an intense lustre and glitter due to a small size of scales which are not more than 1 mm long and 0.1 mm thick. The habit of the stilpnomelane scales is best seen on a scanning electron micrograph (Phot. 3),

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which shows platy aggregates, sometimes slightly folded. Feathery concentrations are frequent as well (Phot. 4). Moreover, cleavage along *001* may be observed, which is not, however, so perfect as in biotite. Sometimes, transverse parting along *010* is also visible. The characteristic features of the stilpnomelane studied are the absence of pseudohexagonal habit, which is so typical of biotite, and the presence of sharp-edged outlines. Stilpnomelane from the pegmatites of Strzegom is frequently paragenetic with tourmaline, hydrothermal albite, fluorite and rarely with bavenite (Phot. 5).

Crystallization of cleavelandite, fluorite, light-yellow chabazite and desmine followed that of stilpnomelane. Two varieties of stilpnomelane are macroscopically discernible in the Strzegom pegmatites. The dark-green or black variety is dominant; according to Haschimoto's nomenclature (1969), it is ferrostilpnomelane. The other variety of golden-brown colour (ferristilpnomelane) appears subordinately. The refractive indices of ferrostilpnomelane determined by Dr. A. Nowakowski with an accuracy of ± 0.002 in sodium light by immersion using monobromonaphthalene and kerosene are:

$n_\gamma = n_\beta = 1.611$—$1.613$ (values determined in 6 plates of stilpnomelane)

$n_\alpha = 1.559$—1.561

$n_\gamma - n_\alpha = 0.052$

Negative optical sign: $2\,V_\alpha = \sim 0°$. Straight extinction with respect to (*001*) cleavage.

The refractive indices of ferristilpnomelane determined under similar conditions in a solution of methylene iodide and monobromonaphthalene have the following values:

$n_\gamma - n_\beta = 1.676$—$1.678$ (values determined in 5 plates of stilpnomelane)

$n_\alpha = 1.596$—1.599

$n_\gamma - n_\alpha - 0.080$—$0.079$

Negative optical sign: $2\,V_\alpha = \sim 0$—$10°$. Straight extinction with respect to (*001*) cleavage.

Both varieties of stilpnomelane show a similar colour and strong pleochroism: α—light-yellow, γ = β—dark-olive-green.

The density of stilpnomelane determined in heavy liquids is 2.72. Since it was impossible to separate a larger amount of stilpnomelane free of chlorite admixtures, its chemical analysis was carried out on the Cameca MS-46 electron microprobe. In addition, X-ray spectrometric analysis was made to detect trace elements. The results of both analyses are presented in Tables 1 and 2. The chemical analysis has revealed the presence of several trace elements (B, Be, Sn, Li) characteristic of the pneumatolitic and hydrothermal processes.

X-ray diffraction analysis was carried out on a DRON-1 diffractometer, using Cu-radiation and Ni filter. Pure CaF_2 was used as internal standard. X-ray data for stilpnomelane from Żółkiewka were compared with those obtained under the same conditions for stilpnomelane from Zlate Hory (specimen No B-17-6 in the Mineralogical Museum of the Wrocław Uni-

Table 1

Chemical analyses of stilpnomelanes (weight %)

Components	Ferro-stilpnomelane from Żółkiewka*	Stilpnomelane (green) from Fujigatami (after Sato 1975)	Stilpnomelane from Zlate Hory (after Hutton 1938)	Ferrostilpnomelane from Crinan (after Graham * 1976)
SiO_2	49.2	43.58	44.45	46.7
TiO_2	—	0.02	0.00	tr
Al_2O_3	7.5	6.60	7.26	6.0
FeO*	29.6	32.27	14.04	27.7*
Fe_2O_3	n.d.	1.52	20.82	n.d.
MnO	2.7	2.17	0.05	0.6
MgO	2.5	1.52	2.77	6.7
CaO	0.7	0.61	0.53	0.2
Na_2O	0.5	0.74	0.03	0.5
K_2O	2.1	1.46	2.06	3.6
H_2O^+	n.d.	6.50	6.41	n.d.
H_2O^-	n.d.	2.76	1.35	n.d.
CO_2	n.d.	0.10	—	n.d.
Total	94.8	99.85	99.77	92.0

* Total Fe determined on electron microprobe as FeO.

Table 2

Occurrence of trace elements in transformation sequence: biotite — Fe-chlorite — stilpnomelane (in p.p.m.)

