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Technology of vessel making of the Early Bronze Age from the Chemar 5 and Chemar 7 settlements (East Kazakhstan)

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Keywords: archaeology, early
Bronze Age, settlement, ceramics,
technical and technological analysis

Түйін сөздер: археология,
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Ключевые слова: археология,
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The settlements of Chemar 5 and Chemar 7 (Beskaragay district, Abay region) are located near the village of Jetijar on the right bank of the Irtys, discovered in 2003 by the Pavlodar archaeological expedition led by V. Merts. As a result, it was discovered that at the settlement of Chemar 5 the recipe “clay + chamotte + organic solution” was often encountered (37.5%), also noted, but less frequently were the recipes “clay + organic solution” (12.5%) and “clay + broken stone temper + organic solution” (12.5%), two other recipes “clay + broken stone temper + chamotte + bone + organic solution” (25%) and “clay + broken stone temper + chamotte + organic solution” (12.5%), reflect a mixture of traditions in the field of composing molding masses. At the Chemar 7 settlement, the most common recipe was “clay + chamotte + organic solution” (55.56%), much less common were the following recipes: “clay + organics” (22.22%), “clay + broken stone temper + organic solution” (11.11%), “clay + chamotte + organics” (11.11%). This indicates the existence of different population groups at the site, who probably lived there at different times. The most common element of the ornament is the comb (45.4 at the Chemar 5 settlement and 47% at the Chemar 7 settlement), patterns and motifs are herringbone, stepping with dragging and striding with rolling. Technological and ornamental data obtained during the study of ceramics from the Chemar 5 and Chemar 7 settlements allow us to conclude that the main population is represented by the Elunin culture group, while other groups of ceramics are related to the Chemar and Odino-Krokhalev type of ceramics of the Ob-Irtys interfluvium.

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**Чемар 5 және Чемар 7 қоныстарынан табылған
ерте қола дәуірі ыдыстарын дайындау технологиясы
(Шығыс Қазақстан)**

Ертістің оң жағалауындағы Жетіжар ауылының маңында орналасқан Чемар 5 және Чемар 7 қоныстарын (Абай обл., Бесқарағай ауд.) В.К. Мерцтің жетекшілігімен Павлодар археологиялық экспедициясы 2003 ж.



ашты. Талдау нәтижесінде Чемар 5 қонысында жиі кездесетін құрам анықталды: «саз + шамот + органикалық ерітінді» (37,5%), сонымен қатар сирек «саз + органикалық ерітінді» (12,5%) және «саз + арнайы ұсатылған тас (дресва) + органикалық ерітінді» (12,5%), басқа да екі құрам «саз + арнайы ұсатылған тас + шамот + сүйек + органикалық ерітінді» (25%) және «саз + арнайы ұсатылған тас + шамот + органикалық ерітінді» (12,5%) қалыптау массаларын жасауда дәстүрлердің араласуын көрсетеді. Чемар 7 қонысында ең көп тараған құрам – «саз + шамот + органикалық ерітінді» (55,56%), ал «саз + органика» (22,22%), «саз + арнайы ұсатылған тас + органикалық ерітінді» (11,11%) және «саз + шамот + органика» (11,11%) одан едәуір аздау кездеседі. Бұл ескерткіштерде түрлі уақытта әртүрлі тұрғындар тобының тіршілік еткендігін айғақтайды. Ең көп таралған тарақ тісті өрнек элементі (Чемар 5 қонысында 45,4% және Чемар 7 қонысында 47%), өрнек пен нақышы – шырша, сүйретіп адымдау және айналдырып адымдау болды. Чемар 5 және Чемар 7 қоныстарындағы керамиканы зерттеу кезінде алынған технологиялық және ою-өрнектік мәліметтер бойынша келесідей қорытынды жасауға болады: негізгі тұрғындарды елунин мәдениетінің тобы құрайтынын, ал керамиканың басқа топтары Обь-Ертіс өзенаралығының чемар және одино-крохалев түрімен сәйкес келетінін көрсетеді.

Қаржыландыру көзі: Мақала ҚР ҒЖБМ Ғылым комитетінің 2024–2026 жж. арналған бағдарламалық-нысаналы қаржыландыруы шеңберінде, ЖТН BR24992916 жобасы аясында дайындалды.

