

Leszek KUROWSKI¹, Patrycja KRAWCZYK¹

**PETROGRAPHY OF THE SŁUPIEC FORMATION SANDSTONES
(MIDDLE LOWER PERMIAN) IN THE NOWA RUDA REGION
(INTRASUDETIC BASIN, SUDETES, SW POLAND)
– PRELIMINARY RESULTS**

The Słupiec Formation makes up a considerable part of the clastic sediments profile of the Lower Permian strata in the Intra-Sudetic Basin. Its thickness reaches approximately 600 m. The sediments belong to the Middle Rotliegend (Upper Autunian). The Słupiec Formation is underlain by a horizon of fine-grained rocks called the Upper Anthracosia Shale, which forms the top of the Krajanów Formation (Lower Rotliegend = Lower Autunian). It is topped, on the other hand, by conglomerates (fanglomerates) of the Radków Formation – Upper Rotliegend (Saxonian) (Nemec et al., 1982).

The lower part of the Słupiec Formation is predominantly formed of sandstones with minor conglomerates and is referred to as the Building Sandstone. The top of the formation is dominated by fine-grained sediments of the Walchia Shale. All types of the sediments display characteristic red colour.

The article presents the preliminary results of petrographic analysis of the sandstone units of the Słupiec Formation. The samples were obtained from a set of outcrops on the Kościelec hill (S part of the Włodzickie Hills) near Nowa Ruda. The analysis comprised macroscopic and microscopic observations. Nine samples of mainly medium-grained (samples I/P1A, I/P1B, II/P5, IV/P2, VII/P5, IX/P1), more seldom coarse- (sample IV/P1) and fine-grained (samples VIII/P3, IX/P3) sandstones (tab. 1), were selected for microscopic observations. The analysis was carried out using a semiautomatic Eltinor 3 point counter.

The sandstones of the Słupiec Formation are medium sorted with poorly (2-3) rounded particles (Pettijohn, 1975). The framework is generally compact. The relative abundance of matrix, exceeding 15% in all the samples, allows to classify the sandstones to wackes. However in some samples matrix exceeds 15% only slightly. The cement is mainly siliceous with admixture of clay and iron compounds (hematite, goethite). The framework is built of: (1) quartz – $Q=Q_m+Q_p$ (where Q_m and Q_p stands for monocrystalline and polycrystalline grains respectively), (2) feldspars – F, comprising potassium feldspars (Fk) and plagioclases (Fp) and (3) lithic grains – L and Lt (where $Lt=L+Q_p$).

¹ *Institute of Geological Sciences, University of Wrocław, Pl. Maksa Borna 9, 50-204 Wrocław, Poland,
lkur@ing.uni.wroc.pl*

Quartz constitutes from 42,4 to 57,7% of the framework of the Słupiec Formation sandstones (tab. 1). Usually polycrystalline quartz dominates over monocrystalline (Qm/Qp ranges from 0,4 to 1,0). The size of quartz grains varies from 0,3 to 0,6 mm, rarely reaching 2,0 mm. The grains usually exhibit wavy or patchy extinction, some contain inclusions, mainly of muscovite. The feldspar content in the investigated samples varies from 10,1 to 23,8% (tab. 1). Plagioclases (8,3 – 17,9%) are noticeably more abundant than potassium feldspars (1,8 to 5,2%). Fk/Fp ratio is typically 0,2-0,3 and only in two samples reaches 0,5-0,6. Feldspar grains are mainly isometric, though there may also be elongated or irregular. Plagioclase grains from the Słupiec Formation sandstones often show polysynthetic twinning. Some grains of alkali feldspar are perthitic. Intergrowths of feldspar and quartz may also be noticed. Lithic grains are an important constituent of the sandstones. Their amount varies from 18,8 to 42,5%. Unstable lithic fragments are dominated by various types of metamorphic schists. The amount of volcanoclasts is also noticeable. The amount of sedimentary rock fragments is relatively small. Other lithic fragments are mainly plates of mica, usually muscovite or strongly chloritised biotite. Lithic grains are small, from 0,1 to 0,3 mm. Only some clasts of sedimentary origin reach up to 5,0 mm (mudstone intraclasts, mud curls).

Tab. 1. Petrographic composition of the Słupiec Formation sandstones.

