

COMPARATIVE MINERALOGICAL-PETROGRAPHIC STUDY OF POTTERY FROM THE EARLY MEDIEVAL NECROPOLIS WITH CREMATIONS NEAR THE VILLAGE OF RAZDELNA, BELOSLAV MUNICIPALITY AND THE EARLY MEDIEVAL SETTLEMENT NEAR THE VILLAGE OF TOPOLA (KOVANLAKA LOCALITY), KAVARNA MUNICIPALITY

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ABSTRACT

The current study presents the results of mineralogical-petrographic analysis performed on pottery sherds from two Early Medieval sites – the necropolis with cremations near the village of Razdelna and the medieval settlement near the village of Topola. The analyzed pottery sherds represent the two most common technological groups of pottery in the considered period – vessels of well-refined fabric with burnished surface and ornament and vessels of sandy fabric with incised ornament.

The study focuses mainly on the mineral composition of the fabric from which the vessels were formed. The analyzed sherds from the necropolis of Razdelna are divided in two main groups – the first one being rich in natural inclusions – mainly quartz, feldspars and mica, while the second group being scarce or even lacks inclusions. The pottery sherds from the Early Medieval settlement near the village of Topola show similar mineral composition, with the additional presence of grinded mussel shells.

In addition to the mineral composition, other interesting observations were made about the presence of slip-like coating of the vessels of sandy fabric from Razdelna, and observations about the outer layer of the burnished pottery from both sites, including the registered traces of organics on the surface of the vessels, which presumably helps with the typical coloration of the burnished pottery. The difference between the pottery from the two sites is the better quality of the vessels from Topola, which suggests more specialized pottery production.

Key words: Early Middle Ages, pottery, mineralogical-petrographic study

The current paper presents the results of the mineralogical and petrographic analyses of 16 pottery sherds from two Early Medieval sites – the Early Medieval necropolis with cremations near the village of Razdelna, Beloslav municipality (Димитров 1959, 56 – 60; Димитров 1978, 120 – 152; Fiedler 1992, 463 – 484, Taf. 57 – 91) and the settlement in Kovanlaka locality near the village of Topola, Kavarna municipality (Бобчева 1976, 122 – 130; Бобчева 1977, 172 – 177; Бобчева 1980, 126



Fig. 1. Location of the two sites

Обр. 1. Местоположение на двата обекта

– 130; Бобчева 1981, 198 – 201).¹ The study was conducted in 2020 – 2021 at the University of Mining and Geology “St. Ivan Rilski” and its basic attempt is to compare the ceramic assemblages of both sites.

The composition of the clay from which the vessels were made, as well as some of the observations the authors made about the alleged presence of an additionally applied slip coating on some of the vessels, determined the need for further analysis. Such studies are

essential for the determination of various elements of the technology of ceramic production. It is hoped that this paper will supplement the scarce at this stage database in terms of raw materials used, tempers and approximate firing temperature.

Materials and methods of the study

Mainly pottery sherds from one technological group are included in the present study. They were parts of vessels, mainly pots, of well-refined fabric of gray to gray-black color (after firing), and displaying burnished decoration. In order to make a comparison in terms of mineral composition and approximate firing temperature, two sherds from the group of vessels with a sandy fabric were also studied. The selection of the pottery sherds of refined fabric and with burnished decoration was based on the presence of a gray, gray-black surface and a finer fraction of inclusions compared to the fabric of the main body. This layer with small inclusions appears at first glance to be an additional coating of diluted clay or more precisely a slip.

The included sherds derive from vessels thrown on a slow potter's wheel (more specifically a tournette). The slow rotation of the potter's wheel can be perceived in the asymmetry of the walls, the traces left on the outer surface of the bases by the thin layer of sand used to ease removal of the finished pot when cutting it free of the wheel, and the presence of relief signs on the bases. In most cases, especially with the materials from the necropolis near the village of Razdelna, during the restoration the vessels were plastered on the inside with gypsum, which made it difficult to determine more precisely the technology used for making the pot. Another obstacle for more accurate identification of the technology applied is the additional smoothing in a vertical direction of the walls of the vessels made by the potter.

