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CHANGES IN LATE FUNNEL BEAKER POTTERY AT THE
END OF THE 4TH MILLENNIUM BC
ON THE POLISH LOWLAND: CASE OF MROWINO, SITE 3.
PRELIMINARY REPORT ON MINERALOGICAL
AND PETROGRAPHIC RESEARCH

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ABSTRACT

Archaeological site no. 3 at Mrowino is located on the Polish Lowland, in the Greater Poland region. It was excavated from 1973 until 1980. The excavation produced very rich movable finds, with the core of them being formed by Funnel Beaker culture (FBC) ceramics. The collections hold over 37,500 FBC pottery shards and several intact or reconstructed vessels. The vast majority of pottery comes from an FBC settlement dated to 3300-3150 BC. The pottery set includes vessels of clear Baden culture connections. For the mineralogical and petrographic study, 40 samples were selected to identify mineral and rock components of the ceramic body and compare the ways of raw-material preparation. In the studied samples, boulder clay in all probability was used to make the vessels. All studied sam-

ples were made from clay with grog and a small amount of sand as temper. In addition, several samples contained igneous rock crumbs. To find out if this was a deliberate or accidental admixture, it is necessary to carry out further research.

Keywords: pottery, raw material, grog temper, Funnel Beaker culture, Baden culture influences

INTRODUCTION

The purpose of this article is to present selected results of the programme of archaeometric studies of late Funnel Beaker culture (FBC) pottery on the Polish Lowland. A set of pottery samples from an FBC settlement at Mrowino, site 3, Greater Poland, was selected for this presentation.

THE SITE

Archaeological site no. 3 at Mrowino is located on the Polish Lowland, in the Greater Poland region, on a sandy-gravel elevation, on the edge of a glacial channel used by the Samica River (Fig. 1).

The site was excavated during eight campaigns (1973-1980) by a team from the Archaeological Museum in Poznań [Tetzlaff 1981; 1989, here further references]. The exploration of thirteen trenches (totaling 1,222 sq. m) was carried out manually. In total, the investigated area yielded 170 features: 137 pits, 21 postholes, 7 daub or pottery concentrations and 5 other features, including a hearth, ditch and grave. Records were made of a number of stratigraphic relationships between features, and of several functional units made up of contemporary pits or postholes.

The excavations produced very rich movable finds, with the core of them being formed by FBC ceramics including intact vessels. The collections hold over 37,500 FBC pottery shards and vessels. Besides, there was only about 270 shards of other pottery (of the Globular Amphora and Lusatian cultures as well as dated to the Middle Ages). The second largest collection is that of daub, containing almost 12,000 lumps associated with FBC features. The other categories include FBC clay artefacts (including 19 spindle whorls, 3 loom weights, 2 miniature clay axes, a clay animal head, etc.), flint and stone goods, and animal bones. Among exceptional finds are copper artefacts of which one may be associated with the FBC.

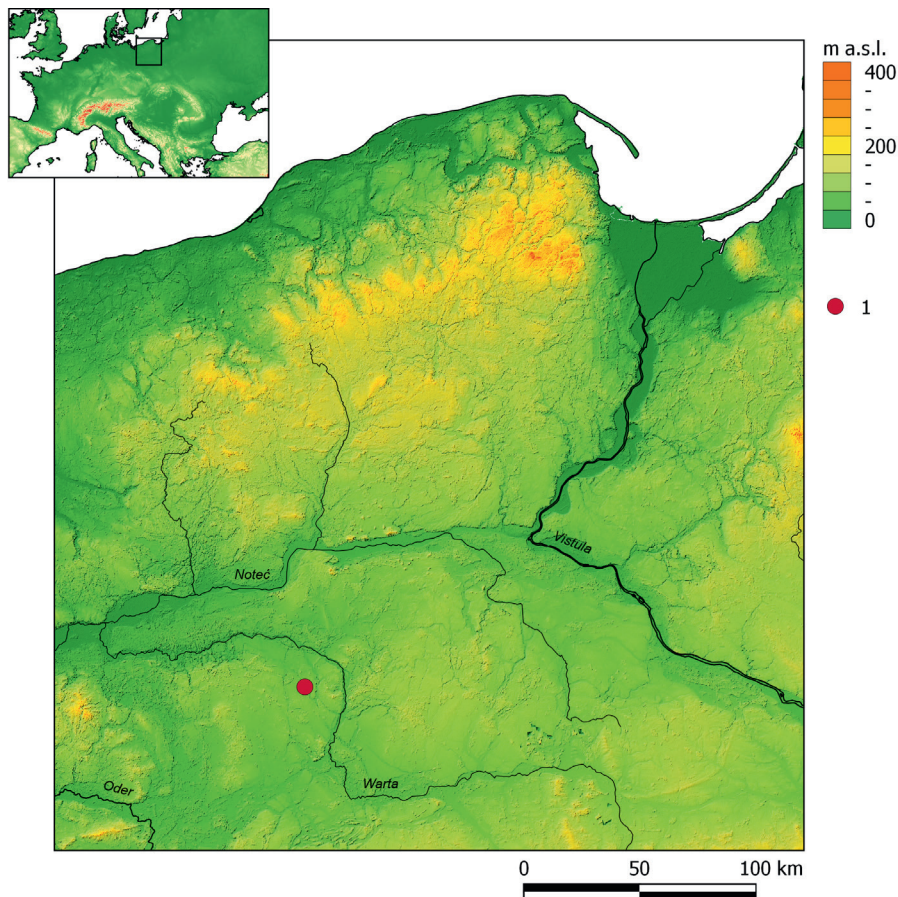


Fig. 1. Mrowino, site 3, Greater Poland Province. Location of the site. Prep. by A. Diachenko