Components	Stilpnomelane from Żółkiewka	Stilpnomelane from Zlate Hory	Biotite from Żółkiewka	Fe-chlorite from Żółkiewka
B	500	—	—	—
Ti	175	175	8 750	17 500
Pb	500	—	8 750	—
Ge	—	—	1	1
Sn	175	25	175	8 750
Ga	500	50	500	500
Ni	—	50	875	—
Cr	—	—	—	—
Bi	875	—	875	—
Be	175	—	—	25
Mo	—	—	—	—
V	—	—	500	175
Li	175	175	175	875
Cu	50	87	25	25
Ag	1	—	10	1
Zn	175	175	500	175
Co	1	1	5	—

Table 3

X-ray powder diffraction data of ferrostilpnomelanes

Żółkiewka Andrzej quarry		Zlate Hory		Queenstown (Eggleton, 1972)		
d(Å)	I/I_0	d(Å)	I/I_0	d(Å)	I/I_0	hkl
12.08	100	12.12	100	12,1	10	001
				8.2	B	$0,1\bar{2}, 11\bar{2}$
				7.16	B	$11\bar{2}, 10\bar{2}$
6.03	12	6.07	15	6.07	1	002
				5.48	2	$2\bar{4}2, 12\bar{1}, 22\bar{2}$
4.72	5			4.75	3	$04\bar{3}, 44\bar{1}$
				4.13	2	many
4.04	60	4.06	40	4.039	8	003
3.54	10	3.60	11	3.6	B	$0\bar{1}4$
3.34	35	3.34	20			
3.028	60	3.028	40	3.027	7	004
2.763	5					
2.723	8	2.699	25	2.715	4	$44\bar{5}$
2.583	15	2.556	40	2.570	10	$44\bar{6}$
2.422	4			2.431	2	$44\bar{2}$
2.362	10	2.343	30	2.350	7	$44\bar{7}$
2.228	8					
2.196	5			2,1889	3	$44\bar{1}$
2.119	10	2.112	20	2,1109	5	$44\bar{8}$
1.956	2	1.956	10	1,956	2	440
1.892	5	1.887	10	1.8856	4	$44\bar{9}$
1.689	15	1.691	10	1.685	4	$4 \cdot 4 \cdot \overline{10}$
1.581	8			1.585	6	$12 \cdot 0 \cdot \bar{5}$
		1.575	15	1.5715	5	$12 \cdot 0 \cdot \bar{6}$
		1.559	15			
1.540	10			1.532	2	$12 \cdot 0 \cdot \bar{7}$
1.515	10			1.5138	3	$4 \cdot 4 \cdot \overline{11}$
1.414	10			1.4141	2	443
				1.4037	1	$12 \cdot 0 \cdot 9$
1.370	15			1.367	2	$88\bar{8}$
1.254	10			1.2834	3	444
				1.154	2B	$88\bar{3}$
1.061	5			1.055	1	$8 \cdot 8 \cdot \overline{16}$

versity), as well as with the data reported by Eggleton (1972) for stilpnomelane from Queenstown, New Zeland (Table 3). Eggleton (1972) is of the opinion that reflections of the value of $d = 8.2$ Å *, 7.16 Å, 5.48 Å, 4.75 Å, 4.13 Å and 3.6 Å define the true triclinic unit cell. Two of these reflections ($d = 4.72$ Å and 3.54 Å) have been recorded in the powder pattern of stilpnomelane from Żółkiewka. The other reflections, the most intensive

* 1 Å — 10^{-1} mm vz SI (1977).

included, are yielded by the trigonal unit subcell. The value of d_{001} averaged from $3d_{003}$ and $4d_{004}$ is 12.115 Å. This value is 12.146 Å for stilpnomelane from Zlate Hory and 12.100 Å for ferrostilpnomelane from Queenstown.

DTA analysis of ferrostilpnomelane was run under atmospheric pressure with a heating rate of 10°C/min. Three pronounced peaks have been recorded on the DTA curve (Fig. 1). An extensive endothermic peak with the indistinct maximum at 80°C corresponds to the loss of interlayer water. It is interesting to note that the process of H_2O removal is initiated at lower

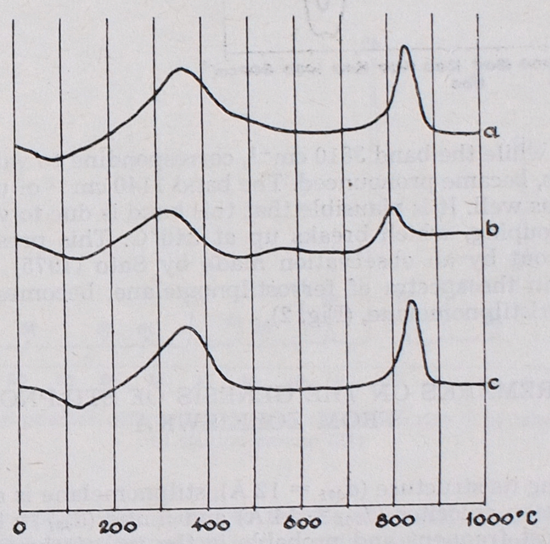

Fig. 1. DTA curves of stilpnomelanes from:
a — Andrzej quarry at Żółkiewka near Strzegom, b — Ural (after Lazarenko 1957), c — Fujigatami (after Sato 1975)

