



Magnetic properties of Lower Silesian serpentinites and some serpentinite artefacts from SW Poland and Moravia

ANTONÍN PŘICHYSTAL¹ & PIOTR GUNIA²

¹Department of Geology and Paleontology, Faculty of Science, Masaryk University, Kotlářská 2, CZ-611 37 Brno, Czech Republic, e-mail: prichy@sci.muni.cz

²University of Wrocław, Institute of Geological Sciences, Mineralogy and Petrology Dept., Pl. M. Borna 9, PL – 50 204 Wrocław, Poland, e-mail: guniap@ing.uni.wroc.pl

Serpentinites represented very popular stone raw materials for perforated polished artefacts in the Aeneolithic. According to investigation of Přichystal – Šebela (1992), they prevail among battle-axes of the Corded Ware Culture in Moravia and the Czech part of Upper Silesia (113 artefacts out of 416 pieces, i. e. 27 %). A detailed petrographical description of the used serpentinites was performed by Přichystal (1999). Almost always the battle-axes are conspicuously patinated, so that their surface has a greenish white-grey colour (more rarely there appears a pinkish or bluish shade). On a fresh fracture, the rock is dark green, rarely with a watery green transparent layer on the edges. On the patinated surface, secondary brownish spots can be observed and dark discontinuous veins, schliers and spots. The structure is prevalingly massive, the arrangement of dark schliers and spots sometimes indicates a preferable orientation. In several cases the occurrence of chrysotile veins was found whose thickness did not exceed 1-2 mm. In thin sections, usually aphanitic rocks have a lepidoblastic texture with predominance of colourless to yellowish or greenish tegular antigorite. Further significant mineral of this mineralogical group, chrysotile occurs on thin veins usually together with carbonate that sometimes completely represents it. In addition to them it is possible to observe relics of dark minerals, probably pyroxenes, on which the original cleavage faces are followed by opaque magnetite. These relics are often filled with carbonate. Also large xenomorphic crystals were found or aggregates of magnetite in whose central parts crimson-brown isotropic granules with a rough surface appear, chrome spinels. The rocks were petrographically marked as antigorite serpentinites with carbonate.

A comparison with serpentinite occurrences in geological units at the eastern margin of the Bohemian Massif (the Brno Pluton, Moldanubicum, Moravicum, Silesicum) has shown there are no such serpentinites there. On the other hand, an accumulation of serpentinite battle-axes of the Ślęza type linked with the Corded Ware Culture has been described from SW Poland, between the town of Wrocław and Czech/Poland state frontier. The raw material of perforated battle-axes of the Ślęza type in Lower Silesia is believed to have its source in the Gogolów - Jordanów Massif near the Ślęza Mts. (Ma-

jerowicz in Wojciechowski 1983, Majerowicz et al. 2000). This assumption is also supported by archaeological investigation of Wojciechowski (1988) who described an Aeneolithic mining of serpentinites at Jańska Góra (eastern part of the Gogolów - Jordanów Massif). On the basis of all macroscopic and microscopic properties, the raw material of serpentinite battle-axes in Moravia and the Czech part of Silesia comes predominantly from the Gogolów - Jordanów Massif as well. Hence, frequent finds of the serpentinite Corded Ware battle-axes in central Moravia were transported very probably along the Odra river and then through the valley of Moravian Gate at a distance of about 200 km.

Besides the Gogolów - Jordanów Massif there are further two massifs of serpentinites (the Braszowice - Brzeźnica Massif, the Szklary Massif) and a few small lentil-shaped serpentinite bodies at the NE part of the Bohemian Massif in Poland. Some of them are believed to be possible sources for Neolithic - Aeneolithic artefacts as well (Majerowicz et al. 2000). Using portable kappameter KT-5 we studied magnetic susceptibility of serpentinite artefacts in Poland and we compared them with magnetic susceptibility of serpentinites at some important outcrops. The following table shows results of measurement at outcrops.