Over the course of many years, the materials and related documentation, stored in the Museum, were only partially published. A breakthrough came in 2016–2018 when a scientific project was launched and a monograph of the site was finally published [Szmyt (Ed.) 2018]. Based on the multifaceted analyses, several stages and phases of human presence in the locality have been identified, three of which fall on the Late Neolithic period [Szmyt 2013]. The most notable habitational period is the first and the richest settlement of the FBC dated to 3300-3150 BC (Fig. 2). Then, probably ca 3100-3000 BC, a smaller FBC settlement existed at the same place (phase MRO-A2). The last Neolithic phase on the site is dated to 2970 BC. At that time, a small cemetery of the Globular Amphora culture was founded there (phase MRO-B).

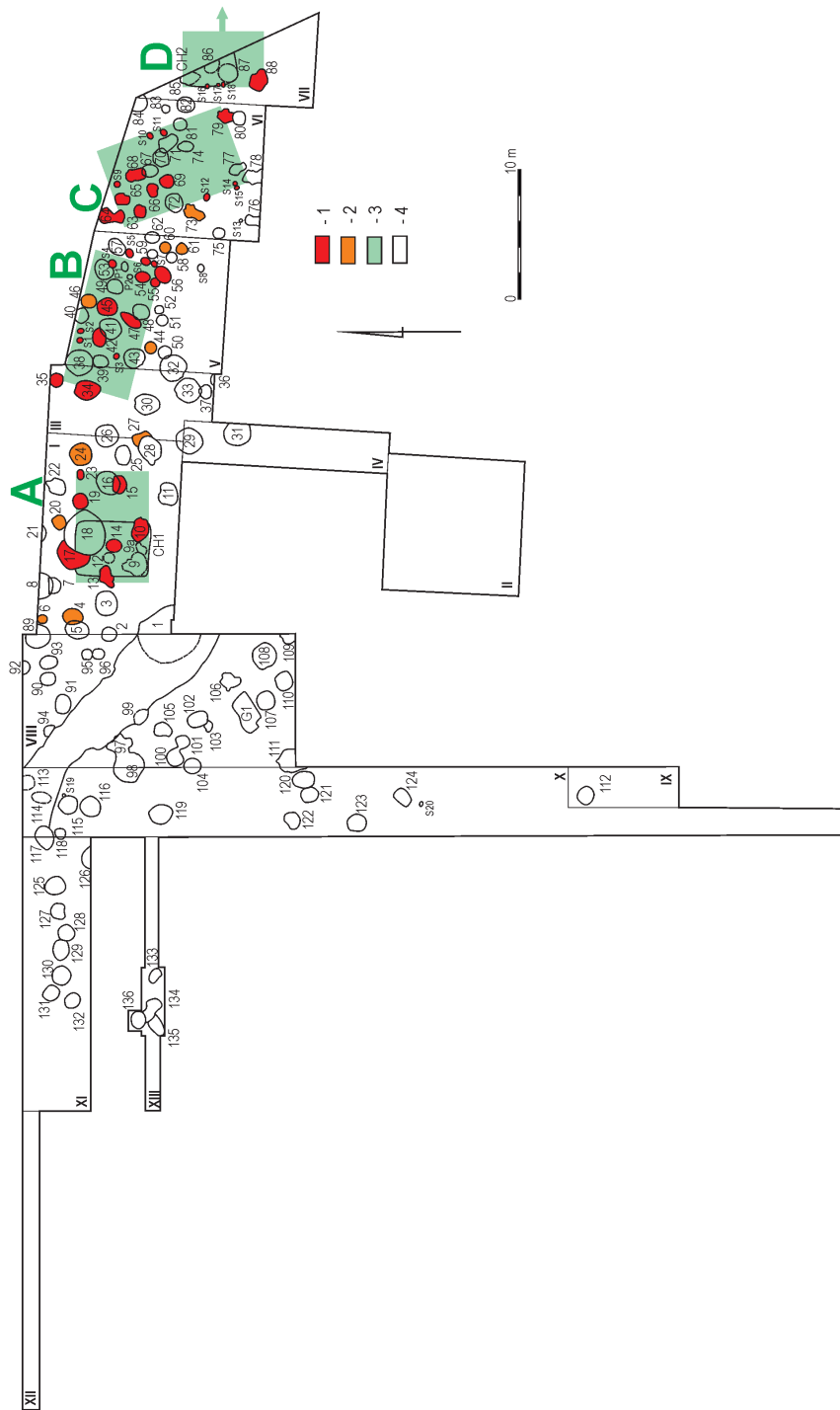


Fig. 2. Mrowino, site 3, Greater Poland Province. Location of features and reconstructed buildings. Foll. Diachenko *et al.* 2018

Key: 1 – features related to the construction and interior of houses; 2 – external features, synchronous with houses; 3 – reconstructed houses; 4 – other features.