temperatures than in other stilpnomelanes (Fig. 1). A pronounced exothermic peak with the maximum at 360°C is due to oxidation of Fe^{2+} to Fe^{3+}. Another exothermic peak appears at 810°C, corresponding to the breakdown of the structure of stilpnomelane. The TG curve notes a substantial weight loss in the sample due to dehydration. X-ray diffractogram of the stilpnomelane sample heated to 600°C shows a shift of the d_{001} reflection from 12.08 Å to 12.3 Å. An increase in the d_{00l} value has also been observed for the second and third order reflections. This substantial increase in d_{001} is due to oxidation of Fe^{2+} at 340°C.

The infrared absorption spectrum of ferrostilpnomelane from Żółkiewka shows a striking similitary to the spectra recorded by Kräutner, Medesan (1969) and Sato (1975) (Fig. 2). Infrared absorption analysis was carried out in a Pye Unicam SP-100 spectrophotometer in the range of 625—3800 cm^{-1}, using KBr disks. Profound changes have been noted in the absorption spectrum of stilpnomelane heated to a temperature of 600°C. The band 3450 cm^{-1} due to stretching vibrations of H_2O molecules

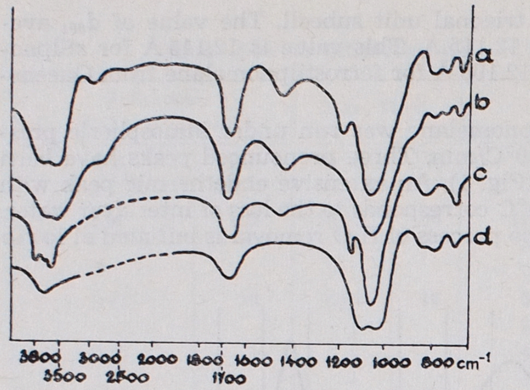

Fig. 2. IR spectra of stilpnomelanes from:
a — Żółkiewka near Strzegom, b — Zlate Hory (specimen from the Mineralogical Museum of the University of Wrocław), c — Fijigatami (after Sato 1975), d — Żółkiewka, heated up to 600°C

disappeared, while the band 3610 cm^{-1}, corresponding to valence vibrations of OH groups, became pronounced. The band 1140 cm^{-1} of unknown nature disappeared as well. It is plausible that this band is due to vibrations of the Fe^{2+}-O-H grouping, which breaks up at 340°C. This presumption seems to be borne out by an observation made by Sato (1975) that this band, while sharp in the spectra of ferrostilpnomelane, becomes diffuse in the spectra of ferristilpnomelane, (Fig. 2).

SOME REMARKS ON THE GENESIS OF STILPNOMELANE FROM ŻÓŁKIEWKA

Considering its structure (d_{001} = 12 Å), stilpnomelane is an intermediate mineral between chlorites (d_{001} = 14 Å) and micas (d_{001} = 10 Å). Consequently, the most frequent and probable is the transformation of chlorites (specifically those high in iron) into stilpnomelane (Hutton 1938, 1956; Frey *et al.* 1973). Stilpnomelane, in turn, may be converted to biotite (von Raumer 1969, Brown 1971). Stilpnomelane in the pegmatites from Żółkiewka is a secondary mineral arising, as can be seen in several specimens, at the cost of iron chlorite which forms layers sometimes attaining a thickness of 7 cm. The fact that stilpnomelane is paragenetic with tourmaline implies that the transformation of Fe chlorite into stilpnomelane was promoted by silica- and boron-rich hydrothermal solutions operating locally, which also gave rise to large amounts of needle-like tourmalines. This hypothesis is borne out by the fact that a considerable amount of boron (500 ppm) has been found in stilpnomelane from Żółkiewka whereas this element has not been detected in biotite, Fe chlorite or stilpnomelane from Zlate Hory (Table 2). During crystallization of stilpnomelane and tourmaline, the process of lowhydrothermal albitization was initiated, giving rise to cleavelandite. A transitional stage of stilpnomelanization of Fe chlorite has been observed using X-ray methods and under the scanning microscope (Phot. 6). The data reported earlier in this paper indicate that two minerals coexist at this stage, i.e. the dominant chlorite and subordinate stilpnomelane, forming a natural mixture. As stilpnomelanization proceeds, the latter mineral gains a quantitative prevalence, but a certain part of chlorite al-

ways remains untransformed, which is evidenced by basal chlorite reflections appearing in the X-ray diffractograms of stilpnomelane from Żółkiewka. The basal chlorite reflection 14 Å, visible in Figure 3, shows a considerably lower intensity ($I = 5$) compared with the intensity of non-transformed chlorites ($I = 25$).

