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NEOLITHIC JADEITITE AXE FROM SOBOTIŠTE (WESTERN SLOVAKIA)

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Abstract: In the area limited by the villages of Kunov–Sobotište–Podbranč (western Slovakia) Neolithic population is documented by archaeological artefacts. Among them Early Linear Pottery of the Baden culture, together with numerous polished stone artefacts document the time period from the Early Neolithic to the Middle Aeneolithic (Jamárik 1961; Pichlerová 1961; Pavúk 1963). Among the polished stone artefacts, one made from jadeitite is unique by its raw material. Electron microprobe study of the raw material of the axe as well as the results of detailed studies from the northern Italy and the Western Alps area showed that the rock under consideration underwent a complicated geological history. Occurrences of this type of raw material have not been recorded in the Eastern Alps, the Bohemian Massif or in the Western Carpathians. Thus it is supposed that the ready-made product was imported from a distant area, such as NW Italy.

Key words: western Slovakia, Neolithic, import, jadeitite axe.

Introduction

In recent years there has been a strong effort to gather information on polished stone artefacts of the Neolithic–Eneolithic–Early Bronze Age found on the territory of Slovakia.

Until the last decade the great majority of several thousands of Neolithic polished stone artefacts found on several dozen archaeological sites were studied and documented by the staff of several archaeological institutions (Archaeological Institute of the Slovak Academy of Sciences, Slovak National Museum, several local museums, and Department of Archaeology of the Philosophical Faculty). Mineralogical and petrographical identification methods were used only exceptionally.

As a result of collaboration between archaeologists and petrographers on the territory of the country previously unknown types of raw material, have been found; e.g. antigorite serpentinite (Hovorka & Illášová 1995), eclogite (Hovorka & Illášová 1996). Al-rich spinel–hornblende–anthophyllite schist (Hovorka et al. 1997), mudstone (Banská et al. in print) and others.

Taking into account problems arising from different use of the term “jade” (used both in gemmology and in different meanings in archaeology, as well) in accordance with a proposal by D’Amico et al. (1995) based on the mineral composition of the artefact studied, the petrographical term “jadeitite” seems to be the most adequate.

The slightly demaged stone axe of green colour was found by an amateur-collector in the fields between villages Kunov–Sobotište and Podbranč (western Slovakia; Fig. 1). This axe is of unclear trapezoid shape with oblong through slightly biconvex body and concave partially rounded edge (Fig. 2). Thus, in shape the axe studied resembles Italian axes described in detail in papers by D’Amico et al. (1991, 1995, 1997). It is made of polished green rock, on which no traces of weathering are visible. On the axe-butt a scarp after splitting of a small part of the axe is visible. Dimensions: length — 8 cm, breadth = 2.4–4.7 cm, edge = 1.5 cm (Fig. 2). Deposition of the axe: private collection.

From the vicinity of the village of Sobotište (Fig. 1), in surface survey, numerous artefacts proving settlements from the Early Linear Pottery to the Baden culture were found. They document the Early Neolithic to Middle Aeneolithic ages (Jamárik 1961; Pichlerová 1961; Pavúk 1963). The axe is close in morphology to the artefacts of the Lengyel culture (Salaš 1986), which is represented in this area by a stage from LgCI (Lengyel culture) till the period of the Ludanice Group, which corresponds to 1000 to 1500 years of development. According to ^{14}C data calibration (95.4 per cent probability) the Lengyel culture deveveloped in the time span 5000–3500 years BC. If we take into account ^{14}C calibration