Out-crop.	Sam-ple.	Petrographic composition of framework [%].									Mtx.
		Q	Qm	Qp	F	Fk	Fp	L	Lt	Σ	
I	P1A	56,9	18,6	38,3	15,4	5,2	10,2	27,6	65,9	99,9	15,3
	P1B	46,0	13,9	32,1	18,3	4,8	13,5	35,8	67,9	100,1	19,0
II	P5	57,4	21,5	35,9	23,8	8,2	15,6	18,8	54,7	100,0	17,0
IV	P1	46,9	22,7	24,2	10,1	1,8	8,3	43,1	67,3	100,1	15,4
	P2	43,2	15,1	28,1	14,3	3,6	10,7	42,5	70,6	100,0	17,2
VII	P5	46,5	18,6	27,9	19,9	4,8	15,1	33,5	61,4	99,9	20,3
VIII	P3	42,4	21,8	20,6	22,2	4,3	17,9	35,2	55,8	99,8	26,9
IX	P1	43,3	16,7	26,6	16,5	2,6	13,9	40,2	66,8	100,0	15,0
	P3	44,3	19,1	25,2	22,5	5,2	17,3	33,2	58,4	100,0	17,7

Q-quartz grains, Qm-monocrystalline quartz grains, Qp-polycrystalline quartzose lithic fragments, F-feldspar grains, Fk-K-feldspar, Fp-plagioclase, L-unstable polycrystalline lithic fragments, Lt=L+Qp, Mtx-matrix.

On the Q-F-L plot (Pettijohn, 1975) the Słupiec Formation sandstones cluster within the lithic wacke field (8 samples), except one sample that falls into the feldspar wacke field (Fig. 1A). On the Qm-F-Lt diagram (Dickinson & Suczek, 1979) they all gather in the lithic wacke field (Fig. 1B). This may suggest low maturity of the sediment. However it must be pointed out that this is due to high content of polycrystalline quartz (Qp) included in Lt.

On the Q-F-L projection (Fig. 1C) the Słupiec Formation sandstones fall in the field of sandstones derived from a recycled orogen (Dickinson & Suczek, 1979). Their projection points cluster mainly towards the lower boundary of the field suggesting that the sandstones composition corresponds best with the sediments of the uplifted foreland provenance. The alimentation area (uplifted foreland) was most probably formed of metamorphic rocks. This agrees well with high amount of metamorphic lithic fragments in the sandstones. On the Q_m-F-Lt triangle (Fig. 1D) the Słupiec Formation sandstones plot along the boundary between magmatic arc (4 samples) and recycled orogen (5 samples) fields. This, on the other hand, may point to deeply dissected volcanic province as an alimentation area for the detrital material of the sandstones (Dickinson & Suczek, 1979).

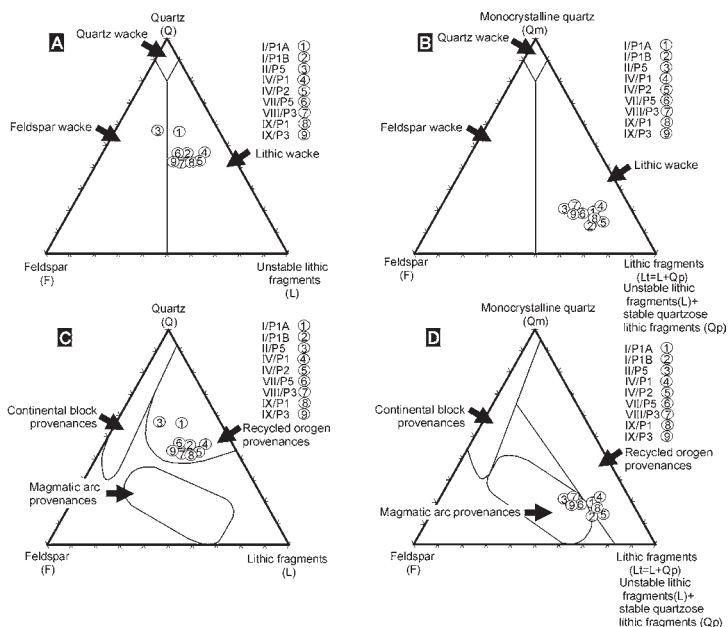


Fig. 1. Petrography of the Słupiec Formation sandstones on the Q-F-L (Pettijohn, 1975) (A) and Q_m-F-Lt triangular diagrams (Dickinson & Suczek, 1979) (B) and the provenance of the detrital material inferred from the plots Q-F-L (C) and Q_m-F-Lt (D) (Dickinson & Suczek, 1979)

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REFERENCES

DICKINSON W.R., SUCZEK C.A., 1979: Plate tectonics and sandstone compositions. AAPG Bull., 63, p. 2164-2182.
 NEMEC W., POREBSKI S.J., TEISSEYRE A.K., 1984: Explanatory Notes to the Lithotectonic Molasse Profile of the Intra-Sudetic Basin, Polish Part. Veröff. Zentralinst. Phys. Erde. AdW. DDR, 66, p. 267-278.
 PETTIJOHN F.J., 1975: Sedimentary Rocks. Harper and Row. New York, 628 pp.