Сілтеме үшін: Рахимжанова С.Ж., Мерц В.К., Ракутубе А. Чемар 5 және Чемар 7 қоныстарынан табылған ерте қола дәуірі қыш ыдыстардың дайындау технологиясы (Шығыс Қазақстан). *Қазақстан археологиясы*. 2025. № 3 (29). 198–209-бб. (Ағылшынша).

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Технология изготовления сосудов эпохи ранней бронзы с поселений Чемар 5 и Чемар 7 (Восточный Казахстан)

Поселения Чемар 5 и Чемар 7 (Бескарагайский р-н, обл. Абай) находятся близ с. Жетижар на правобережье Иртыша, открыты в 2003 г. Павлодарской археологической экспедицией под руководством В.К. Мерца. В результате анализа выявлено, что на поселении Чемар 5 часто встречаемым был рецепт «глина + шамот + органический раствор» (37,5%), также отмечены, но реже, рецепты «глина + органический раствор» (12,5%) и «глина + дресва + органический раствор» (12,5%), два других рецепта «глина + дресва + шамот + кость + органический раствор» (25%) и «глина + дресва + шамот + органический раствор» (12,5%), отражают смешение традиций в области составления формовочных масс. На поселении Чемар 7 самым распространенным являлся рецепт – «глина + шамот + органический раствор» (55,56%), намного реже встречены рецепты: «глина + органика» (22,22%), «глина + дресва + органический раствор» (11,11%), «глина + шамот + органика» (11,11%). Это свидетельствует о существовании на памятнике разных групп населения, обитавших на нём вероятно в разное время. Самый массовый элемент орнамента – гребенчатый (45,4 на поселении Чемар 5 и 47% на поселении Чемар 7), узоры и мотивы – ёлочка, шагание с протаскиванием и шагание с прокатыванием. Технологические и орнаментальные данные, полученные при изучении керамики поселения Чемар 5 и Чемар 7 позволяют сделать вывод о том, что основное население представлено группой елунинской культуры, а другие группы керамики соотносятся с чемарским и одино-крохалевским типом керамики Обь-Иртышского междуречья.

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1 Introduction

At present, the Early Bronze Age in East Kazakhstan has been studied unevenly. Although a significant number of archaeological sites have been discovered, their investigation remains sporadic. The identified cultural complexes belong to the Elunin culture [Kiryushin et al. 2005], the Krotov culture [Molodin, Nechepurenko 1976], the Alkabek type, and the Odinovo-Krokhalevo ceramic type [Merts V. 2002; Merts I. 2017; 2022].



The materials studied so far indicate that complex cultural and historical processes were taking place in the region during this period. This is evidenced by specific types of archaeological artifacts. For instance, excavated sites often contain layers with the synchronous presence of several ceramic types, reflecting cultural contacts and instances of cohabitation [Rakhimzhanova 2018].

Thus, a technological analysis of Early Bronze Age ceramic assemblages from East Kazakhstan will allow for a deeper and broader understanding of the population and everyday life of the tribes that inhabited this region.

2 Materials and Methods

The Chemar 5 and Chemar 7 settlements are located in the Beskaragay District of the East Kazakhstan Region, near the village of Jetijar on the right bank of the Irtysh River (Fig. 1). They were discovered in 2003 by a reconnaissance team of the Pavlodar archaeological expedition under the direction of V. Merts [2004: 165]. Since then, multiple surface collections have been carried out at the sites, and the recovered artifacts have been analyzed. Among the collected materials were ceramic fragments from the Early Bronze Age, which are the focus of this study.

The technological analysis of the ceramics was conducted within the framework of the historical-cultural approach to the study of ancient pottery, developed by A. Bobrinsky [1978; 1999] and his followers [Volkova 1996; Vasilyeva, Salugina 2013; Stepanova 2010; Tsetlin 2012].

The ceramic samples were studied using fresh fractures under an MBS-10 microscope to identify natural inclusions in the clay and artificially added tempering materials. To determine the degree of iron content in the original plastic raw material (clay), the ceramic fragments were fired in a muffle furnace at 850°C and then compared in color to an experimental iron-content scale for clays [Tsetlin 2006: 424]. Ornamentation was analyzed using the methodology developed by Yu. Tsetlin [2008].