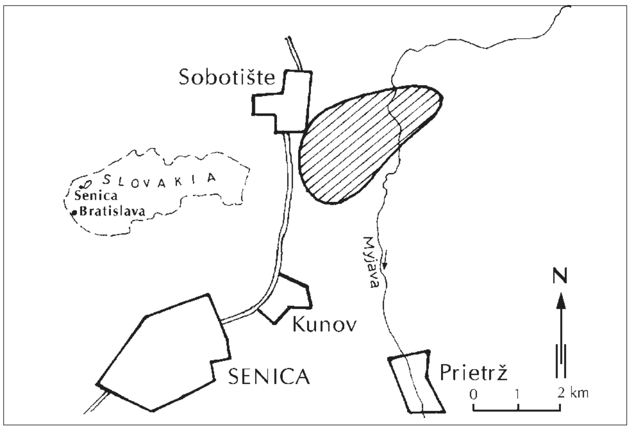

Fig. 1. A scheme of the Sobotište area (hatched field represents the area with surface Neolithic/Aeneolithic artefact occurrences).

on 68.2 per cent probability, the corresponding age is 4900–3950 years BC (Stadler 1995). The assignment of the studied axe to the time span of the Lengyel culture is supported by data from nearby Moravia (eastern part of the Czech Republic). On the territory of Moravia, jadeitite tools are found more often, even though jadeitite is also a rare raw material here (Palliardi 1913; Červinka 1943; Skutil 1946; Schmidt & Štelcl 1971). A majority of the Moravian tools made from nephrite and jadeitite belong to the Moravian Painted Pottery People stage, which is a part of the Lengyel culture (Palliardi 1913; Skutil 1946; Podborský 1993), though in some cases a younger dating is not excluded (Červinka 1943; Skutil 1946; Schmidt & Štelcl 1971).

The closest Moravian jadeitite tool (l.c.) to the described axe from western Slovakia is that from the site of Jarošov near Uherské Hradiště (Schmidt & Štelcl 1971; Fig. 1c). Both mentioned axes belong to varieties with a symmetrical cross section of oblong trough biconvex shape and symmetrical edge. According to present knowledge, these are connected with developed stages of the LgC (Salaš 1986), while in the older stages varieties with oblong sides prevail.

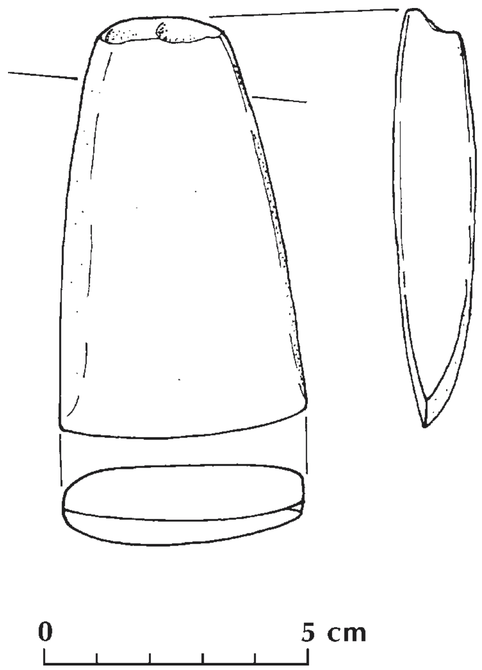

Fig. 2. A sketch of the jadeitite axe.

Raw material (jadeitite) description

Rather slight foliation of the studied raw material is caused by the presence (visible in thin section only) of irregular non consistent bands of lighter colour. On the section perpendicular to the prolongation of the artefact, light "spots" of isometric shape with unsharp delimitation against the surrounding rock are characteristic. Such spots may be as big as 1.5 mm, but are mostly about 1 mm. In both longer sides of the axe negative holes with 1.5 mm in diameter are visible. A very fine "skin" of turquoise-green colour has developed in some of these holes.