Macro- and microscopic observations indicate that ferristilpnomelane from Żółkiewka forms at the cost of ferrostailpnomelane, which statement is consistent with the opinion of several authors (Hutton 1938; Zen 1960; Brown 1971; Sato 1975; Graham 1976). It seems that oxidation of ferrostilpnomelane was frequently unaffected by atmospheric conditions, i.e. it

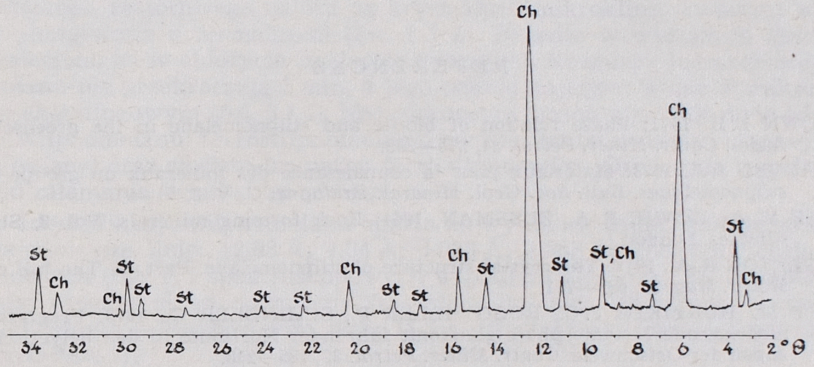

Fig. 3. X-ray powder diffraction pattern of Fe chlorite (Ch) transformed in stilpnolemane (St)

took place before pegmatite came to the Earth's surface. It appears then that the following transformation series exists in the granite pegmatites of Żółkiewka: biotite * — Fe chlorite *** — ferrostilpnomelane ** — ferristilpnomelane *. The asterisks denote the frequency of occurrence of respective members of the series in the pegmatites near Strzegom.

The system encountered at Żółkiewka is an open system in which ionic exchange took place between SiO_2 and B_2O_3 — rich hydrothermal solutions and chlorite. It is worth noting that the stilpnomelane in question occurs within peculiar pegmatite zones, the so-called net-type pegmatites. It is a complex of druse nests ranging from 1 to 40 cm in size, concentrated over a small area (about 20 small caverns may be present in 1 m^2). The common feature of those caverns is their flattened form. They are often connected by narrow channels forming a system resembling a net. The boundary between granite and the zone of graphic intergrowths of pegmatite is not clearly defined, which suggests their metasomatic origin. Similar forms have been reported from the Ural Mountains (Nikitin, Rudenko, Eškin 1972).

Only one occurrence of stilpnomelane has been reported from a mineralized fissure beyond the net-type pegmatites; on the other hand, it has never been found in large caverns of druse pegmatites. Such spatial conditions of stilpnomelane occurrences in net-like pegmatites imply that pressures within those pegmatites were slightly higher than in large caverns.

It seems very likely that elevated pressures are necessary to promote the transformation of chlorite into stilpnomelane rather than to assist the crystallization of stilpnomelane itself.

The occurrence of stilpnomelane in granite pegmatites near Strzegom provides the evidence to further substantiate the thesis of Lazarenko (1954) and Deer, Howie and Zussman (1964) that this mineral can occur over a wide range of conditions and may arise under hydrothermal conditions. It seems that the transformation-inducing hydrothermal solutions circulating in the net-like pegmatites of Żółkiewka created the optimum conditions for crystallization of stilpnomelane.

REFERENCES

BROWN E. H. 1971: Phase relation of biotite and stilpnomelane in the greenschist facies. *Contr. Miner. Petrol.* 31, 275—299.

CHAUVEL J. J., 1973: Matériaux pour la connaissance des mineraux du groupe des stilpnomelanes. *Bull. Soc. Geol. Mineral. Bretagne*, C. V. 2, 51—91.

DEER W. A., HOWIE R. A., ZUSSMAN, 1964: Rock forming minerals. Vol. 3. Sheet silicates. London.

EGGLETON R. A., 1972: The crystal structure of stilpnomelane. Part. II. The full cell. *Miner. Mag.* 38, 639—711.