GENERAL DESCRIPTION OF THE POTTERY COLLECTION

The FBC pottery assemblage comprises 62 complete or reconstructed vessels and 37,590 shards, weighing in total 640.429 kg. The average incidence of FBC pottery per investigated area is almost 31 shards/sq. m or 524 g/sq. m by weight. The state of preservation of the pottery is relatively good, which is best illustrated by the average weight of a single shard of 17 g.

A characteristic trait of the assemblage is a much greater proportion of thick-walled vessels than it is known from older materials from the region (Fig. 3). Those belonging to Class III (wall thickness of 10 mm and more), as a rule, have

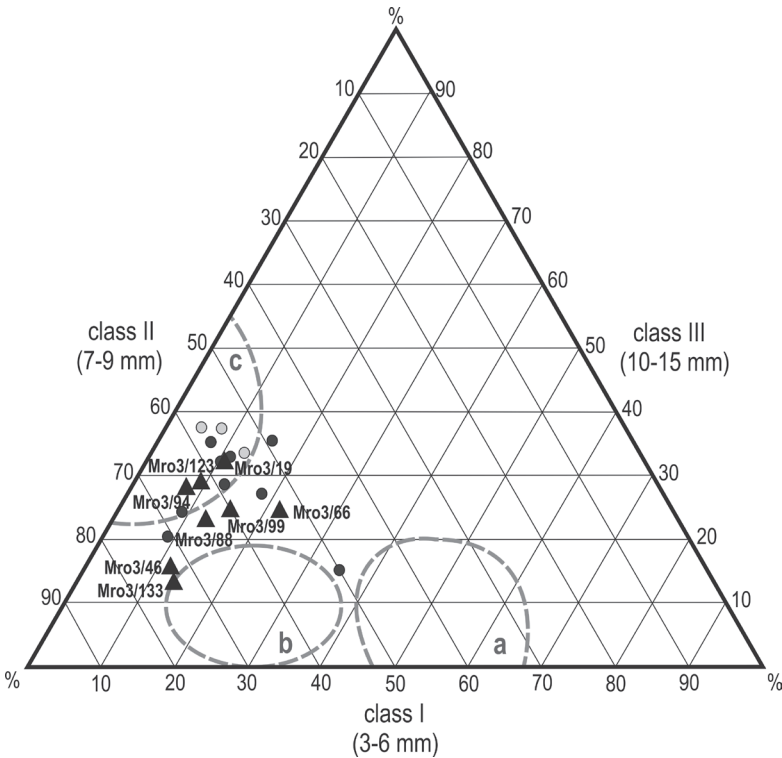


Fig. 3. Mrowino, site 3, Greater Poland Province. Structures of vessels wall thickness from selected features against the background of data from Kujawy and Greater Poland. Foll. Szmyt, Żurkiewicz 2018, changed

Key: pottery sets from individual features from: black triangles – Mrowino, site 3 (features no. 19, 46, 66, 88, 94, 99, 123, 133); dark gray circles – Opatowice, site 42 (Kujawy); bright gray circles – Opatowice, site 3 (Kujawy); dashed lines indicate the ranges of variation of the early (a), classical (b) and late (c) phases of the Funnel Beaker culture in Kujawy [after Koško 1981; Koško *et al.* 2014; Koško, Przybył 2007].

straight or arched walls and are classified as pots and vases, as well as large amphorae. They are most often decorated with fingerprints, horizontal strips and convex arches. More complex decorations (including ones made with various kinds of a cord and with a stab-and-drag technique) were placed on medium-thick (Class II) and thin (Class I) vessels.

The set of ornamental elements used to decorate Mrowino vessels is rather limited, with finger or nail impressions, relief arches, horizontal strips and bosses of various shapes and sizes dominating. These basic elements, either alone or in combination with one another, are responsible for over 72.5% of motifs. The second most popular elements are stanchions (mostly impressed and rarely incised) and zig-zags (incised and stabbed-and-dragged, rarely impressed). They were part of 15.0% of motifs. The third most popular group encompassed the motifs that employed two – or three-strand cord impressions (9.0%). The fourth group was made up of motifs constructed from vertical or oblique impressed, incised and stabbed-and-dragged (furrowed) lines (4.4% of motifs). Other ornaments (group C) were used much less frequently and usually in combination with third and fourth group ones.

Four stylistic components were distinguished in the ceramics from Mrowino. They are connected to: late Wiórek stage, Luboń stage, Baden influences, and the western (probably mainly Salzmünde) influx. These components document pottery traditions, of which the first two are local (endogenous) and the last two – exogenous, associated with the processes of Eneolithization.

MINERALOGICAL AND PETROGRAPHIC RESEARCH

For the mineralogical and petrographic analyses, 40 FBC vessel shards were selected to identify mineral and rock components of the ceramic body and compare the ways of raw-material preparation [Rauba-Bukowska 2018]. This work presents selected results that give preliminary archeometric characteristics of FBC late-stage pottery on the Polish Lowland. It is called the Luboń stage [Jażdżewski 1936] and includes vessels with references to the Baden culture.