In thin sections made from the material of the studied axe two characteristic domains are observable:

1. a granoblastic fine-grained (0.1 mm) aggregate of clinopyroxene representing practically a monomineralic aggregate. Massive fabrics, in places interrupted by the planparallel orientation of shortcolumnar clinopyroxene crystals are characteristic of this part of the thin section. In central parts of individual clinopyroxenes opaques are present. Because of their small dimensions, it is more-or-less impossible to identify them in thin sections. By the use of microprobe they were identified as rutile. Clinopyroxene aggregate represents approximately 95 per cent of the rock. The remaining 5 per cent of the given rock is formed by:

2. a fine-grained aggregate (0.1 mm dimensions of individual phases) of zoisite, light mica and probably also plagioclase (Fig. 3). After weathering such aggregates form the above mentioned "holes" on the surface. Also based on above aspects jadeitite axe studied has equivalents among Italian axes (l. c.).

The thin section and microprobe studies of the jadeitite axe raw material led to the following conclusions: The rocks under consideration belong to the group of monomineralic rocks which are composed of jadeite present in a xenoblastic aggregate of fine grained (0.1 mm) colourless crys-

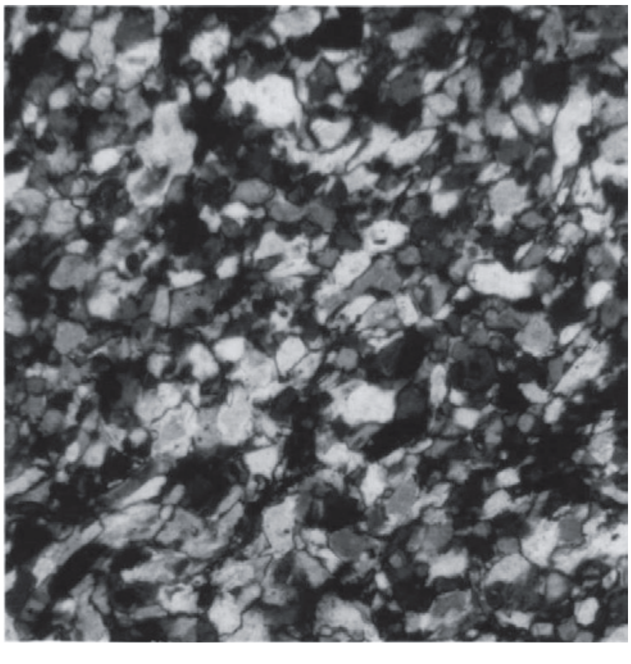

Fig. 3. Photo micrograph of thin section (enlarg. 32×, X polars).

tals of equidimensional shape. The microprobe analyses (Table 1) showed that the jadeites are non-zonal, homogeneous with stable high contents of Na_2O within the range 13.91–14.91 weight per cent. They correspond to pure (stechiometric) jadeite (Fig. 5). Some of the jadeite crystals contain very tiny (0.0X mm) crystals of rutile. Omphacite (3 and 4 in Fig. 5, anal. 3 and 4 in Table l) is present in the form of rims around jadeite. In thin sections both types of clinopyroxenes are indistinguishable. But there is an evident difference in