The ceramic assemblage from the Chemar 5 settlement consists of 19 ceramic fragments representing 13 vessels. Due to the small number and fragmentary condition of the vessels, their shapes could not be reconstructed. The wall thickness of the vessels ranges from 7 to 8.5 mm, with 7 mm being the most common. The ceramic assemblage from Chemar 7 consists of 43 ceramic fragments representing 16 vessels. The wall thickness of the vessels ranges from 6 to 10 mm, with 8 mm being the most common.



Fig. 1. Location of Chemar 5 and Chemar 7 settlements on the map. Performer: M. Antonov
1-сур. Чемар 5 және Чемар 7 қоныстарының картада орналасуы. Орындаған: М.А. Антонов
Рис. 1. Расположение поселений Чемар 5 и Чемар 7 на карте. Исполнитель: М.А. Антонов



3 Results and discussion

Chemar 5 Settlement

Ornamental Elements:

A total of three types of decorative elements were identified on the outer surfaces of the ceramic vessels from Chemar 5:

Comb-stamped – 5 instances (45.4%)

Punctate – 2 instances (18.2%)

Plain (no ornamentation) – 4 vessels (36.4%)

On the inner surface and rim edge, a smooth linear element was observed in a single case.

Patterns:

Three types of ornamental patterns were identified on five vessels from Chemar 5:

A pattern composed of comb-stamped elements set at alternating angles, created by dragging the tool (referred to as “stepping with dragging”)

A pattern formed from horizontal comb-stamped impressions with a rounded working edge of the tool (“roller” type)

A pattern composed of comb-stamped elements set at alternating angles, made using a stepping motion

Pattern 1 is the most common (60%), while patterns 2 and 3 occur more rarely.

Motifs:

Two types of simple motifs (Type-1) were identified on Chemar 5 ceramics, totaling three instances:

Motif composed of punctate elements (two cases)

Motif combining punctate elements with plain (unornamented) surfaces

Type-2 motifs (composite motifs) are more common at Chemar 5, with a total of ten instances in three variations:

Most frequently observed is a complex composite motif formed from alternating-angle comb-stamped patterns (“stepping with dragging”) – 50%

Less common is a composite motif formed from regular comb-stamped patterns – 30%

Rare variants include:

Composite motif combining alternating-angle comb-stamped patterns created with a tool featuring a rounded working edge (“roller”)

Composite motif made from comb-stamped patterns created using a stepping technique

A single example of rim-edge decoration was recorded: a simple Type-1 motif consisting of smooth, left-slanted elements.

Imagery. Double Motifs:

Only one double motif was identified in the assemblage, which is likely due to the fragmentary condition and limited quantity of the material. This motif is a complex composite (Type-2) consisting of an unornamented zone combined with a complex composite motif made of comb-stamped patterns executed using the “stepping with dragging” technique.

For the technological analysis, ceramic fragments from 8 different vessels from the Chemar 5 settlement were selected.

Raw Material Analysis

The study of raw material selection and preparation techniques used by the potters of Chemar 5 revealed the use of three types of clay [Kazdym, Lopatina 2010: 46]:

High sand content – 25%



Medium sand content – 62.5%

Low sand content – 12.5%

Medium sand content clay was the most commonly used.

In terms of iron content, the clays were classified as:

Moderately iron-rich – 75%

Non-iron-rich – 25%

The clays are characterized by a variety of natural mineral inclusions. Among the naturally occurring mineral inclusions identified in the clay were: Fine sand (grain size 0.5 to 0.9 mm)

Unsorted sand

Brown iron ore

Limestone

Talc (?)

Clay Characteristics: The degree of sand content and the composition of natural inclusions suggest that local potters sourced their raw material from seven distinct hypothetical “locations” (or variants) of clay deposits.

I. Clay 1 + limestone – 1 vessel (12.5%),

II. Clay 1 – 1 vessel (12.5%),

III. Clay 2 + fine sand + brown iron ore + limestone – 2 vessels (25%)

IV. Clay 2 + fine sand – 1 vessel (12.5%),

V. Clay 3 + fine sand – 1 vessel (12.5%),

VI. Clay 3 + unsorted sand – 1 vessel (12.5%),

VII. Clay 4 + fine sand + talc – 1 vessel (12.5%).

In all cases, the raw material was used in a naturally moist state.