METHODS

From shards, thin sections were made to be studied under polarization transmitted-light microscope (Figs. 4-8). With the use of quantitative petrographic analysis (point counting), the percentage content was determined of such com-

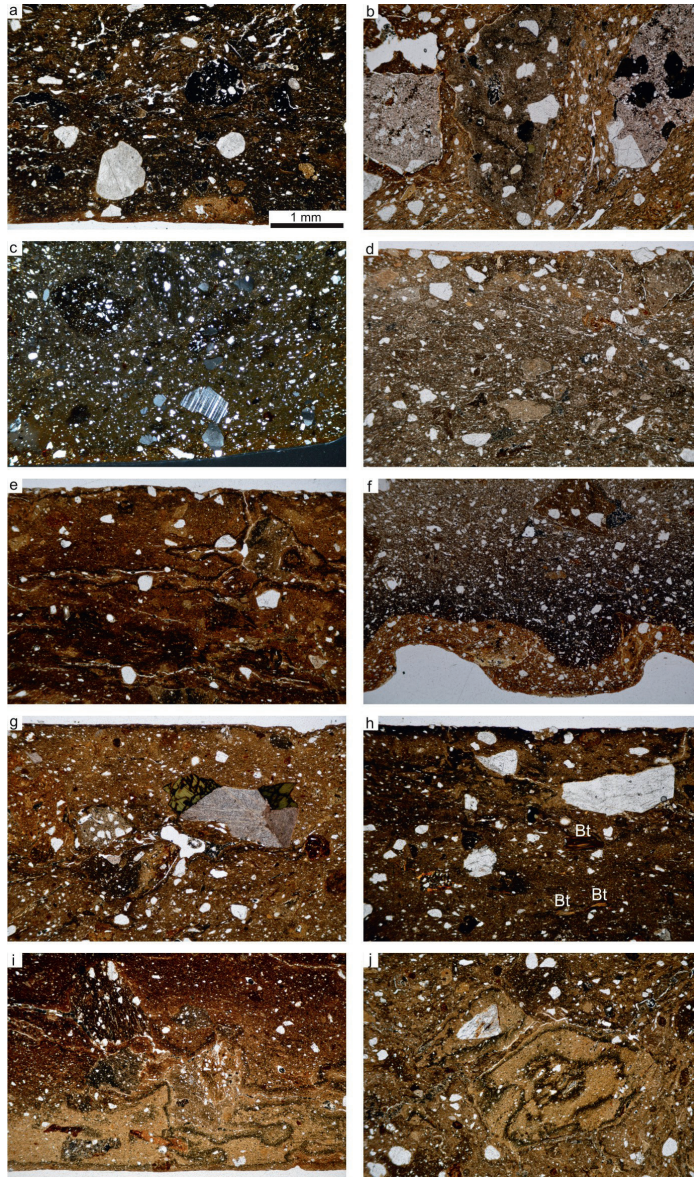


Fig. 4. Mrowino, site 3, Greater Poland Province. Microscope photographs of thin sections of ceramic samples. Foll. Rauba-Bukowska 2018

Key: a – sample Mrow1, rounded grains and dark grog fragments visible in the ceramic fabric, 1N; b – sample Mrow2, visible two fragments of igneous rock (on the sides) and a piece of chamotte (in the center), 1N; c – sample Mrow3, numerous fine grains of quartz and a plagioclase (at the bottom), NX; d – sample Mrow4, rounded crystalline grains (bright objects) and fine grog pieces, 1N; e – sample Mrow5, rounded crystalline grains, 1N; f – sample Mrow6, an orange (oxidized) layer and an ornament at the outer surface, 1N; g – sample Mrow7, a fragment of an igneous rock (slightly to the right in the center), next to it is a piece of chamotte, 1N; h – sample Mrow8, rounded quartz grains, a feldspar fragment (larger white object), and biotite flake (Bt), 1N; i – sample Mrow9, pieces of chamotte (brown object on the left) and uneven color of the mass, 1N; j – sample Mrow10, in the center visible two pieces of chamotte with similar staining as in the sample Mrow9, 1N.