From the necropolis near the village of Razdelna are included samples from nine pots used as burrial urns, and from a jug from Grave No. 29, which are stored in RMH – Varna (fig. 2, fig. 3, fig. 4; Table 1: 1 – 10; Cat. Nos. 1 – 10). The pots made from a purified fabric are 20 cm in height, have spherical bodies, and are with maximum diameters around the middle part of the body. The

¹ The authors would like to especially thank colleagues from RMH – Varna: Assistant Prof. Dr. I. Lazarenko, Assistant Prof. Dr. M. Manolova-Voykova, St. Lazarenko, Assistant Prof. Dr. V. Tenekedzhiev, and the colleagues from RMH – Dobrich: D. Dobrev, Dr. B. Totev and N. Nikolova – for providing access to the materials from both sites, as well as for allowing to subject some of the sherds to analysis.

pottery from the settlement near the village of Topola is represented by pottery sherds from four pots and two bowls which are stored in RMH – Dobrich (fig. 5, fig. 6; Table 2: 1 – 6; Cat. Nos. 11 – 16). Unfortunately, the authors were unable to include sherds from structures belonging to the settlement, but this, it is hoped, will be possible in the future.

The laboratory methods applied include optical (macro- and microscopic methods), X-ray diffraction (XRD) and Scanning Electron Microscopy and Energy Dispersive X-Ray Analysis (SEM-EDX).

Petrographic thin sections from the pottery sherds were prepared and microscopic (petrographic) analyses were performed. The observations were made with a petrographic microscope (*Nikon*) in order to characterize their microscopic features. Through these analyses, information was obtained about the natural inclusions (minerals and rocks) and the added material known as tempers, and about the micro-structure of the ceramic body which is determined by size, shape, orientation of the inclusions, their quantitative presence, the presence of cracks and cavities, treatment of the outer and/or the inner surface of the ceramic body. All examined pottery sherds were photo documented with an *OLIMPUS 5060* digital camera.

X-ray Powder Diffraction (XRD) has been used to detect crystal mineral phases that are optically indeterminate, and the presence of some of them helps in some cases to predict the firing temperature range of the ceramic items. The research was performed in the Laboratory of X-ray Diffraction at the Faculty of Geology and Research (FGR) of the University of Mining and Geology “St. Ivan Rilski” with BRUKER D2 Phaser instrument, equipped with Cu tube and PSD detector. The experiments were performed under the following conditions: Ni filtered Cu radiation with wave length $\lambda = 1.542$ in the range of $2\Theta = 2 - 70^\circ$, 30 kV voltage with scanning step – $0.04^\circ 2\Theta$ and exposure duration in step 1.5s. The results were interpreted with EVA software with COD (Crystallography Open Database).

Scanning Electron Microscopy (SEM-EDX) – the method is used to determine the structure of the pottery, composition and distribution of certain mineral phases in the ceramics and its chemical composition. The equipment used to perform the analyses is JEOL JSM-6010 PLUS/LA with EDS type analyzer (energy-dispersion-spectrometer). The analyses are semi-quantitative and the standards are by default. The analyses were performed in the Scientific Research Laboratory of Scanning Electron Microscopy at the FGR of the University of Mining and Geology “St. Ivan Rilski”.

Results of mineralogical-petrographic research

Sherds from the necropolis near the village of Razdelna, Beloslav municipality (fig. 2, fig. 3, fig. 4; Table 1: 1 – 10; Cat. Nos. 1 – 10)

The majority of the studied pottery sherds comprise material with a similar mineral composition, which suggests a common source from which they were made. Depending on the presence of mineral and rock inclusions, two groups are distinguishable: the first group comprises pottery sherds rich in natural inclusions – mainly quartz, feldspars and mica (Cat. Nos. 1, 3, 4, 7, 9), rarely grog (Cat. No. 7), while the second group (Cat. Nos. 2, 5, 8, 10) is lacking in inclusions. The sherds from the second group are highly friable and the size of the natural inclusions is below 0.05 mm.

The groundmass (matrix) of the studied sherds has a hydromica composition varying in color – from brown-red in the periphery to black and dark brown in the central parts of the ceramic body, optically isotropic. *The inclusions* are mainly mineral with size below 0.1 to 0.01 mm and are represented by quartz (mainly), mica – muscovite, biotite, ore minerals (ilmenite) and sporadic grains of feldspar (plagioclase and K-feldspar), epidote, amphibole and others. In pottery sherds