Molding mass. Among the artificial mineral inclusions, the following were used: unsorted chamotte in concentrations of 1:5–4 (100%), unsorted broken stone temper in concentrations of 1:4–5, as well as fine broken stone temper (0.5–0.9 mm) in concentration 1:6 combined with chamotte and calcined bone of small (0.5–0.9 mm) and medium (1.0–1.9 mm) sizes. Among the artificial organic components, an organic solution was added (100%), identified by the black “fatty” gloss on the surface of the mineral inclusions and amorphous voids whose walls are also covered with a film (Fig. 2).

Data on the composition of artificial inclusions used by the potters of the Chemar 5 settlement allow for the identification of 5 different cultural traditions in the preparation of ceramic molding masses.

Among the 5 identified recipes of molding masses, the most common are “clay + chamotte + organic solution” (37.5%), “clay + broken stone temper + chamotte + bone + organic solution” (25%), “clay + organic solution” (12.5%), “clay + broken stone temper + chamotte + organic solution” (12.5%), and “clay + broken stone temper + organic solution” (12.5%).

Surface treatment analysis revealed several types of smoothing: horizontal and diagonal crosswise smoothing with grass (3 vessels), horizontal smoothing with a comb stamp (1 vessel), and the rest smoothed with a soft object.

During the study of vessel fragments, for the analysis of firing based on the color of the fracture, the following groups were identified:

1. Three-layer fracture: outer – gray-brown 2 mm, middle – black 5 mm, inner – gray-brown 1.5 mm (1 vessel);
2. Two-layer fracture: outer – gray 5 mm, inner – black 2 mm (1 vessel); outer – light brown 2.5 mm, inner – black 5.5 mm (2 vessels); outer – gray-brown 4 mm, inner – black 3 mm (1 vessel);
3. One-layer fracture: black (3 vessels).

