



Formation of the Fedorovka (Andronovo) Ceramic Traditions of the Late Bronze Age Mochishche Settlement in the Trans-Urals

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Abstract. In the Southern Trans-Urals, there are complexes of main Andronovo cultures—Alakul and Fedorovka—but their relationships, both chronological and genetic, remain the topic of almost a century-long debates. Analysis of ceramic complexes from the Mochishche settlement demonstrated that from the technological point of view of technique and the decoration typology, Alakul and Fedorovka ceramics are not related. At the same time, the Fedorovka pottery of the settlement is identical to the Fedorovka (Andronovo) pottery of more eastern areas. However, the technological analysis showed that Fedorovka potters used silty clay (18.8%), typical for the Alakul and Fedorovka pottery of Western Siberia. There are also additions of chamotte, which are typical for the Fedorovka pottery of Altai and Western Siberia. Probably, with the spread of the Fedorovka pottery tradition to the west, the Alakul potters were assimilated, and their skills were adapted. However, at the same time, Fedorovka's techniques for applying ornamentation, decorative schemes, and forms of ware, as well as their corresponding constructing methods, were perceived. Thus, we see a very interesting effect when the spread of pottery technologies differs from the spread of forms and ornamentation. The former reflects the participation in the cultural genesis of a specific population, and the second does the inclusion of the collective in some socio-economic systems.

Keywords: Late Bronze Age · Andronovo · Fedorovka · Trans-Urals · Kazakhstan · Pottery · Forms and ornamentations · Technologies

1 Introduction

The Fedorovka and Alakul cultures are the main formations of the Andronovo cultural and historical community, which sites are distributed from the Urals to the Yenisei in the south of Middle Siberia. Alakul sites occupy only the western part of this area between the Ural Mountains and the Irtysh River, although they are rare on Irtysh. The formation of the Alakul culture is associated with the Sintashta groups of the Urals and the Poltavka groups of Eastern Europe (Grigoriev and Salugina 2023, p. 168). In contrast, the Fedorovka sites are widespread everywhere in this zone but are more concentrated in

the forest-steppe zone. The Andronovo commonality¹ itself was named after a cemetery in the Minusinsk Basin in the extreme east, and the Fedorovka culture was named after a cemetery in the Urals in the extreme west². In these regions, we see contrasting funeral rites: cremation in the west and inhumation in the east, but the forms and ornamentation of ware are the same for all regions. Therefore, the formation of the Fedorovka culture was caused by some unified process.

There were several approaches to the relationship of the Fedorovka and Alakul cultures (for the historiography of the problem, see Grigoriev 2021): (1) Alakul was formed on the Fedorovka basis (according to Salnikov), (2) Fedorovka was formed on the Alakul basis (according to Zdanovich, Vinogradov, Matveev, Malyutina, Alaeva), (3) these were two parallel cultures (Kuzmina, Potemkina). The Cherkaskul culture is usually regarded as related to Fedorovka, and it was formed either in parallel or based on Fedorovka. In the latter case, it has a rather late chronological position. Then, on the basis of Cherkaskul, the Mezhovka culture was formed. A variant of the third approach is the synchronization of a newcoming Fedorovka culture only with the developed Alakul culture, while the early Alakul is dated to the previous period (Stokolos, Grigoriev). In this case, Cherkaskul may have been formed soon after the appearance of the Fedorovka culture. But it is very likely that the Mezhovka ceramic type appeared simultaneously with the Cherkaskul type, and it was a continuation of the Fedorovka settlement ware. Only after the gradual disappearance of the Cherkaskul type can one speak of the Mezhovka culture.

At the same time, we have already discussed that the formation of similar ceramic forms and ornamentations could be caused by fashion or being drawn into some common socio-economic systems (Grigoriev and Salugina 2023, p. 164, 168). In contrast, pottery technologies are usually transferred in a kinship environment, and their spread may reflect migration processes. Therefore, a joint study of ornamentations and technologies of pottery of the Mochishche settlement can shed light on the formation of Fedorovka culture.