FREY M., HUNZIKER J. C., ROGGWILLER P., SCHINDLER C., 1973: Progressive niedriggrade Metamorphose glaukonit führender Horizonte in den helvetischen Alpen der Ostschweiz. *Contr. Miner. Petrol.* 39, 185—218.

GRAHAM M. C., 1976: A note of some Dalradian stilpnomelanes and their oxidation. *Miner. Mag.* 40, 467—472.

HASHIMOTO M., 1969: A note on stilpnomelane mineralogy. *Contr. Miner. Petrol.* 23, 86—88.

HUTTON C. O., 1938: The stilpnomelane group of minerals. *Miner. Mag.* 25, 172—206.

HUTTON C. O., 1956: Further data on the stilpnomelane mineral group. *Amer. Miner.* 41, 608—615.

KRÄUTNER H. G., MEDESAN A., 1969: On stilpnomelane in some Romanian Carpathian crystalline formations. *Tschermaks Miner. Petrogr. Mitt.* 13, 203—217.

[LAZARENKO E. K.] ЛАЗАРЕНКО Е. К., 1954: О стилъпномелане. *Мин. Сборник. Геол. Общес.* 8, 119—144.

[NIKITIN V. D., RUDENKO S. A., EŚKIN V. J.] НИКИТИН В. Д., РУДЕНКО С. А., ЭШКИН В. Ю., 1972: Типы хрусталеносных пегматитов Урала и уселовя их образования. Пегматиты. Докл. Конференции, 151—159. Ленинград.

von RAUMER J. F., 1969: Stilpnomelane als alpinmetamorphes Produkt in Mont Blanc — Granit. *Contr. Miner. Petrol.* 21.

SATO K., 1975: Stilpnomelane from the Fujigatami skarn ore deposit, Japan and its bearing on the problem of ferric and ferrous stilpnomelanes. *N. Jb. Miner. Mh.*, 4, 179—192.

WINKLER H. G. F., 1967: Die Genese der metamorphen Gesteine. Berlin — Heidelberg:

ZEN EAN, 1960: Metamorphism of Lower Paleozoic rocks in the vicinity of the Taconic Range in west-central vermont. *Amer. Miner.* 45, 129—175.

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STILPNOMELAN Z PEGMATYTÓW GRANITOWYCH MASYWU STRZEGOM—SOBÓTKA

Streszczenie

W magmowych pegmatytach granitowych z kamieniołomów Andrzej i Krakowski w Żółkiewce koło Strzegomia stwierdzono stilpnomelan. Występuje on w tzw. pegmatytach sieciowych, gdzie pojawia się w formie swoistego, migotliwego nalotu na kryształach mikroklinu, kwarcu i albitu w paragenezie z turmalinem (fot. 1 i 2). Ponadto w większych ilościach znaleziono go w chlorycie (metasomatycznym). Rozmiary łuseczek stilpnomelanu nie przekraczają 1 mm, a jego pokrój najlepiej widać w mikroskopie skanningowym (fot. 3 i 4). Makroskopowo można wyróżnić dwie odmiany stilpnomelanu: ferrostilpnomelan o barwie ciemnozielonej i czarnej (dominujący) oraz złocisto-brunatny ferristilpnomelan. Oznaczono współczynniki załamania światła obu odmian.

Identyfikację stilpnomelanu oparto na wynikach badań rentgenowskich (najsilniejsze linie: 12,08 Å; 4,04 Å; 3,028 Å; 2,583 Å) oraz badaniach termicznych (fig. 1) i spektroskopowych w podczerwieni (fig. 2). Ponadto podano również skład chemiczny ferrostilpnomelanu, oznaczony na mikroanalizatorze rentgenowskim (tab. 1) i występowanie pierwiastków śladowych (tab. 2).

Stwierdzenie po raz pierwszy stilpnomelanu w granitowych pegmatytach magmowych rzuca nowe światło na ten dotychczas uważany za typowy minerał metamorficzny.

Wypowiadając swój pogląd na genezę stilpnomelanu z Żółkiewki koło Strzegomia, autorzy uważają, że powstał on w wyniku przeobrażenia chlorytu Fe pod wpływem zasobnych w krzemionkę i bor roztworów hydrotermalnych wzbogaconych w pierwiastki śladowe: Be, Li, Sn i inne. W pegmatytach granitowych Żółkiewki stwierdzono szereg transformacyjny: biotyt — chloryt Fe — ferrostilpnomelan — ferristilpnomelan.