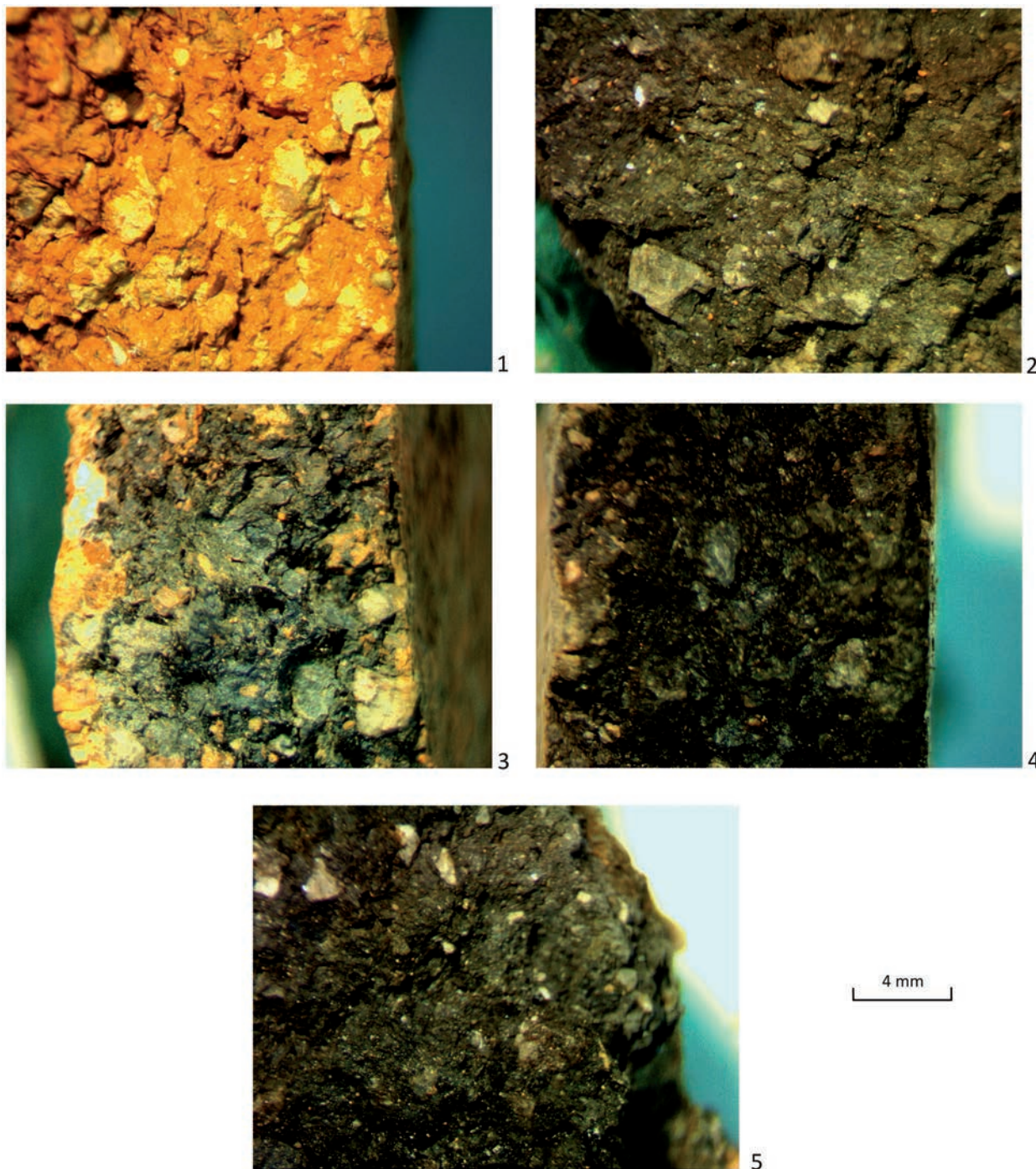


Fig. 2. Microphotograph of ceramics from the Chemar 5 settlement. Photo: Saule Rakhimzhanova
2-сур. Чемар 5 қонысы қыш ыдысының микрофотосы. Фотосурет Сауле Рахимжанованікі
Рис. 2. Микрофото керамики поселения Чемар 5. Фото: Сауле Рахимжанова