Chronology of complexes. The dates of the Fedorovka culture in the Trans-Urals (ca. 1980–1510 BCE) correspond to the Alakul dates, which form an overly wide interval of 2300–1450 BCE, and Cherkaskul dates fall in ca. 1610–1260 BCE (Molodin et al. 2014, pp. 142–145). But for the Trans-Urals, the chronology of these sites is not very reliable. Taking into account the difference between the old LSC and modern AMS dates, as well as the stratigraphy of the sites, it is obvious that Alakul was formed no later than Sintashta, which is dated in the AMS dates to ca. 1960–1770 BCE. An Alakul-Fedorovka burial in the cemetery of Lisakovsky is dated to 1719 ± 50 BCE (Usmanova and Panyushkina 2011, p. 378; Grigoriev et al. 2018, p. 191–193; Epimakhov 2020). Therefore, it is likely that the formation of the Fedorovka culture in the Trans-Urals began after the end of the Sintashta and the early Alakul stage in the 18th century BCE; the formation of Cherkaskul soon began, and these forest-steppe cultures coexisted with the classical stage of the Alakul culture, which is located in the southern forest-steppe and steppe. At the same time, the spread of the Fedorovka tradition from the east was

¹ See discussion about the term (Grigoriev 2021, p. 4).

² Due to this situation, in Southern Siberia, the term “Fedorovka” is not used for complexes with the Fedorovka pottery, but “Andronovo culture” is used, which cannot be applied in the west without the risk of misleading the reader.

extremely fast, and the dates in the Altai region do not fundamentally differ from those in the Tobol area and the Trans-Urals.

2 Materials and Methods

Materials of the multilayered settlement of Mochishche in the forest-steppe zone of the Southern Trans-Urals have been used for the analysis. The early horizon of this settlement was represented by the Petrovka and early Alakul materials, the analysis of which has been published (Grigoriev and Salugina 2020, 2023). Above, there was a horizon with pottery of the Fedorovka, Cherkaskul, and Mezhovka types. Their analysis shows that these types in the settlement were simultaneous, and they appeared after the end of the early Alakul stage, although for the Fedorovka type, we assume a partial coexistence with the end of this stage. In the Cherkaskul horizon of the settlement, the proportion of Cherkaskul pottery is 29.8%, Mezhovka—30.77%, Fedorovka—10.58%, and Fedorovka-Cherkaskul—28.84% (Grigoriev et al. 2018, pp. 191–193). As we will see below, the Fedorovka-Cherkaskul type is morphologically closer to the Fedorovka type than Cherkaskul, and may be considered within the framework of the Fedorovka culture. Therefore, the proportion of ceramics from this culture in the settlement collection is 39.42%, and that of the Cherkaskul-Mezhovka culture is 60.57%. Therefore, at this stage, this settlement can be defined as Cherkaskul-Fedorovka. As at any Bronze Age settlement, its collection contains ware that cannot be reliably attributed to any group, and we analyzed only reliably identifiable fragments. In general, only 629 pieces have been attributed to the Fedorovka-Cherkaskul-Mezhovka group: 116—Fedorovka, 152—Fedorovka-Cherkaskul, 186—Cherkaskul and 175—Mezhovka. The material is very fragmented, making it difficult to analyze the original vessel shapes. Therefore, the main attention was paid to the decoration. Nineteen ornamental techniques and 24 ornamental figures have been identified. These data were inserted into the tables. Then, on this basis, the coefficient of similarity of various types has been calculated according to the Pearson's chi-squared test.³

The analysis of pottery technologies was carried according to Bobrinsky's (1978) method. The ceramic samples were examined under an MBS-10 microscope at 16–32-fold magnification. During this study, the characteristics of the raw material and the added components were determined. The obtained data on the qualitative composition of the raw materials and the paste components are compared with the standard base. The pottery of the settlement and the standards were heated in a muffle furnace to 800–850 °C to ensure standard observation conditions. The number of inclusions, their shape and size, and the color of different ceramic layers were determined. Analysis of the composition of the raw materials and components of the paste was carried out at a qualitative and quantitative level. At the qualitative level, the shape, color, and preservation of inclusions were fixed; at the quantitative level, the number of different inclusions per area of 1 cm², for which standard samples were made in bars 10 cm long with an area of 1 cm². Actions with these components at the preparation stage of

³ In previous publications we used to apply the Pearson's coefficient of correlation, which is less suitable in this case, although the ratio of the coefficients are very similar and it did not cause different conclusions. However, the Pearson's chi-squared test is better.

raw materials (heating, crushing, grinding, sizing, cleaning, rubbing, preheating, or lack thereof) were determined. Mineral components include chamotte—old crushed ceramics, gruss—crushed stone, and sand. The organic components are ruminant manure, organic solutions, mollusk shells, calcined bone, etc. Currently, the standard database for the ceramic study is available on the Internet for free access: <http://archsamara.ru/katalog/>.