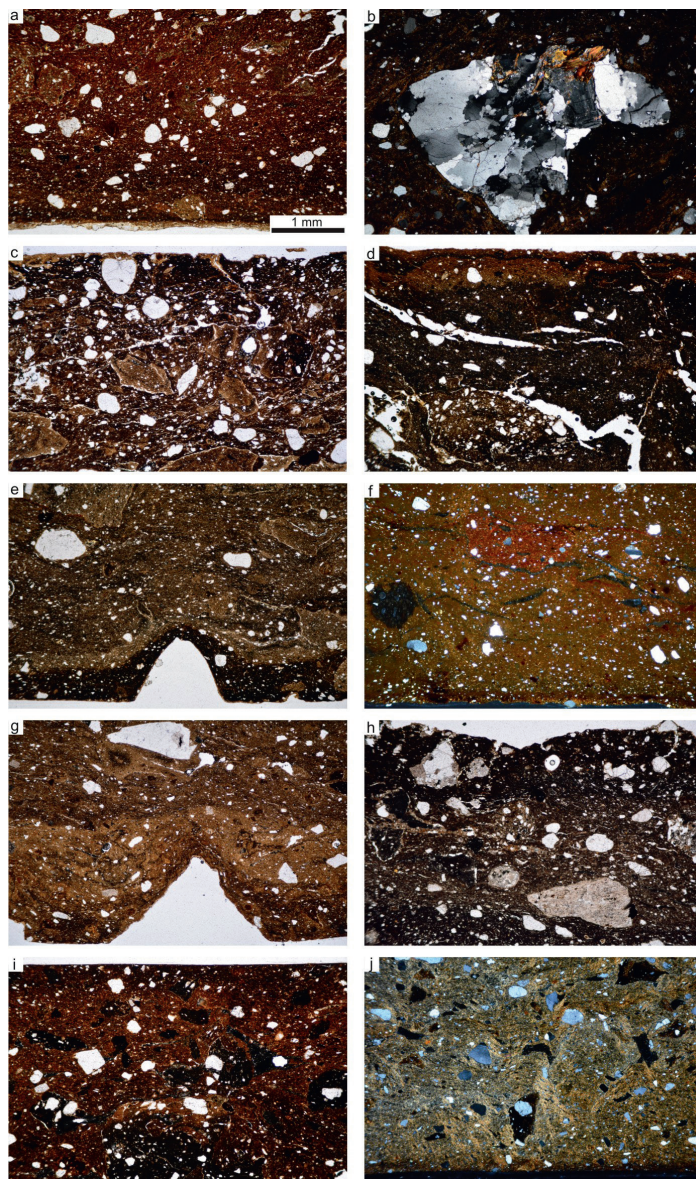


Fig. 5. Mrowino, site 3, Greater Poland Province. Microscope photographs of thin sections of ceramic samples. Foll. Rauba-Bukowska 2018

Key: a – sample Mrow11, visible rounded crystalline grains and pieces of chamotte with a colour similar to ceramic mass, 1N; b – sample Mrow12, visible fragment of igneous rock, NX; c – sample Mrow13, numerous poorly sorted, rounded crystalline grains (bright objects) and pieces of chamotte, 1N; d – sample Mrow14, numerous oblong voids visible, and a piece of chamotte (at the bottom), 1N; e – sample Mrow15, visible a few larger rounded grains, and a trace of an engraved ornament, 1N; f – sample Mrow16, ceramic mass strongly saturated with iron compounds, NX; g – sample Mrow17, visible larger fragment of feldspar (top) and a trace of the ornament (bottom), 1N; h – sample Mrow18, visible rounded quartz grains and feldspar (larger gray objects), 1N; i – sample Mrow19, pieces of chamotte in the ceramic fabric (brown objects) and rounded crystalline grains (white objects), 1N; j – sample Mrow20, the ceramic mass shows poor mixing and the temperature of approx. 700-750°C, NX.

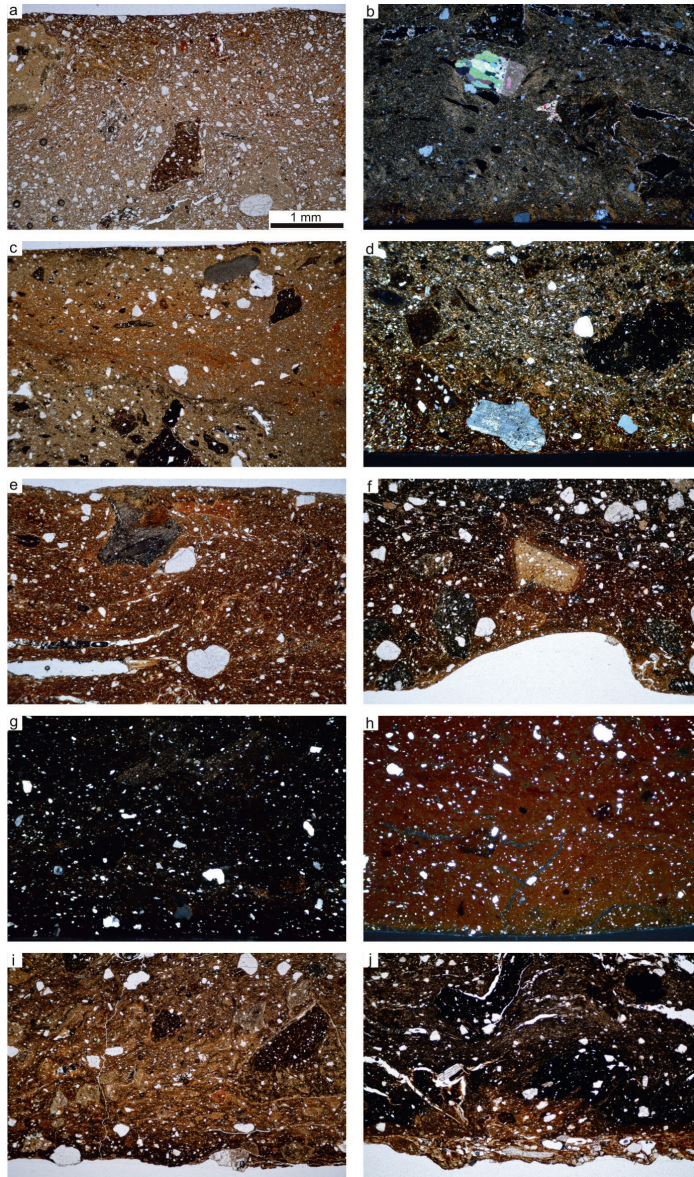


Fig. 6. Mrowino, site 3, Greater Poland Province. Microscope photographs of thin sections of ceramic samples. Foll. Rauba-Bukowska 2018