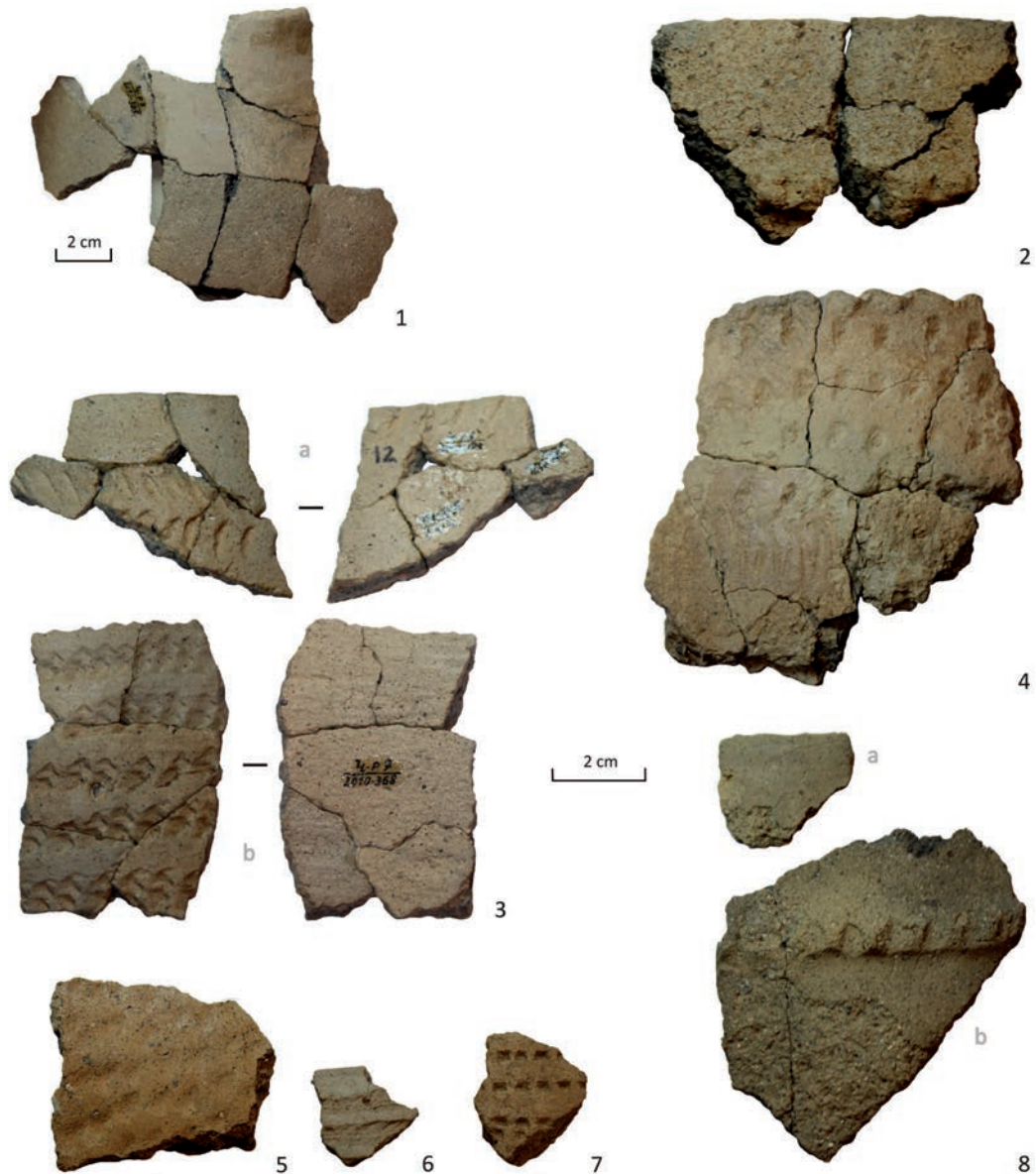


Fig. 3. Ceramics of the Chemar 7 settlement. 1, 2 – fragments of rims without ornamentation on the outer surface; 3 – fragments of rim (a) and body (b) from the outer and inner side with comb and smooth ornamentation; 4 – fragment of rim with pitted ornamentation; 5 – fragment of body with pitted ornamentation; 6 – fragment of rim with comb ornamentation (in the technique of stepping with dragging); 7 – fragment of body with comb ornamentation (in the technique of stamping); 8 – fragment of rim and body with a ridge. Photo: Saule Rakhimzhanova and Zhanna Akkoshkarova

3-сур. Чемар 7 қонысының керамикасы. 1, 2 – сыртқы беті өрнексіз ернеу фрагменттері; 3 – сыртқы және ішкі беті тарақша және тегіс ою-өрнекпен өңделген ернеу (1) мен бүйір (2) фрагменттері; 4 – шұңқырлы өрнегі бар ернеу фрагменті; 5 – шұңқырлы өрнегі бар бүйір фрагменті; 6 – тарақша өрнегі бар ернеу фрагменті (адымдап сүйрету техникасында жасалған); 7 – тарақша өрнегі бар бүйір фрагменті (қалыптау техникасында жасалған); 8 – белдеуі бар ернеу мен бүйір фрагменті. Фотосурет: Сауле Рахимжанова, Жанна Аккошкарлова



Chemar 7 Settlement. Ornament Elements. A total of six ornament elements were recorded on the external surfaces of vessels at Chemar 7 (Fig. 3): combed – 8 (47%), punctate – 2 (11.8%) (ornament element [non-toothed]), smooth – 2 (11.8%), pitted – 1 (5.9%), ridge – 2 (11.8%), and vessels without ornament – 2 (11.8%). On the internal surfaces and on the rim edges: smooth on 1 vessel, combed on 1 vessel.

Patterns. On the ceramics of the Chemar 7 settlement, 3 types of ornamental patterns were identified, totaling 4: pattern (1) made of vertical combed elements (stepping with dragging) (two cases); in single instances: pattern (2) made of variously inclined combed elements (herringbone) (Fig. 3, 3), pattern (3) made of smooth elements (in the shape of a V).

Motifs. A total of 10 motifs in eight variants were found on the outer surface of vessels from the Chemar 7 settlement. Simple motifs of Type 1 total 4: a motif made of combed elements (two cases) (Fig. 3, 3), others only in single instances – a motif made of punctate elements and unornamented areas; a motif made of pitted elements (Fig. 3, 4), less frequently encountered is a simple motif made of combed elements (27.3%). Type 2 motifs total 4 (Fig. 3): a complex composite motif made of combed patterns (stepping with dragging) (two cases), in single instances – a motif of complex composite combed elements inclined to the right and left; a complex composite motif made of smooth patterns. Type 3 motifs were found on materials from the Chemar 7 site only on 2 vessels – a complex intersecting motif made of smooth elements superimposed on a formed ridge and a complex intersecting motif made of punctate elements superimposed on a formed ridge. On the rims of vessels, the following motifs were recorded in single cases: a simple motif made of smooth elements inclined to the left; a simple motif made of combed elements inclined to the right.

