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MICAS FROM MARTWY KAMIEŃ GREISENS (LOWER SILESIA) -PRELIMINARY REPORT.

INTRODUCTION

The particular interests of this paper are mica minerals coming from greisen rocks from Martwy Kamień. It is focused mainly on geochemistry of muscovites from these rocks. This paper is a short fragment of more advanced and comprehensive research study of micas from pegmatites and pneumatolytic rocks from the Sudetes Mts.

GEOLOGICAL SETTING

Variscan Karkonosze granitoid massif with metamorphic the Izera complex form together Karkonosze–Izera block (Karwowski, Kozłowski 2002). The greisens' outcrops occur in the area of Mirsk Dale in the bed of the Kwisa River, at the Wyrwak Hill in Kamień village near Mirsk. The greisens formed from the protholit of the older rocks of granitoid type composition which had passed metamorphic processes. Their genesis is probable connected with post-magmatic activity of the Karkonosze granitoid massif (Karwowski, Kozłowski 2002).

At the Martwy Kamień Hill some greisen samples were taken for detailed mica research. Their major components include quartz, feldspars, topaz, white micas, and tourmaline; within minor minerals appear epidote, zircon and ore minerals.

EXPERIMENTAL METHODS

Chemical analyses were obtained using ICP-AES and INAA methods. Infrared spectra in the region 400-3700 cm^{-1} were recorded using a BIO-RAD FTS 165 spectrometer. X-ray investigations were carried out on powdered randomly oriented samples using a Philips X'PERT diffractometer. The EPR spectra were recorded with Bruker ELEXSYS spectrometer in the range of 0-5000G.

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DISCUSSION AND CONCLUSIONS

The microscope investigations of thin sections revealed that there are two kinds of muscovites in the greisens: relatively big flakes of primary muscovite and tiny flakes of secondary muscovite which fills space between other minerals (Karwowski 1977). In the X-ray patterns all basal reflections of the muscovites correspond to the $2M_1$ polytype. In the absorption spectra of the muscovites from the K/2, K/4 and K/6 rocks there is wide band at 3655-3627 cm^{-1} characteristic of the OH stretching region. The location of this band confirms that the OH group is coordinated with Al-Al cations. The weak band at 1684 cm^{-1} in the IR spectra of the muscovite from K/6 sample can be caused by N-H bending vibrations. In the EPR spectra of the muscovites from K/2, K/4 and K/6 there are lines coming from octahedral Fe3+. Only the spectrum of the muscovite from K/6 shows a characteristic lines for Mn^{2+}, as the mica possesses the highest content of this element.

Tab.1. Major element composition of micas.

Main Elements [wt%]	**K/2**	**K/4**	**K/6**
SiO_2	49,35	46,27	48,73
Al_2O_3	34,41	35,44	33,47
TiO_2	0,045	0,037	0,101
Fe_2O_3	1,42	1,5	2,15
MnO	0,011	0,011	0,031
MgO	0,09	0,19	0,14
CaO	0,02	0,56	0,04
Na_2O	0,82	1,32	0,53
K_2O	9,1	9,52	10,09
P_2O_5	0,07	0,08	0,08
H_2O^+	4,54	5,25	4,51
F	0,837	0,983	0,655
Total	100,713	101,161	100,527

The chemical analyses revealed that in these muscovites the interlayer sites are occupied by K, Na and traces of Ca and Rb; in the octahedral positions mainly: Al, Fe, Mg and in minority: Ti, Mn occur, while in the tetrahedral ones there are Si, Al and P (Tab.1.). The low TiO_2 content in the muscovites confirms postmagmatic genesis of the host rocks (Puziewicz 1987). The Na/(Na+K) ratio ranges from 0,04 to 0,11. The lowest Na/(Na+K) values are typical of hydrothermal micas. K is a major element which can be substituted by Rb and Cs. Both elements accumulate in late fractions of melt (Černy et al. 1985). In the muscovite (K/4) Cs content reaches 92 ppm. The enrichment in F in all muscovites can be an eloquent proof for hydrothermal activity. The biggest concentration of F-0,98 wt% is in the muscovite (K/4).The relatively low Cr and V but high Rb and Cs contents of the muscovites (Tab.2) indicate a "metasomatic" replacement (Bailey 1985). Low amounts of Ba in the interlayer sites of micas are characteristic of micas coming from the most fractionated rocks (Černy at al. 1985). The muscovites are slightly enriched in Ta, while Ta-bearing complexes are stable at low temperatures (Černy at al. 1985). The concentration of Cd and Zn is decreasing with progressing igneous fractionation (Černy at al. 1985), so depletion in Zn and lack of Cd confirm post magmatic genesis of host rocks. The noticeable high content of W in the muscovite (K/4) - 0,15 wt% (Tab.2) is probably related with contamination with traces of dispersed tungsten minerals.

It was expected that the muscovites from pneumatolytic rocks would have revealed much chemical diversity. However, chemical analyses revealed poor concentration of trace elements in micas. Hydrothermal process is the one which can be responsible for micas' depletion in many trace elements Zawidzki (1973, *fide* Karwowski 1977). On the whole, enrichment in F, Rb and Cs confirms post-magmatic genesis of host rocks, so does depletion in Ti, Zn and Cd. Naturally, mineral composition of host rocks especially the presence of topaz and tourmaline as well as geochemical data of the micas seem to confirm that the micas are pegmatite-pneumatolytic origin later affected by hydrothermal fluids.

Tab.2. Trace element composition of micas.

Trace elements [ppm]	**K/2**	**K/4**	**K/6**	**Trace elements [ppm]**	**K/2**	**K/4**	**K/6**
Ag	*	*	0,9	**Pb**	5	9	3
Au [ppb]	*	7	5	**Rb**	1250	1470	1410
B	63	**	67	**Sb**	1,2	1,8	1,4
Ba	44	137	78	**Sc**	8,3	12,8	17,5
Be	9	8	7	**Sm**	0,3	0,4	*
Co	4	1	2	**Sr**	11	39	7
Cr	*	4	*	**Ta**	8	17	10
Cs	66,1	92,3	82,7	**Th**	1,1	4,7	0,9
Cu	2	2	1	**U**	0,7	4,7	1,1
Hf	*	*	0,6	**W**	67	1480	68
La	0,9	0,9	0,7	**Y**	1	4	*
Li	**	**	**	**Yb**	*	1,2	0,5
Lu	*	0,19	0,07	**Zn**	12	10	25
Ni	7	*	6	**Zr**	7	21	7

* not detected, ** not determined

Bi, Br, Cd, Ce, Eu, Mo, Nd, Se, Tb and V are under detection limit.

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