Key: a – sample Mrow21, two larger pieces of chamotte in the ceramic mass, 1N; b – sample Mrow22, ceramic mass of marly clay, in the center a fragment of limestone, NX; c – sample Mrow23, areas of poorly mixed fabric are visible (middle orange band), a rounded micrite fragment (gray object) at the top, 1N; d – sample Mrow24, silty clay ceramic fabric with numerous fine mica flakes, pieces of chamotte (dark objects) and grain of partially altered feldspar visible, NX; e – sample Mrow25, visible a few larger rounded crystalline grains and a fragment of chamotte, 1N; f – sample Mrow26, dark orange ceramic fabric near the surface of the vessel, a trace of an ornament (at the bottom) and numerous rounded crystalline grains visible, 1N; g – sample Mrow27, an opaque ceramic fabric, NX; h – sample Mrow28, the ceramic mass shows isotropic properties, which indicate a high firing temperature, NX; i – sample Mrow29, fragment of chamotte and rounded crystalline grains (white objects), 1N; j – sample Mrow30, dark fragment of chamotte in the ceramic fabric, an oxidized layer visible on the surface, 1N

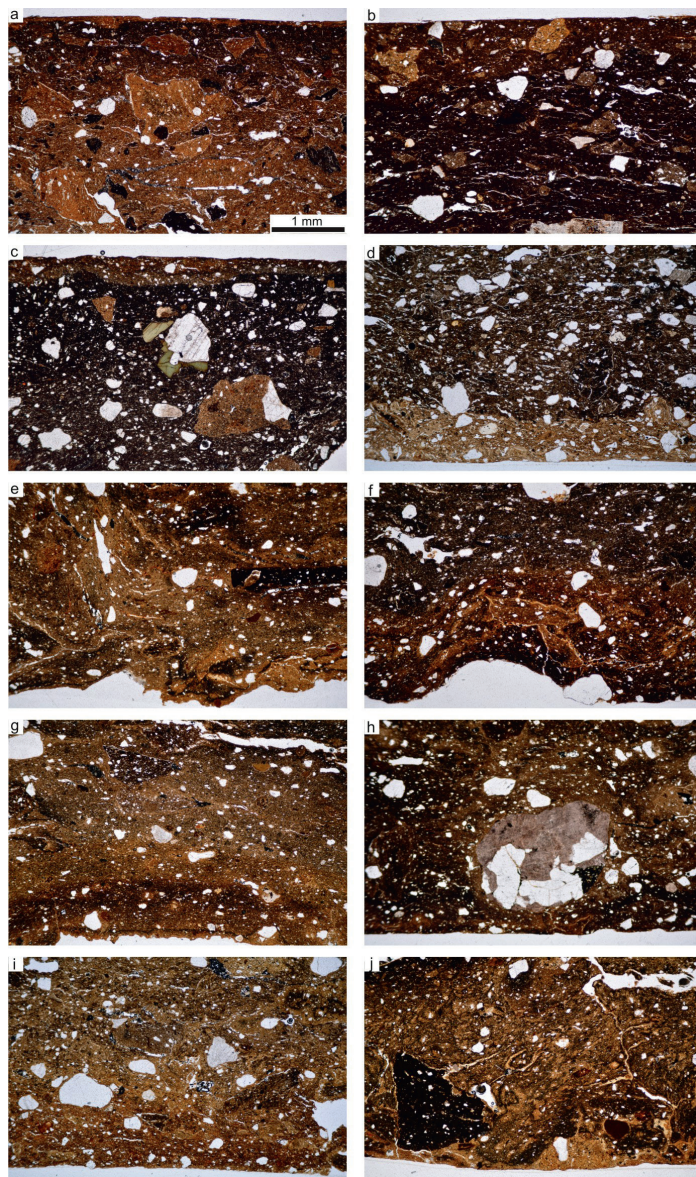


Fig. 7. Mrowino, site 3, Greater Poland Province. Microscope photographs of thin sections of ceramic samples. Foll. Rauba-Bukowska 2018

Key: a – sample Mrow31, numerous fragments of grog in the ceramic fabric, 1N; b – sample Mrow32, visible silty rock grains and lighter grog fragments, 1N; c – sample Mrow33, in the center a fragment of igneous rock with green hornblende, 1N; d – sample Mrow34, numerous crystalline grains, an oxidized layer visible near the surface, 1N; e – sample Mrow35, larger and darker fragments of grog in the ceramic mass, 1N; f – sample Mrow36, at the surface of the vessel, the oxidized mass turns orange, numerous crystalline grains visible, 1N; g – sample Mrow37, visible crystalline grains and grog fragments, 1N; h – sample Mrow38, in the center a fragment of an igneous rock, 1N; i – sample Mrow39, visible poorly sorted crystalline material and numerous grog fragments, 1N; j – sample Mrow40, on the lower left, a larger dark fragment of grog is visible, 1N.