Images. Double images. According to the materials from the Chemar 7 settlement, 13 double ornament images were recorded, all occurring singly. Among them, Type 1 (images from simple motifs) includes images: from a simple motif of pitted elements and a zone without ornamentation; from a zone without ornamentation and a simple motif of pitted elements; from a zone without ornamentation and a simple motif of punctate elements and unornamented areas; from a simple motif of punctate elements and unornamented areas and a zone without ornamentation; from a zone without ornamentation and a simple motif of combed elements inclined to the right. Type 2 images (images from composite motifs) found on Chemar 7 ceramics total 4 – from a zone without ornamentation and a complex composite motif of smooth patterns (V); from a zone without ornamentation and a complex composite motif of combed patterns (herringbone); from a complex composite motif of combed patterns (herringbone) and a zone without ornamentation; from a zone without ornamentation and a complex composite motif of combed patterns (stepping). Type 3 images (images from intersecting motifs) include 4 images: from a zone without ornamentation and a complex intersecting motif of combed elements superimposed on a formed ridge; from a complex intersecting motif of smooth elements superimposed on a formed ridge and a zone without ornamentation; from a zone without ornamentation and a complex intersecting motif of punctate elements superimposed on a formed ridge; from a complex intersecting motif of punctate elements superimposed on a formed ridge and a zone without ornamentation.



Рис. 3. Керамика поселения Чемар 7: 1, 2 – фрагменты от венчиков без орнаментации на внешней поверхности; 3 – фрагменты венчика (а) и тулова (б) с внешней и внутренней стороны с гребенчатым и гладким орнаментом; 4 – фрагмент венчика с ямчатым орнаментом; 5 – фрагмент тулова с ямчатым орнаментом; 6 – фрагмент венчика с гребенчатым орнаментом (в технике шагание с протаскиванием); 7 – фрагмент тулова с гребенчатым орнаментом (в технике штампование); 8 – фрагмент венчика и тулова с валиком. Фото: Сауле Рахимжанова, Жанна Аккошкарва



Triple ornamental images. A total of 7 were found on the ceramics of the Chemar 7 settlement. A simple image (Type 1) symmetrical was found once – an image from a zone without ornamentation, a simple motif of punctate elements inclined to the right, and a zone without ornamentation. Symmetrical images (Type 2) appeared in one variant in a single case: from a zone without ornamentation, a complex composite motif of combed patterns inclined right and left (herringbone), and a zone without ornamentation. Asymmetrical images (Type 2) total two, each in single instances: from a complex composite motif of combed patterns inclined left and right (herringbone), a zone without ornamentation, and a simple motif of combed elements inclined right; from a simple motif of pitted elements, a zone without ornamentation, and a complex composite motif of smooth patterns (V). Also, 2 symmetrical images (Type 3) were found, again in single cases – from a zone without ornamentation, a complex intersecting motif of punctate elements superimposed on a ridge, and a zone without ornamentation; from a zone without ornamentation, a complex intersecting motif of smooth elements superimposed on a ridge, and a zone without ornamentation.

For the technological analysis of ceramics, fragments from 9 different vessels from the Chemar 7 settlement were selected. As a result of the conducted study, the following technological information was identified.

Analysis of raw materials. The study of skills in selecting and preparing raw materials showed that potters used two types of clay: high sand content – Clay 1 (44.4%), medium sand content – Clay 2 (55.6%). The clays are characterized by medium iron content (100%), as well as a varied composition of natural mineral inclusions. Among the natural mineral inclusions in the clay, fine sand (from 0.5 to 0.9 mm), uncalibrated sand, brown iron ore, and limestone were identified.

Local potters used 5 conditional “sources” (or variants) of raw material extraction, identified by the degree of sand content and the composition of natural inclusions in the clays:

- I. Clay 1 + brown iron ore – 1 vessel (11.12%),
- II. Clay 1 – 3 vessels (33.32%),
- III. Clay 2 + fine sand – 3 vessels (33.33%),
- IV. Clay 2 + uncalibrated sand – 1 vessel (11.12%),
- V. Clay 2 + limestone – 1 vessel (11.12%).

In all cases, the clay was used in its natural moisture state.