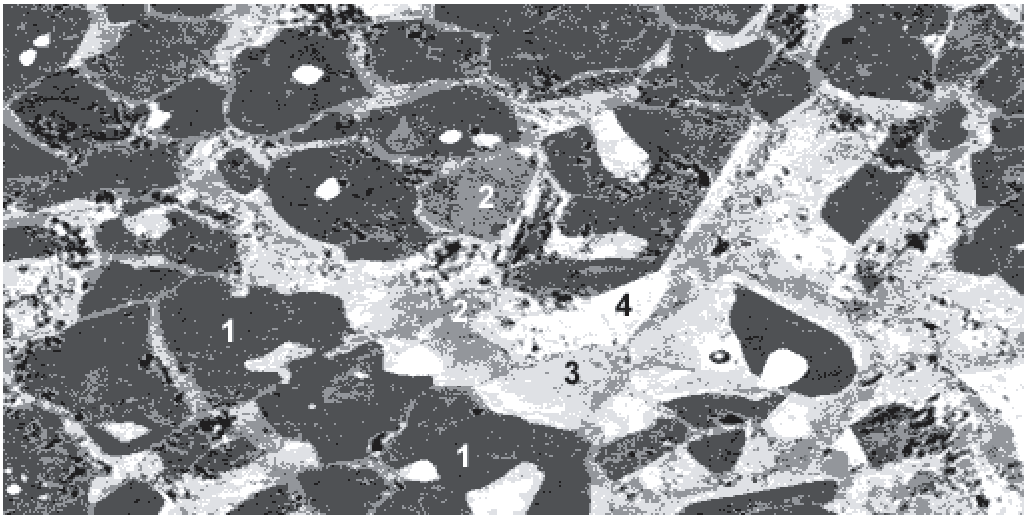

Fig. 4. Computer image of the given rock.

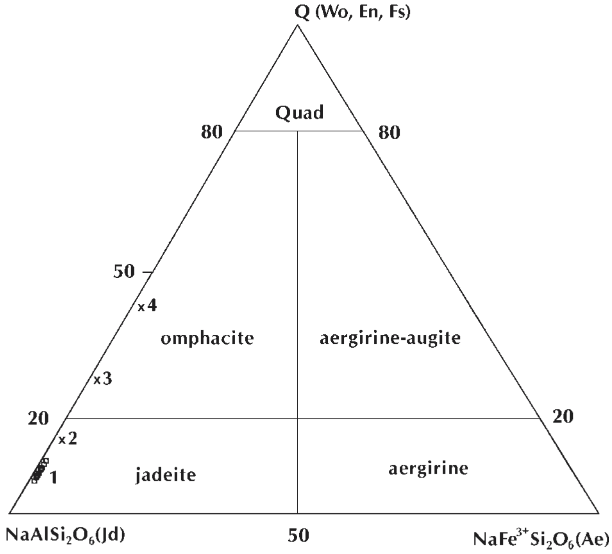

Fig. 5. Classification diagram of clinopyroxenes (Morimoto et al. 1889).

their chemical composition. In contrast to the jadeite in omphacites the lower contents of Al_2O_3 and Na_2O are remarkable. On the other side gradual increased (in comparison to jadeite) contents of FeO and CaO, and MgO have been recorded (Table 1). The presented analytical data indicate the heterogeneity of composition of the omphacites, in contrast to that of the jadeite (Fig. 5, field l).

Jadeite and omphacite together represent approximately 95 per cent of the studied rock.

In thin sections, light irregular cumuloblasts can be seen with the naked eyes on the polished surface of the axe: they are formed by at least two phases of the epidote-group minerals. The most spread is zoisite and epidote (microprobe identification). Both phases represent the products of Ca-rich plagioclases or lawsonites (?) recrystallization. The origin of epidote needed iron, which originated by its liberation during the original pyroxene (diopside ?) recrystallization. The studied rock also sporadically contains tiny crystals of zircon and xenotime.

Discussion and conclusion

Since only one artefact with no direct relation to the geological position of its raw material does not supply facts for genetical interpretation of the petrological history of the given raw material type, in this stage of studies we limit our consideration to the following remarks.

Jadeite and rutile crystals are typical representatives of the eclogite pT conditions. The metamorphic/metasomatic origin of the given rock is supported by its mosaic-granoblastic fabric and non-preferred orientation of mineral aggregate. The presence of omphacite rims around stechiometric jadeite proves changes of pT conditions during the rock´s evolution.

In these ways the jadeitite studied is comparable to those described by D'Amico et al. (1991, 1995, 1997) from the northern Italian (Trentino, Sammardenchia) and Provence sites.

On the basis of its mineral composition the rock (raw material) of the studied axe should be named "clinopyroxenite" in a broader sense, or "jadeitite" according to its proper mineral composition. It should be pointed out that so far such a rock-type has been found only once within a set of more than 250 thin sections studied by one of the authors (D. H.) from various archaeological sites in Slovakia. No similar rock has been described by any author in the past.