OBJAŚNIENIA FIGUR

Fig. 1. Krzywe termiczne stilpnomelanów
a — kamieniołom Andrzej w Żółkiewce koło Strzegomia, *b* — Ural (Lazarenko 1957), *c* — Fujigatami (Sato 1985)

Fig. 2. Widma absorpcyjne w podczerwieni stilpnomelanów
a — z Żółkiewki koło Strzegomia, *b* — ze Zlatych Hor (okaz z Muzeum Mineralogicznego Uniwersytetu Wrocławskiego), *c* — z Fujigatami (Sato 1975), *d* — z Żółkiewki, ogrzany do 600°C

Fig. 3. Dyfraktogram rentgenowski chlorytu Fe (Ch) przeobrażanego częściowo w stilpnomelan (St)

OBJAŚNIENIA FOTOGRAFII

Fot. 1. Stilpnomelan (S) na kryształach mikroklinu (M). Kamieniołom Andrzej Żółkiewka koło Strzegomia. Zm. × 2

Fot. 2. Stilpnomelan w druzie pegmatytu sieciowego. Żółkiewka koło Strzegomia. Zm. × 2

Fot. 3. Kryształy stilpnomelanu na powierzchni mikroklinu. Mikroskop skanningowy JSM-35. Pow. × ~4000

Fot. 4. Pierzaste agregaty stilpnomelanu z Żółkiewki koło Strzegomia. Mikroskop skanningowy JSM-35. Pow. × ~ 10 000

Fot. 5. Parageneza stilpnomelanu z turmalinem. Mikroskop skanningowy Cambridge. Pow. × ~ 4000

Fot. 6. Kryształy stilpnomelanu powstające na powierzchni (*001*) chlorytu Fe. Mikroskop skanningowy Cambridge. Pow. × ~ 4000

Fot. 5 i 6 wykonano w Środowiskowym Laboratorium Mikroskopii Elektronowej Politechniki Wrocławskiej

Михал САХАНБИНЬСКИ, Януш ЯНЭЧЕК

СТИЛЬПНОМЕЛАН ИЗ ГРАНИТНЫХ ПЕГМАТИТОВ МАССИВА СТШЕГОМ—СОБУТКА

Резюме

В магматических гранитных пегматитах из каменоломней Анджей и Краковски в Жулкевце в близи Стшегомя обнаружен был стильпномелан. Содержится он в так называемых сетеподобных пегматитах, в которых появляется он в форме очень характеристического мерцающего покрова на кристаллах микроклина, кварца и альбита в парагенетических соединениях с турмалином (фот. 1 и 2). Помимо этого в значительных количествах был он обнаружен в хлорите (метасоматическом). Размеры чешуек стильпномелана не превышают 1 мм, а его форму лучше всего рассмотреть в сканнинговом микроскопе (scanning microscope, фот. 3 и 4). Макроскопически можно выделить две разновидности стильпномелана. Ферростильпномелан тёмно-зелёного цвета или чёрного (преобладающий) и золотисто-коричневый ферристильпномелан. Были измерены коэффициенты свето преломления обеих разновидностей.

Отождествление стильпномелана основано на результатах рентгеновских исследований (самые сильные линии: 12,08 Å; 4,04 Å; 3,028 Å; 2,583 Å) а также термических исследований (фиг. 1) и ИК — спектроскопических исследований (фот. 2). Помимо этого был описан химический состав ферростильпномелана, который был выявлен при помощи рентгеновского микроанализатора (таб. 1), и содержание следовых микроэлементов (таб. 2). Обнаружение впервые стильпномелана в магматических гранитных пегматитах бросает новый свет на этот минерал, который до сих считался типичным для метаморфических скал.

Излагая своё мнение по поводу генезиса стильпномелана из Жулкевки вблизи Стжегомя авторы считают, что образовался он из-за преображения хлорита Fe, на который воздействовали богатые кремнезёмом и бором гидротермальные растворы, добавочно обогащённые следовыми элементами: Be, Li, Sn и другими. В гранитных пегматитах Жулкевки обнаружено переходный ряд: биотит — хлорит Fe — ферростильпномелан — ферристильпномелан.

ОБЪЯСНЕНИЯ К ФИГУРАМ

Фиг. 1. Термические кривые стильпномеланов
a — каменоломня Анджей, Жулкевка вблизи Стжегомя, *b* — Урал (Лазаренко, 1957), *c* — фуджигатами (Сато, 1975)

Фиг. 2. ИК-спектр поглощения стильпномеланов
a — из Жулкевки вблизи Стжегомя, *b* — из Златых Гор (образец из Минералогического Музея Вроцлавского Университета), *c* — из фуджигатами (Сато, 1975), *d* — из Жулкевки подогретый до температуры 600°C

Фиг. 3. Рентгеновская дифрактограмма хлорита Fe(Ch) частично преобразованного в стильпномелан (St)

ОБЪЯСНЕНИЯ К ФОТОГРАФИЯМ

Фот. 1. Стильпномелан (S) на кристаллах микроклина (M). Каменоломня Анджей, Жулкевка вблизи Стжегомя. Уменъш. × 2