3 Results and Discussion

Ornamentation of ceramics. The standard situation is the presence of two types of ware on the Fedorovka settlements: pots with a smooth profile and lush comb ornamentation (Fig. 1 4, 5, 8), and pot-and-jar forms with coarser ornaments (the so-called settlement ware) (Fig. 1 1–3, 6, 7, 9, 10). The Cherkaskul type was formed on the basis of the first, and the Mezhovka type did on the basis of the second (Grigoriev et al. 2018, p. 215). As a result, in the Trans-Ural collections it is extremely difficult to distinguish Fedorovka settlement ware from Mezhovka one, while Fedorovka and Cherkaskul ceramics are distinguishable, and it is possible to distinguish a transitional Fedorovka-Cherkaskul type, in which comb ornaments, characteristic of Fedorovka ceramics, made in an oblique grid, are often accompanied by shallow grooves around ornamental figures, which is typical for Cherkaskul. The ornamentation technique of the Fedorovka ceramics is dominated by comb stamp impressions (64.4%), which are often thin. Cannelures are in the second place (18.6%), triangular impressions are less often (5%), and other ornamental techniques are even rare. The dominant figures are straight lines, oblique and ordinary triangles, and straight and oblique meanders. The proportion of geometric ornaments is 51.61%. Of the ornamental figures, hatched triangles (mainly “oblique”), horizontal lines, meanders and zigzags are typical.

The coefficient of similarity of the Fedorovka ornamentation with ornaments of other types of this settlement was calculated (Table 1). As a result, the similarity between Alakul and Fedorovka ceramics has turned out to be too low (0.12) for discussing their relationship. The Fedorovka type shows the greatest similarity with the Fedorovka-Cherkaskul (0.66) and Cherkaskul (0.46) types. They are related, and the Fedorovka-Cherkaskul type can be considered rather within the Fedorovka culture, because it shows the less similarity with the Cherkaskul type (correspondently 0.66 and 0.43). Less similarity is seen with the Mezhovka type, but higher than with Alakul. The similarity of the Cherkaskul and Mezhovka types with Alakul also remains low: the similarity of Cherkaskul slightly decreases, and for the Mezhovka type, we see a slight increase. Thus, on the basis of ornamentation, three different traditions may be distinguished: Petrovka, Alakul and Fedorovka-Cherkaskul-Mezhovka.

Ceramic production technology. The initial raw materials of the Fedorovka pottery are mainly represented by natural ferrous clays (81.2%) and silty clay (18.8%), which indicates the presence of at least two groups with different ideas about the selection of this raw material. Mineral (talc and chamotte) and organic (ruminant manure and flow from it) admixtures were used to prepare molding masses. Chamotte and gruss (talc) were used in equal proportions; from organic admixtures, flow from ruminant manure was usually added. Analysis of the composition of chamotte has shown that

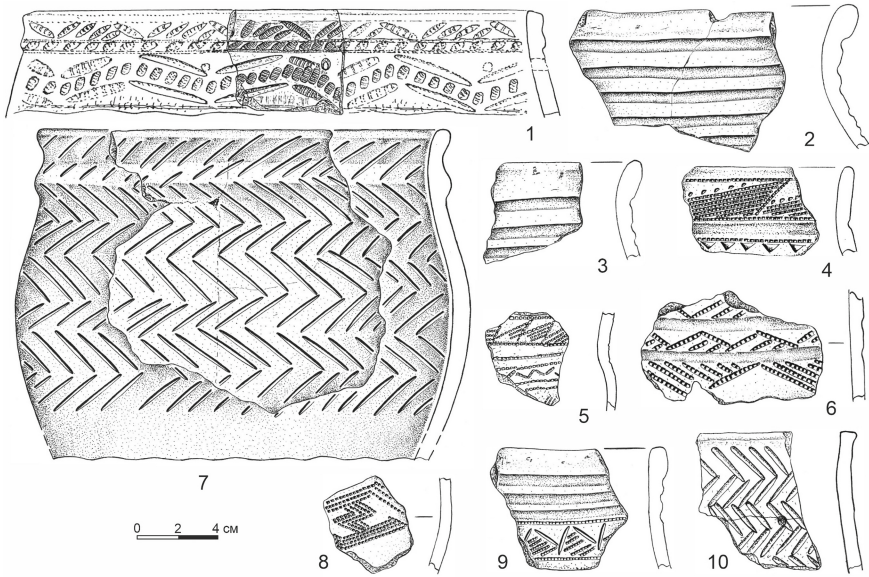


Fig. 1. Fedorovka ceramics of the Mochishche settlement.