Molding mass. The composition of the forming masses shows that as artificial mineral additives, quartz chaff of fine (0.5–0.9 mm) and medium (1.0–1.9 mm) sizes were used at a concentration of 1:4, chamotte of coarse (2.0 mm and above) and medium (1.0–1.9 mm) sizes at a concentration of 1:4–5, medium size (1.0–1.9 mm) at a concentration of 1:5, fine (0.5–0.9 mm) size at a concentration of 1:5, and uncalibrated at a concentration of 1:5. In other cases, only organic additives, namely organic solution, were added as artificial components of the forming mass. Organic impurities (organic solution) were added in combination with mineral ones in 100% of cases.

Based on the obtained information about the composition of artificial additives used by the potters of the Chemar 7 settlement, it is possible to distinguish 4 different cultural traditions of forming ceramic masses.

Among the 4 identified recipes for forming masses, the most common was “clay + chamotte + organic solution” (55.56%), less frequently used was the recipe: “clay + organic” (22.22%), and even less frequently – “clay + broken stone temper + organic solution” (11.11%), “clay + chamotte + organic” (11.11%).

During the study of surface treatment of the vessels, the following groups were identified: horizontal smoothing with a comb stamp (2 vessels), the rest were smoothed with a soft object.

The ceramic fragments vary in color, which may be related to different firing conditions. Based on the color of the samples at the fracture, the following types are distinguished:



1. Three-layer fracture: outer – brown 2 mm, middle – black 4 mm, inner – dark brown (1 vessel);
2. Two-layer fracture: outer – light brown, inner – black (4 vessels); outer black 9 mm, inner – dark brown 1 mm (2 vessels);
3. Single-layer fracture: dark brown (1 vessel).

4 Conclusion

Chemar 5 settlement. For pottery production at the Chemar 5 settlement, clay with medium sand content was used most extensively (62.5%). Features of the clays: their degree of plasticity and the composition of natural impurities indicate that local potters utilized 7 conditional “sources” (or variants) of raw material. Analysis of the composition of artificial additives shows that the most common recipe was “clay + chamotte + organic solution” (37.5%), less frequently used were the recipes “clay + organic solution” (12.5%) and “clay + broken stone temper + organic solution” (12.5%), while the recipes “clay + broken stone temper + chamotte + bone + organic solution” (25%) and “clay + broken stone temper + chamotte + organic solution” (12.5%) reflect a mixing of traditions in the composition of forming masses. The most common ornament element is the combed one (45.4%), with patterns and motifs being stepping with rolling and stepping with dragging. The study of the color structure of sherds from the Chemar 5 settlement showed that most likely the analyzed vessels were fired in a prolonged firing in a reducing atmosphere with a short hold at the clay sintering temperature of 650°C.

Chemar 7 settlement. The study of skills in selecting and preparing raw materials showed that the potters of Chemar 7 most often used medium-iron clays with medium sand content (55.6%). Local potters utilized 5 conditional “sources” (or variants) of raw plastic material. Among the 4 identified recipes for forming masses, the most common was “clay + chamotte + organic solution” (55.56%), less frequently used was the recipe “clay + organic” (22.22%), and even less frequently – “clay + broken stone temper + organic solution” (11.11%) and “clay + chamotte + organic” (11.11%). This indicates the existence of different population groups at the site, likely inhabiting it at different times.

The most common ornamental element is the comb pattern (47%), with patterns and motifs including the herringbone and stepping with dragging.

The analysis of the color characteristics of the surfaces and fractures of the studied vessel fragments from the Chemar 7 settlement indicates that they were fired under reducing and semi-reducing conditions, with a short exposure to temperatures of 650-700°C [Volkova, Tsetlin 2016].

Thus, summarizing all the obtained data, we can conclude that the most part of the population that left ceramic material at the Chemar 5 and Chemar 7 settlements was represented by the Elunin culture group, common in the Middle Irtysh region, steppe and forest-steppe Altai and northeastern Saryarka [Grushin 2003; Kiryushin et al. 2005; Merts, Fedoruk 2019: 88, Merts I. 2018; 2021], and other groups of ceramics are related to the Chemar and OdinoVo-Krokhalev type of ceramics [Merts V. 2004; Tkacheva, Tkachev 2008: 246], which is found at other sites of the Ob-Irtysh interfluvium.

AUTHOR'S CONTRIBUTION

S. Rakhimzhanova: concept development, methodology development, research implementation, visualization, manuscript drafting.

V. Merts: visualization, manuscript writing – review and editing.

A. Rakotobe: manuscript writing – review and editing, translation of the manuscript.

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