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Krystyna KLIMAS[1], Mark FANNING[2], Stanisław MADEJ[1], Ryszard KRYZA[1], Teresa OBERC-DZIEDZIC[1]

MORPHOLOGY AND SHRIMP STUDY OF ZIRCONS FROM THE LIGHT STACHÓW GNEISSES (LIPOWE HILLS, FORE-SUDETIC BLOCK): PETROLOGICAL IMPLICATIONS

The Lipowe Hills Massif (*LHM*) in the eastern part of the Fore-Sudetic Block, the NE part of the Bohemian Massif, comprises four principal varieties of gneisses (Oberc-Dziedzic, 1995): 1) light, layered or augen gneiss (the light Stachów gneiss - *LSg*), 2) dark, fine-grained migmatitic, sillimanite gneiss (the dark Stachów gneiss - *DSg*) - both varieties of gneisses are exposed in the northern part of the *LHM*, 3) light, migmatitic gneiss with sillimanite nodules (the Nowolesie gneiss - Ng), which is common in the middle part of the *LHM*, and 4) mylonitic, chlorite gneiss (the Henryków gneiss - *Hg*) - in the southern part of the *LHM.*

The zircons from five samples of the principal varieties of the *LHM* gneisses (Oberc-Dziedzic, 1995), were studied (morphology, morphometry and typology) (Klimas at al., 2002) in order to explain their petrogenesis and to make the effective selection of zircon crystals for U-Pb dating. The zircon crystals from the sample from Nieszkowice (*LSg*) are dominantly colourless, 95% euhedral and subhedral, normal and long prismatic, with predominance S_2, S_7, L_2, L_1 and S_4 types, which are typical of crustal anatectic rocks (Pupin, 1980; 1988). The Cl images reveal their complex internal structure with cores and rims. Some grains are simply zoned, totally dominated by inherited zircon with little new magmatic growth.

The SHRIMP zircon geochronological study on the *LSg* from Nieszkowice (Table 1) indicates the presence of: (a) inherited zircon cores of Palaeo- to Neoproterozoic ^{206}Pb-^{238}U ages (from 1916±25 to 636.3±8.4 - 560.3±6.9 Ma), and (b) mostly euhedral and zoned crystals, Cambrian/Ordovician in age, with distinct mean of 500±5 Ma interpreted as the age of emplacement of the magmatic precursor of the gneiss. The ages of inherited zircon cores from the Stachów gneiss suggest that source material for the Stachów gneiss and the Strzelin gneiss (with inherited zircon cores of 1230-1870 Ma; Oberc-Dziedzic et al., 2003) were different.

The results (Table 1) indicate that the cores of zircons (1916 ± 25 – 560.3 ± 6.9 Ma) have higher Th/U ratios; (1.51, 0.92, 0.43 to 0.07). In contrast, in the euhedral rims of

[1] *Institute of Geological Sciences, University of Wrocław, pl. M. Borna 9, 50-204 Wrocław, Poland; e-mail: klim; smad; rkryza; toberc@ ing.uni.wroc.pl*
[2] *Research School of Earth Sciences, Australian National University, Canberra, ACT, 0200 Australia*

the zircons (with mean 500 ± 5 Ma), the Th/U ratio varies in the range of 0.43-0.03, from which more than half are Th/U < 1.0.

The Th/U ratio in zircon is being used to distinguish zircons of different origins.

Table 1. Selected SHRIMP data of zircons from Nieszkowice (*JSg*) (* = rim of grain)

Grain Spot*	U ppm	Th ppm	Th/U	$^{206}Pb/^{238}U$ age	Grain Spot*	U ppm	Th ppm	Th/U	$^{206}Pb/^{238}U$ age
12.2	130	195	1.51	1916 ± 25	4.1*	689	105	0.15	507.6 ± 5.4
16.1	136	125	0.92	636.3 ± 8.4	12.1*	683	85	0.12	499.9 ± 5.4
10.1	1278	205	0.16	630.9 ± 6.4	17.2*	618	36	0.06	499.6 ± 6.2
17.1	485	158	0.32	619.4 ±7.9	19.1*	199	48	0.24	497.3 ± 6.3
11.1	602	256	0.43	567.0 ± 6.1	8.1*	530	56	0.11	497.1 ± 6.3
13.2	319	21	0.07	560.3± 6.9	7.1*	580	27	0.05	496.5 ± 5.3
3.1*	392	26	0.07	523.8 ± 6.4	15.1*	416	87	0.21	495.8 ± 5.6
9.1*	748	47	0.06	520.9 ± 5.7	5.1*	575	44	0.08	494.1 ± 5.3
1.1*	585	64	0.11	518.9 ± 6.1	14.1*	751	20	0.03	493.1 ± 6.1
18.1*	623	734	0.05	510.1 ± 6.0	13.1*	722	19	0.03	491.9 ± 5.3
14.2*	413	178	0.43	508.3 ± 5.7	6.1*	560	27	0.05	479.2 ± 5.3
2.1*	509	63	0.12	508.1 ± 5.5	10.2*	596	77	0.13	466.1 ± 5.5

Th/U ratios in igneous zircons from various rocks is greater than 1.0, while zircons grown under metamorphic conditions show Th/U lower than 1 (e.g. Rubatto & Gebauer, 2000). However, Rubatto (2002) describes zircon overgrowths crystallised during HT metamorphism in equilibrium with partial melt, which have chemical composition (U, Th, Hf, P, REE patterns) similar to that of magmatic zircon, but their Th/U ratio is low (<0.07). In spite of that, she considers the low Th/U ratio as the only feature which allows to distinguish the metamorphic zircons from the igneous ones.

The zircon crystals from the dated sample from Nieszkowice (*LSg*) have often low Th/U ratio (<0.08), but are unlikely to be of metamorphic origin. The euhedral crystals have igneous zoning and mainly show concordant Pb-U systems. The newly formed euhedral zircon crystals reveal magmatic zoning in SEM and CL images. Some zircons have cores relatively large compared to the new planar overgrowth zones composed of one or two bands. Euhedral zircons with smaller cores and distinct thin-oscillation zoning are found only sporadically Some oscillatory zoned euhedral zircon crystals reflect changes on the crystallization environment, from characteristic of more alkaline rocks, with dominance of {101} pyramides and {110} prisms to more peraluminous with {211}>{101} and {110}>{100}. The gneiss from Nieszkowice (*LSg*) was interpreted to have formed from S-granite protholits (Klimas et al. 2002, Madej, 2002). More detailed petrogenetic characteristics of the gneisses from the Lip-

owe Hills and their comparison with the gneisses from the Strzelin Massif is being prepared.

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