all the vessels from which the chamotte was obtained had been made of natural clay, and talc (61.5%), chamotte (15.4%), talc and chamotte (23.1%) were introduced into their molding masses. Thus, for the Fedorovka potters of the Mochishche settlement, the tradition of introducing chamotte and talc into clay was stable.

Potters started to make vessels from the bottom, using a spirally-patched method. The body of the vessels was made of patches built up along a spiral trajectory. The final shape of the vessels was given by pressing with fingers and knocking with a mallet with a smooth working part. There are no traces of the use of form models typical of the Alakul vessels on the settlement. Processing of vessel surfaces was carried out in two ways: simple smoothing and polishing. Pieces of textile or leather and stone pebbles and rarely a wooden knife were used as smoothing tools. More often, the primary smoothing of the surfaces was carried out with an elastic object, after which there was an additional smoothing and compaction with stone pebbles. Polishing was recorded on two vessels, and one must speak of local polishing in the area of the rim and sometimes on the vessel shoulders.

Giving products strength and moisture resistance was carried out by heat treatment in a fireplace or hearth. A solid gray color means that the heat treatment was carried out without access to oxygen in a reducing atmosphere, and 56.2% of the vessels were fired under these conditions. The presence of a lighter layer only on the outer or on both sides of the vessel indicates a short-term effect of the temperature of incandescence in a mixed redox environment; 25% of the vessels were fired under such conditions. The thickness of the lighter layers in the fractures of most vessels is less than 1.5 mm. This means that the vessels were in the zone of hot temperatures (650 °C and above) for less than 20 min (Vasilieva and Salugina 1999, p. 247). Some of the vessels (18.8%) have a

Table 1. The similarity coefficient of the ceramic complexes of the Mochishche settlement

	Petrovka	Alakul	Fedorovka	Fedorovka-Cherkaskul	Cherkaskul	Mezhovka	Sargary
Petrovka		0.11	0.01	0.05	0.03	0.18	0.03
Alakul	0.11		0.12	0.12	0.07	0.16	0.01
Fedorovka	0.01	0.12		0.66	0.46	0.27	0.00
Fedorovka-Cherkaskul	0.05	0.12	0.66		0.43	0.46	0.02
Cherkaskul	0.03	0.07	0.46	0.43		0.28	0.00
Mezhovka	0.18	0.16	0.27	0.46	0.28		0.19
Sargary	0.03	0.01	0.00	0.02	0.00	0.19	

uniform brown fracture, which indicates their complete calcination. The firing of such vessels, most likely, was carried out in an oxidizing atmosphere with a plenty of oxygen.

Comparison with complexes of other regions and cultures. For the Altai Fedorovka ceramics (the Zharkovo-3 settlement), only medium-plastic and plastic clays were selected (in our terminology, non-sandy and slightly sandy). When compiling forming masses, the leading recipe was “clay + chamotte + organic” (Papin et al. 2021, p. 47). The tradition of using chamotte as a mineral admixture was the main one at most of the Andronovo sites in the region (Gutkov et al. 2014, p. 317).

In materials from the south of Western Siberia (the settlement of Bolshoi Log-I), the use of two types of raw materials has been recorded: silty clay (88.24%) and natural ferrous clay (11.76%), everywhere the main component of the molding masses is chamotte; gruss (talc) is found episodically (Leontieva and Rahimzhanova 2016, pp. 32–33). Silty and natural clays were equally selected for Fedorovka ceramics in the Lower Tobol region, to which mainly chamotte was added as mineral admixtures; talc is rare. Moreover, chamotte was made of vessels produced of silty clays. A significant number of vessels are polished (Zakh and Ilyushina 2010; Ilyushina 2014, 2015, pp. 39–42). It is indicative that this difference in the use of silty clays in the Tobol region and natural clays with talc admixtures in the Southern Trans-Urals was already characteristic at the early Alakul stage (Grigoriev and Salugina 2020, pp. 53, 56).

