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MORPHOLOGICAL AND TYPOLOGICAL COMPARATIVE STUDY OF ZIRCONS FROM MYLONITES OF THE NIEMCZA SHEAR ZONE AND FROM THE GÓRY SOWIE GNEISSES (SW POLAND)

The N-S trending Niemcza Zone (NZ) is a major shear zone, c. 50 km long and up to 10 km wide, developed along the eastern margin of the Góry Sowie Block (GSB) in SW Poland. (Bederke (1929) and Dziedzicowa (1985) considered the dominating rocks of this zone as sedimentary-derived mica schists, while Scheumann (1937), and Mazur and Puziewicz (1995) interpreted them as mylonites developed from the Góry Sowie gneisses. The mylonites contain porphyroclasts of plagioclase, garnet and, locally, cordierite, embedded in a fine-grained, layered matrix composed of quartz, plagioclase, and syndeformation biotite, fibrolite, white mica and chlorite. According to Mazur and Puziewicz (1995), the assemblage of porphyroclasts in the mylonites, together with field evidence (gneiss and mylonite intercalations and gradational contacts between them) indicate that the mylonites were produced at the expense of the GSB migmatites. In this study we use the morphology and typology of zircon grains to test whether the mylonites of the NZ did develop from the GSB gneisses and migmatites or whether other protoliths could have been involved in the regional-scale mylonitisation processes.

Samples selected for the zircon studies represent two groups of mylonites defined by Mazur and Puziewicz (1995):

- mylonites deformed under the amphibolite facies: specimens 1, 6, 8 and 11, and
- mylonites deformed under the greenschist facies: specimens 5 and 19.

From the basic morphological and morphometric characteristics (Table 1) it is evident that zircons from most of the samples of the gneisses and migmatites of the GSB differ from those of the NZ mylonites in:

1. domination of coarser-grained zircon fractions;
2. higher elongation values;
3. higher standard deviations for of length, width and elongation of grains;
4. considerably larger proportion of euhedral and subhedral crystals, and smaller amount of subrounded and rounded grains;
5. less amount of grains with cracks and fractures.

The zircons from the mylonites display more features which can be interpreted as resulting from strong deformation (Klimas and Mazur, 2002). Typological distribution

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Table 1. Morphology, morphometry and typology of zircons from mylonites and migmatites of Niemcza Zone and from gneisses and migmatites of the Góry Sowie Block.

Morphology and morphometry of zircons	Mylonites from the greenschist facies (NZ)			Mylonites from the greenschist facies (NZ)			Migmatites from the NZ		Migmatites from the Góry Sowie Block				Granite-gneiss
Sample	1*	11*	9*	9A** M1-1	5A** M8-1	19	9b** M1B1	9c** M1 B2	M 3 - 1 M***	M3-1 L***	M5-1 ***	M2-1 ***	M6-1 ***
Quantity of investigated zircons	100	50	100	100	100	100	100	100	100	100	100	100	100
Euhedral and subhedral crystals, %	20	12	24	59	43	27	39	65	35	45	40	55	58
Subrounded forms, %	57	28	35	41	40	37	36	30	43	27	37	13	23
Rounded grains, %	5	54	18	0	16	28	25	5	22	24	23	32	19
Angular forms, %	18	6	23	-	-	8	-	-	-	-	-	-	-
Broken zircons, %	10	8	17	10	10	4	6	10	8	20	6	15	6
Fractured zircons, %	2	0	0	-	-	4	-	-	-	-	-	-	-
Zircons with "extinction angle",%	8	8	6	-	-	4	-	-	-	-	-	-	-
Mean length, mm	0.06	0.07	0.08	0.13	0.11	0.10	0.13	0.15	0.14	0.17	0.15	0.12	0.12
Standard deviation of length, mm	0.02	0.02	0.02	0.03	0.02	0.02	0.03	0.05	0.03	0.04	0.03	0.03	0.02
Mean width, mm	0.04	0.04	0.05	0.07	0.06	0.05	0.06	0.07	0.07	0.07	0.07	0.06	0.06
Standard deviation of width, mm	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.01	0.02	0.02	0.01	0.01
Mean elongation	1.8	1.6	1.8	2.1	2.0	1.9	2.1	2.5	2.2	2.4	2.0	1.9	2.0
Standard deviation of elongation	0.5	0.4	0.5	0.5	0.4	0.5	0.6	0.6	0.6	0.6	0.4	0.4	0.3
Main typological forms	S_7, S_2	S_{13}	S_2, S_7 S_{11}	S_4, S_{13} S_7	S_4, S_{25}	S_3, S_2	S_3, S_4 S_9	S_2, S_3 S_7	S_{17},S_{18} S_{12},S_{22}	S_{17}, S_{18} S_{22}	S_{12}, S_7 S_2	S_7, S_8 S_9	S_7, S_9 S_{13}
Subordinate typological forms	S_3 S_4	S_{18} S_{12}	S_1, S_{12} S_8	S_8, S_2 S_{12}, S_1	S_9	S_7, S_8 S_9,S_4	S_7, S_8 S_{13}	S_1	S_{13}	S_{23}, S_{19} S_{12}	S_{13} S_3	S_2 S_{13}	S_8 S_2

* symbols and location of samples as in Mazur and Puziewicz (1995); ** symbols and location of samples as in Jendrzejaczyk (1998), samples collected near the specimens studied by Mazur and Puziewicz (1995) and Klimas & Mazur (2002); *** symbols and location of samples as in Jendrzejaczyk (1998); Samples 5, 5A collected from an old quarries, south and SW of Ratajno; Samples 9, 9A, 9b, 9c are from Piekielko gorge, east of Gilów; Samples M3-1 NE; M5-1 and M6-1 from the NW vicinity of Owiesno (M3-1M = melanosome, M3-1L = leucosome).

(Pupin 1980) indicates that both the migmatites (9b and c) and mylonites (9 and 9a) which alternate in one exposure of Piekielko gorge (near the boundary between the GSB and NZ) have very similar subtypes of zircons. Similar forms are found also in the greenschist facies mylonite (sample 19) from Strach Hill near Koźmice, and from granite-gneiss (M6-1) from Owiesno. Furthermore, a mylonite sampled south of the road Piława-Przerzeczyn (sample 11) have zircon subtypes roughly similar to those from the melanosome M3-1M of migmatite collected NE of Owiesno. In the remaining samples of the GSB migmatites, the observed typological distribution within particular samples is wider than that in samples of mylonites and migmatites from the NZ. Most typically, the gneisses and migmatites of the GSB comprise dominating S17, S18 and S22 subtypes, while in the migmatites and mylonites of the NZ, subtypes S7, S2, S12 and S8 are most common.

The preliminary results of comparative zircon morphology studies show that the Niemcza Zone mylonites developed partly from gneisses and migmatites similar to those of the GSB. However, the observed systematic variation of zircon populations in the mylonites suggest that they could have developed in part also from other protoliths. More samples and application of other techniques (e.g. cathodoluminescence imaging) could highlight the problem in more detail.

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