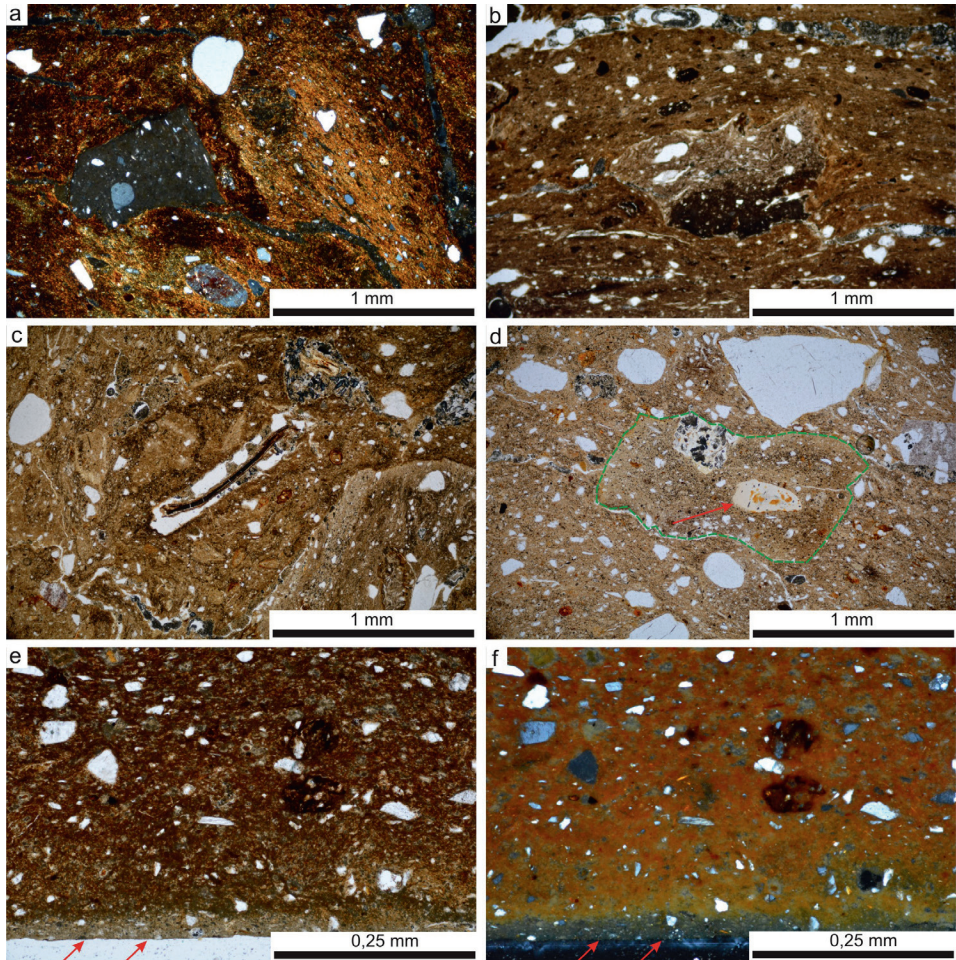


Fig. 8. Mrowino, site 3, Greater Poland Province. Microscope photographs of thin sections of ceramic samples. Foll. Rauba-Bukowska 2018

K e y : a – sample Mrow9, a piece of chamotte with isotropic optical properties in an orange, poorly firing ceramic, NX; b – sample Mrow21, a two-coloured fragment of grog, 1N; c – sample Mrow10, a partially preserved organic fragment in the center, 1N; d – sample Mrow2, in the center a grog fragment with a small fragment of bone approx. 0.4 mm (an arrow), 1N; e, f – sample Mrow28, zone at the outer surface of the vessel, a thin layer of clay is visible, which after firing has a whitish color (arrows), e – 1N, f – NX.

ponents as: clay minerals, quartz, potassium feldspars, plagioclases, muscovite, biotite, carbonates, as well as sedimentary, igneous and metamorphic rock grains, fragments of reused pottery as well as organic material. For each microscope thin section, a petrographic description was made, giving the percentage content of particular components, degree of body kneading and the conditions and temperature of firing. The descriptions were used for comparative studies and helped divide the samples according to the technologies of clay preparation and ready-product firing. The approximate firing temperature was determined, basing on the thermal alteration of clay minerals (degree they changed into amorphous, isotropic substances) and observations of biotite, hornblende and glauconite minerals [Quinn 2013: 190–203]. The division into grain fractions follows the recommendations of the Soil Science Society of Poland [PTG 2009].

RESULTS

We focus on two aspects: identification of the raw materials from which the vessels were made, and the admixtures added to clay in order to prepare ceramic body.