Фот. 2. Стильпномелан в пустоте в сетеподобном пегматите. Жулкевка вблизи Стжегомя. Уменъш. × 2

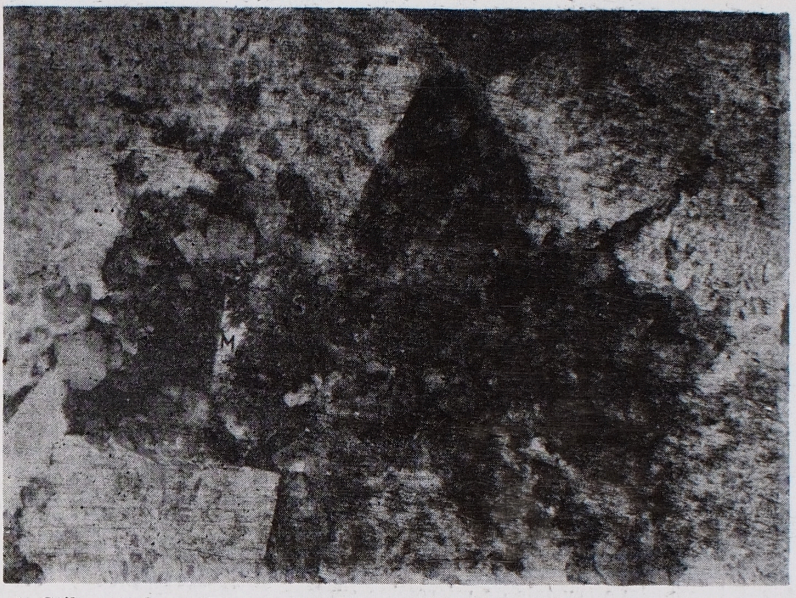
Фот. 3. Кристаллы стильпномелана на поверхности микроклина. Сканнинговый микроскоп ISM-38. Увеличение × ~ 4000

Фот. 4. Перьеподобные агрегаты стильпномелана из Жулкевки вблизи Стжегомя. Сканнинговый микроскоп ISM-35. Увеличение × ~ 10 000

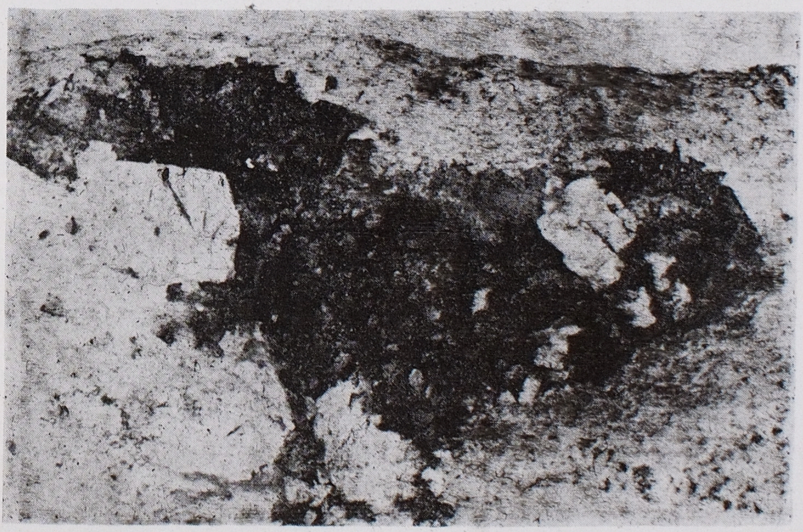
Фот. 5. Парагенез стильпномелана с турмалином. Сканнинговый микроскоп. Cambridge. Увеличение × ~ 4000

Фот. 6. Кристаллы стильпномелана образующиеся на поверхности (*001*) Fe — хлорита. Сканнинговый микроскоп. Увеличение × ~ 4000

Примечание: фото 5 и 6 были сделаны в Окружной Лаборатории Электронной Микроскопии Вроцлавского Политехникума