Magnetic susceptibility measurement of serpentinite polished artefacts connected with the Lengyel cultural complex (LgCC, samples deposited at the Department of Archaeology, University of Wrocław) or with the Corded Ware Culture (CWC, Museum in Sobótka) have shown two basic groups of values:

a) 44,7 - 53,7 x 10⁻³ SI (Księgienica, the Lubin District, LgCC), 53,8 - 59,4 x 10⁻³ SI (Lukowice Brzeskie, the Brzeg District, LgCC), 56,6 - 58,8 x 10⁻³ SI (Okulice, CWC), 49 - 60,1 x 10⁻³ SI (Księgienia Wielkie, CWC) - these data can be well compared with the serpentinite from Jordanów quarry (eastern part of the Gogolów - Jordanów Massif).

b) 33 - 36 x 10⁻³ SI (Gniechowice, the Wrocław District, LgCC), 32,4 - 39,6 x 10⁻³ SI (Psary, the Trebnica District, LgCC), 31,5 - 41,2 x 10⁻³ SI (Polska Cerekiew, the Kozle District, LgCC) - they correspond partly to the

Tab. 1 Magnetic susceptibility of Lower Silesian serpentinites.

Locality	Number of measurements	Average value (x 10 ⁻³ SI units)	Dispersion (x 10 ⁻³ SI units)
Jordanów	6	54,7	40,3 - 64,9
Trzebnik	7	25	17,4 - 28,7
Gilów	13	109,4	82,7 - 114
Szklary A	8	19,9	11,6 - 36,7
Szklary B	7	21,1	14 - 29,1
Szklary C	6	28,3	21,2 - 33,9
Braszowice A	8	42,7	24,5 - 65,3
Braszowice B	5	42,6	30,9 - 50,8
Braszowice C	6	41,9	33,4 - 51,3
Bystrzyca Górna A	7	61,3	38 - 92
Bystrzyca Górna B	6	68,2	57 - 74,6

The Gogolów – Jordanów Massif: Jordanów, Trzebnik. Gilów – mylonitized serpentinite in the Niemcza Zone. The Szklary Massif : A – Kozmicky hill, B – Tomicky hill, C – Siodłowa hill. The Braszowice – Brzeźnica Massif: A – north of Grochowice hill, B – between Grochowice and Mních hill, C – Mikołajevo. Bystrzyca Górna - serpentinite body in the Sowie Góry Block.

Braszowice Massif but we can not exclude another locality in the Gogolów - Jordanów Massif (hand specimens from Jańska Góra have magnetic susceptibility around 30×10^{-3} SI).

Our results show the determination of magnetic susceptibility as a non-destructive method can help significantly together with study of thin sections for solution of serpentinite polished artefact provenance.

References

- Majerowicz A., Wojcik A., Gunia P. & Cholewa P., 2000: Comparative study of serpentinite textures and rock material of Neolithic artefacts from Lower Silesia (SW Poland). *Krystalinikum*, 26, Brno, Moravian Museum, 111-117.
- Přichystal A., 1999: The petrographic investigation of stone artefacts of the Corded Ware culture in Moravia and the adjacent part of Silesia. In: Šebela L., *The Corded Ware culture in Moravia and in the adjacent part of Silesia (Catalogue)*. *Fontes Archaeologiae Moraviae*, T. XXIII, Brno, AÚ AV ČR, 213-223.
- Přichystal A. & Šebela L., 1992: Lithic raw materials used by the people with Corded Ware in Moravia and the adjoining part of Upper Silesia. *Scripta Fac. Sci. Nat. Univ. Masaryk Brun.*, 22, Geology, Brno, Masaryk University, 29-39.
- Wojciechowski W., 1983: Neolithic Mining of Lower Silesian Serpentinite in the Light of Excavation on Jańska Góra. *Przegląd Archeologiczny*, 31, Wrocław, 5-46 (in Polish, English summary).
- Wojciechowski W., 1988: Versuch der Ortsbestimmung der Produktionszentren der Äxte vom Ślęza-Typ im Lichte der petrographischen Untersuchungen. *Przegląd Archeologiczny*, 35, Wrocław, 101-138 (in Polish, German summary).