The jadeitite axe, together with the majority of the other stone artefacts were found on sites without the raw material debris which originates when stone blocks were processed. So in this case we also suppose the import of a ready-made artefact to the place of its finding. A similar conclusion was reached by Schmidt & Štelcl (1971) in the past when they discussed the place of origin of 8 jadeitite axes which have been found at Moravian localities.

Geologically documented jadeitite occurrences on the European continent are very rare (D'Amico et al. 1995). They are usually spatially connected with serpentinized ultrabasite (peridotite) massifs, which are considered to be members of ophiolite complexes. Jadeitites mostly occur together with eclogites and low temperature amphibolites, which represent their retrogressed equivalents. Such occurrences, which

Table 1: The composition of clinopyroxenes.

Selected analyses of clinopyroxene

Phases	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	4
SiO_2	60.36	60.86	60.75	60.25	60.17	60.02	60.88	60.88	60.88	60.88	60.45	59.77	60.21	60.21	58.98	58.96	57.56
TiO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Al_2O_3	23.63	23.19	22.40	23.29	22.76	23.45	22.98	22.98	22.98	22.98	23.23	23.32	22.71	22.71	19.44	14.81	10.00
Cr_2O_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FeO^+	0.96	1.13	1.56	1.34	1.28	0.86	1.27	1.27	1.27	1.27	1.24	0.97	1.05	1.05	4.24	5.71	6.67
MnO	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.04	0.16
MgO	0.30	0.40	0.79	0.54	0.71	0.18	0.49	0.49	0.49	0.49	0.49	0.38	0.24	0.24	1.10	3.14	6.37
CaO	0.61	0.67	1.19	0.92	1.11	0.37	0.91	0.91	0.91	0.91	0.84	0.61	0.53	0.53	1.53	4.32	7.94
Na_2O	14.65	14.29	13.97	14.07	13.91	14.91	14.02	14.02	14.02	14.02	14.05	14.43	14.87	14.87	14.35	12.61	9.86
TOTAL	100.49	100.55	100.66	100.44	99.94	99.79	100.55	100.55	100.55	100.55	100.31	99.48	99.61	99.61	99.64	99.59	98.55
Formula based on 6 oxygens																	
Si^{IV}	2.03	2.04	2.04	2.03	2.04	2.03	2.04	2.04	2.04	2.04	2.03	2.03	2.04	2.04	2.04	2.08	2.08
Al^{IV}	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Al^{VI}	0.94	0.92	0.89	0.92	0.91	0.94	0.91	0.91	0.91	0.91	0.92	0.93	0.91	0.91	0.79	0.61	0.43
Fe^{2+}	0.03	0.03	0.04	0.04	0.04	0.02	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.12	0.17	0.20
Mn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mg	0.01	0.02	0.04	0.03	0.04	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.06	0.16	0.34
Ca	0.02	0.02	0.04	0.03	0.04	0.01	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.06	0.16	0.31
Na	0.95	0.93	0.91	0.92	0.91	0.98	0.91	0.91	0.91	0.91	0.92	0.95	0.98	0.98	0.96	0.86	0.69

FeO^+ = total Fe as FeO

should be considered, also include those of the Western Alps and other places reported by D'Amico et al. (1995).

The provenance of the Western Alps seems to be the most important for the substantial part of the European jadeitite artefact occurrences. This view is based on the estimation that 80–90 per cent of all documented axes around the Western Alps are made from jadeitite and eclogite (D'Amico et al. 1995). Occurrences of jadeitite artefacts are also extensive in northern Italy (l. c.).

The raw material studied represents a rock which originated under complicated geological conditions. The high content of natrium in the main phase (jadeite), is most probably the consequence of metasomatic processes which took part during the high-pressure recrystallization of the original rock. Only after such a complicated geological history did Neolithic people gather blocks of rocks with suitable technical properties for the production of tools for daily use, ceremonial symbols or even symbols of excelence.

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