Thus, the unusualness of the Mochishche pottery production is obvious. Regarding the skills of selecting raw materials, it occupies an intermediate position between the sites of Southern Siberia and Altai, on the one hand, and the Lower Tobol region, on the other. There are silty clays here, which are rare at the Altai sites, but their percentage is low compared to the Tobol sites. According to the features of the molding masses composition, the tradition of introducing chamotte was the leading one in Siberia, while chamotte and talc were used equally in Mochishche. For the manufacture of chamotte, only clay-made vessels were used. Regarding polishing, the situation is similar: in Mochishche, surfaces of only a few vessels were polished.

Comparison with the Alakul ceramics of the settlement (Grigoriev and Salugina 2020) shows both common and specific features. The Alakul and Fedorovka potters preferred a similar clay 1, which is unsurprising: the choice of clays around is limited. At the same time, silty clay and clays 2 and 3, which had been unknown in Alakul pottery, were selected to manufacture Fedorovka ware. For the Fedorovka potters, a more stable situation is observed: they selected mostly non-sanded raw materials, while the Alakul potters also used medium-sanded clays. To a great extent, molding masses coincide both in terms of the composition of the components and in terms of quantitative indicators. In Fedorovka ceramics, a much smaller percentage of polished ware has been noted compared to Alakul ones. It is possible that at some stage in the existence of the settlement, these two cultural traditions came into contact, which, on the one hand, gave rise to common features in their technologies and, on the other hand, formed the features of Fedorovka pottery, different from other Fedorovka collectives.

4 Conclusions

The limited data presented here show that in the Tobol region and the Southern Trans-Urals, the features of Alakul pottery are represented in Fedorovka pottery, but the Alakul traditions were different in both regions: natural ferrous clays in the Trans-Urals and silty clays in the Tobol regions. The Fedorovka potters of the Tobol region inherited the use of silty clays from the local Alakul potters, and later they brought this tradition to the Trans-Urals⁴. Methods of modeling vessels and the use of chamotte as admixture are common Fedorovka components of eastern origins. Therefore, the process of spreading the Fedorovka pottery tradition can be described as follows. The Fedorovka people moving from the east to Western Siberia came into contact with the local Alakul people and partially assimilated them. As a result, the Tobol Alakul features appeared in the Fedorovka pottery technology of the region. After some time, these transformed traditions penetrated into the Trans-Ural forest-steppe, where this process was repeated, but with the participation of the local Alakul people. Thus, the Alakul potters took part in the formation of Fedorovka pottery traditions in both regions. Our materials do not indicate a direct penetration of the Fedorovka people from the Altai into the forest-steppe Trans-Urals⁵. We can assume that in Mochishche, the proportion of the primary Fedorovka people was already quite small, and this is reflected in the preservation of the tradition of using chamotte, but mainly in the forms and ornamentation of ware. It is possible that this was a fairly universal process when the spread of Fedorovka stereotypes was superimposed on the former Alakul basis, and the former Alakul population participated in this process. The proportion of Fedorovka people could not be too high. At the same time, some new systems of socio-economic relations were emerging, which led to the dominance of external forms of the Fedorovka culture in some forest-steppe regions. It cannot be ruled out that this was supported by interaction with some areas of compact residence of the bearers of the Fedorovka culture, to which the Southern Trans-Urals did not originally belong.

The problem of the Fedorovka culture formation is more complex, since a well-known fact is the dominance of cremation in the Fedorovka funeral rites in the Trans-Urals, and its gradual decrease until the complete disappearance on the east. A separate problem is Central Asian inclusions in the Fedorovka complex. All this does not quite fit into the trends we have identified for pottery. Therefore, either the processes of culture formation were much more complex, and non-linear, or the materials of individual sites do not fully reflect the processes of formation of the ceramic traditions of culture, and it is necessary to expand the research base. We suspect that both possibilities are plausible. The second problem is the formation of the Cherkaskul culture, which can be considered a continuation of the Fedorovka culture or its variant (Grigoriev et al. 2018, p. 199, 200).

⁴ In the Irtysh basin in the Altai region, the use of silty clays is found on the early Fyodorovka settlements. This was probably caused by the Petrovka-Alakul impulses at the stage of formation of the Fyodorovka culture. However, this was not typical for the bulk of the Altai sites.

⁵ There are some evidences in the steppe area, which are out of our discussion.

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