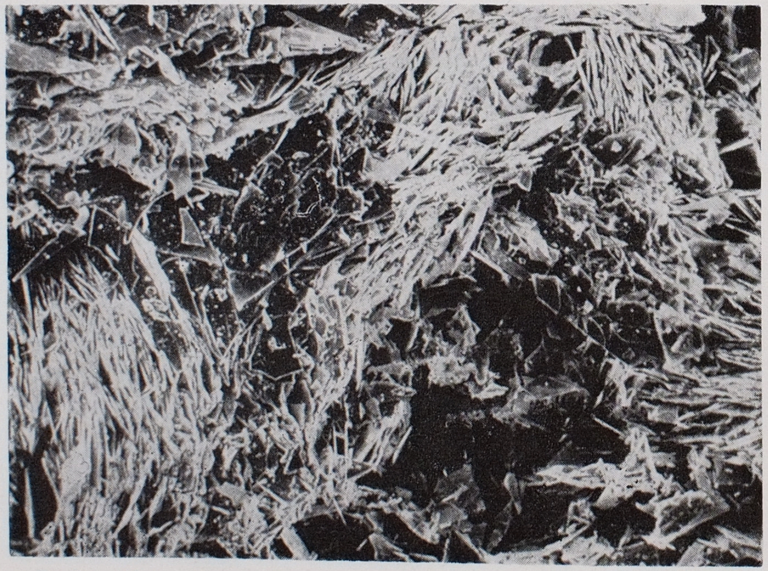
Phot. 1. Stilpnomelane (S) on microcline crystals (M). Andrzej quarry at Żółkiewka near Strzegom. Scale 1 : 2



Phot. 2. Stilpnomelane in a druse of net-type pegmatite at Żółkiewka near Strzegom. Scale 1 : 2

Michał SACHANBIŃSKI, Janusz JANECZEK — Stilpnomelane from granite pegmatites of the Strzegom—Sobótka Massif

Phot. 3. Stilpnomelane crystals on microcline surface. SEM JSM-35. Magn. × ~ 4000



Phot. 4. Feather-like stilpnomelane aggregates from Żółkiewka near Strzegom. SEM JSM-35. Magn. × ~ 10 000

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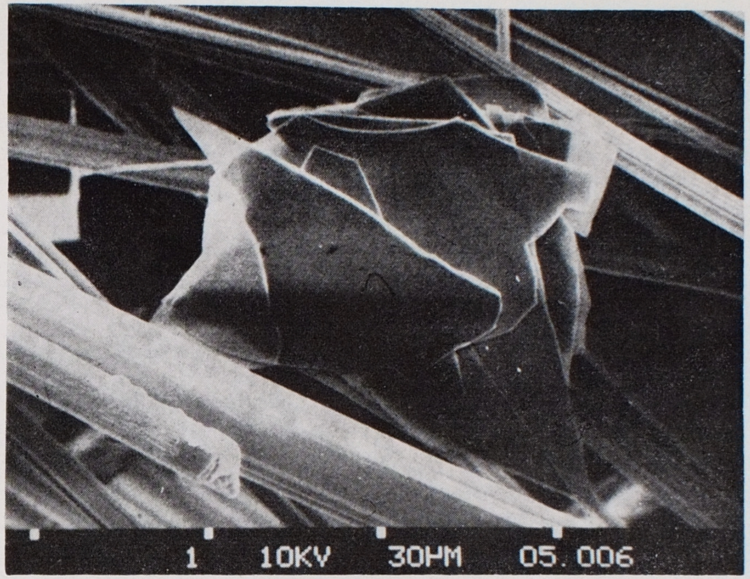
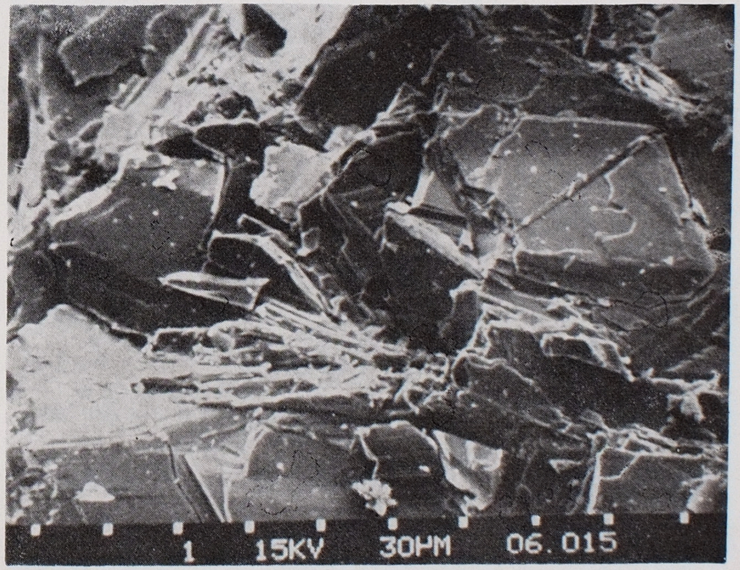


Phot. 5. Stilpnomelane and tourmaline. SEM (Cambridge). Magn. × ~ 4000



Phot. 6. Stilpnomelane crystals on the surface (*001*) of Fe chlorite. SEM (Cambridge). Magn. × ~ 4000

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