IDENTIFICATION OF RAW MATERIAL

The studied samples (Figs. 4-8) are diversified in terms of mineral content and petrography [Rauba-Bukowska 2018]. Some vessels (17 samples: Mrow3, Mrow4, Mrow5, Mrow9, Mrow10, Mrow11, Mrow13, Mrow14, Mrow15, Mrow16, Mrow19, Mrow25, Mrow26, Mrow27, Mrow28, Mrow31, Mrow35) were made from rather heavy clays, containing glauconite, fine heavy minerals (e.g. hornblende, zircon) and small amounts of fine (frequently partially metamorphosed) micas. Observable in them, crystalline grains, approx. 0.1-0.3 mm in size, are mostly rounded quartz.

Three vessels (Mrow6, Mrow21, Mrow24) were made from raw-material containing a large amount of silt-fraction grains and a higher amount of mica flakes.

To make another three vessels (, Mrow22, Mrow23, Mrow38), marly clay was used. This raw material consists of a clayey matrix in which very fine micrite particles are evenly dispersed as well as other carbonates, such as calcite, or fauna relics (e.g. Mrow23).

Next three vessels (Mrow17, Mrow20, Mrow29) were made from heavy clays (small content of silty grains) in which carbonates were identified such as calcite and micrite intraclasts.

The ceramic bodies of five vessels (Mrow8, Mrow30, Mrow32, Mrow33, Mrow34) were found to contain larger brown biotite plates. In addition, three samples of this group (Mrow8, Mrow33, Mrow34) were found to contain hornblende.

A group of ceramic bodies was identified that contained igneous rock crumbs. Nine samples (Mrow1, Mrow2, Mrow7, Mrow12, Mrow18, Mrow36, Mrow37, Mrow39, Mrow40) were found to contain acid igneous rocks (probably granites) made up of feldspars, quartz, mica flakes and hornblende (Fig. 4: b). The crumbs are approx. 1-2 mm and angular. Rock crumbs were also found in raw materials containing carbonates.

Generally, the samples were diversified in terms of petrography, poorly sorted and contained various grain fractions (silt, sand and gravel fraction), particular grains being poorly rounded. The petrographic diversity of the samples argues for assuming that the studied ceramics was made from boulder clay (or glacial till). According to the Central Geological Database, in the immediate vicinity of Mrowino glacial till is common, accompanied by its detritus and the glacial silts, sands and gravels of the North Polish Glaciation [Hildebrandt-Radke 2018: 20-22].

IDENTIFICATION OF TEMPER

All studied samples were found to contain deliberately added grog temper (from 1.7% to 28.6% by volume). Fragments of grog (made of older pottery vessels) are usually easily distinguished from ceramic body because of their darker colour and isotropic optical properties (Fig. 8: a). This means, in turn, that they were fired in rather high temperatures. Sometimes, these crumbs are bicoloured. This happens when ceramic body is added a subsurface shard fragment with an oxidation zone (Fig. 8: b). The crumb size varied as well. The ceramic bodies contain both fine (approx. 0.1 mm) and larger pieces of grog. In few samples, they are well sorted.

Organic fragments were found in many ceramic bodies; preserved fragments were identified in 16 samples. These are predominantly partly damaged plant tissues of elongated shapes (Fig. 8: c). Their occurrence in many samples suggests that plant fragments were a deliberate temper or that in the surroundings of the ceramic body workshop there were fine plant fragments. In many other samples, empty spaces were recorded. It is difficult to determine whether they were left by plant fragments (destroyed during firing) or whether they are resulted from breaks

in ceramic body. In one instance (sample Mrow2), a piece of grog was observed with a bone fragment inside it (Fig. 8: d).

Rounded grains (sand) were found in all samples in various proportions. Next to such grains, there are poorly rounded or angular ones. This may suggest that a small amount of sand was added to ceramic body.

Igneous rock fragments were identified in ceramic bodies of various composition, for instance, in marly clays. In boulder clays (glacial till), angular rocks fragments may occur, hence this component probably naturally occurred in raw materials used. However it is not excluded that this is intentional admixture.

CONCLUSIONS

In the studied samples, glacier till in all probability was used to make ceramic vessels. It may be highly variable in terms of lithology, which the studied samples bore out. In general terms, the raw material used to make the samples consisted of clay with a low content of silt fraction grains and mica flakes and a relatively low share of crystalline grains.

The main temper used in making the ceramic fabric was grog and probably small amounts of sand. The ceramic body was found to contain plant fragments as well, but they rather did not have any technological significance for the ceramics product and may have found their way to the raw material by accident.

The samples did not differ much in terms of ceramic fabric preparation. With reference to the earlier findings, the studied samples of ceramic body may be classified as Type B [Rauba-Bukowska 2014; 2015]. It is characterized by the use of grog (chamotte) and a small amount of sand as temper.

Mrowino ceramic body samples are distinguished by their raw-material changeability, with samples made from silty clay, containing mica flakes, standing out as do vessels made from marls clay or ones containing a significant share of carbonates. The content of igneous rocks found in several samples from Mrowino has so far been rarely identified in FBC ceramics [cf. Pawlikowski 2015 and unpublished materials from the Kujawy region]. To find out if this was a deliberate or accidental admixture, it is necessary to carry out further research.

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