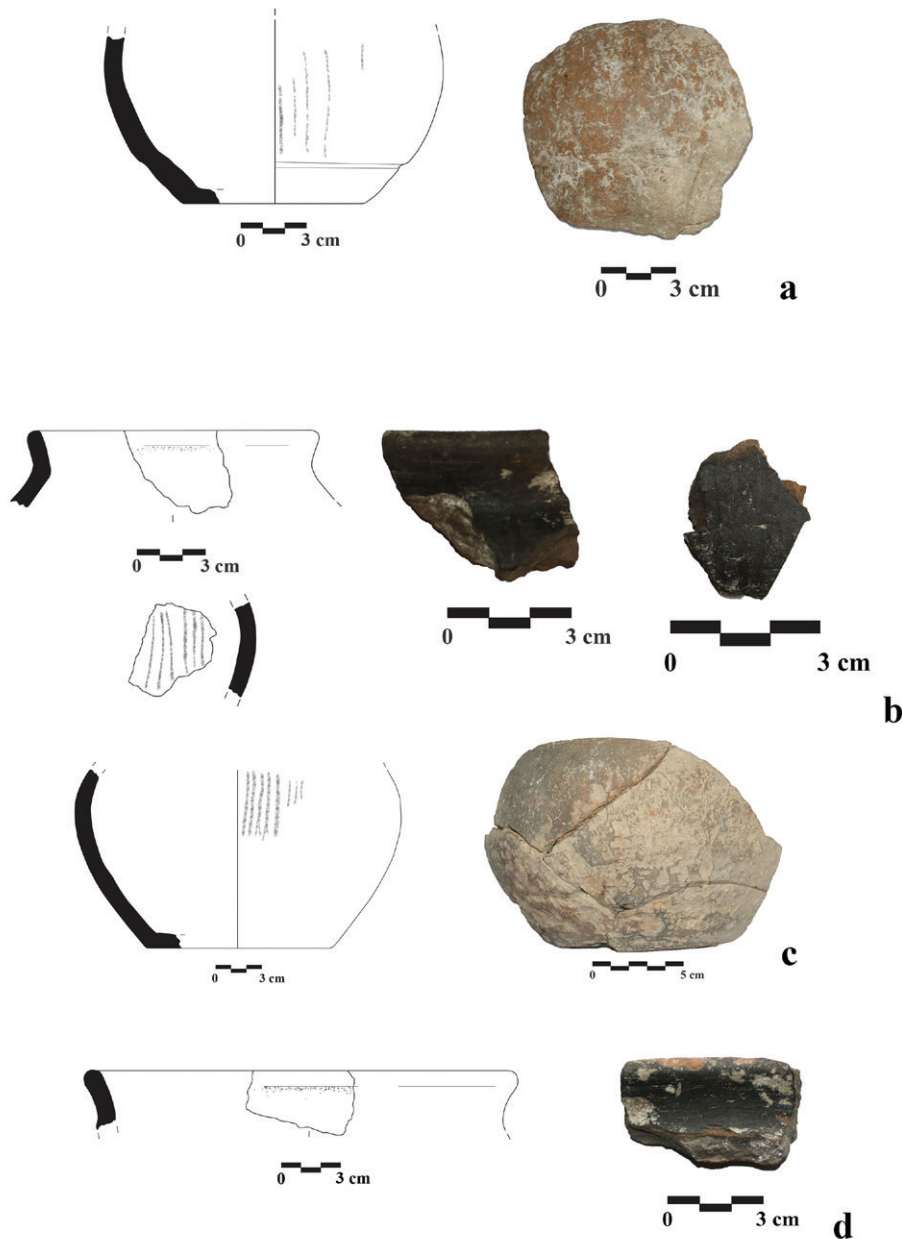


Fig. 2. Pottery from the necropolis near the village of Razdelna: a. Grave No. 183; b. Pot – urn from Grave No. 183; c. Grave No. 185; d. Pot – urn from Grave No. 24

Обр. 2. Керамика от некропола при с. Разделна: а. Гроб № 183; б. Гърне – урна от гроб № 183; в. Гроб № 185; д. Гърне – урна от гроб № 24

from the first group, the quartz inclusions predominate quantitatively and they are characterized by a pronounced angular shape, which could suggest that they were manually crushed from their source rock and used as temper. Rock inclusions of quartzites, chalcedony aggregates and limestones (Table 1: 5, 6, 8) have a limited presence in the pottery sherds.

In the studied cross-sections of the pottery sherds different layers were established, which resulted from: change in the size of the mineral inclusions sharply decreasing in their outer peripheral surface (Table 1: 1, 4, 8); change in the color of the main body – black in its central parts and light brown in the peripheral areas.

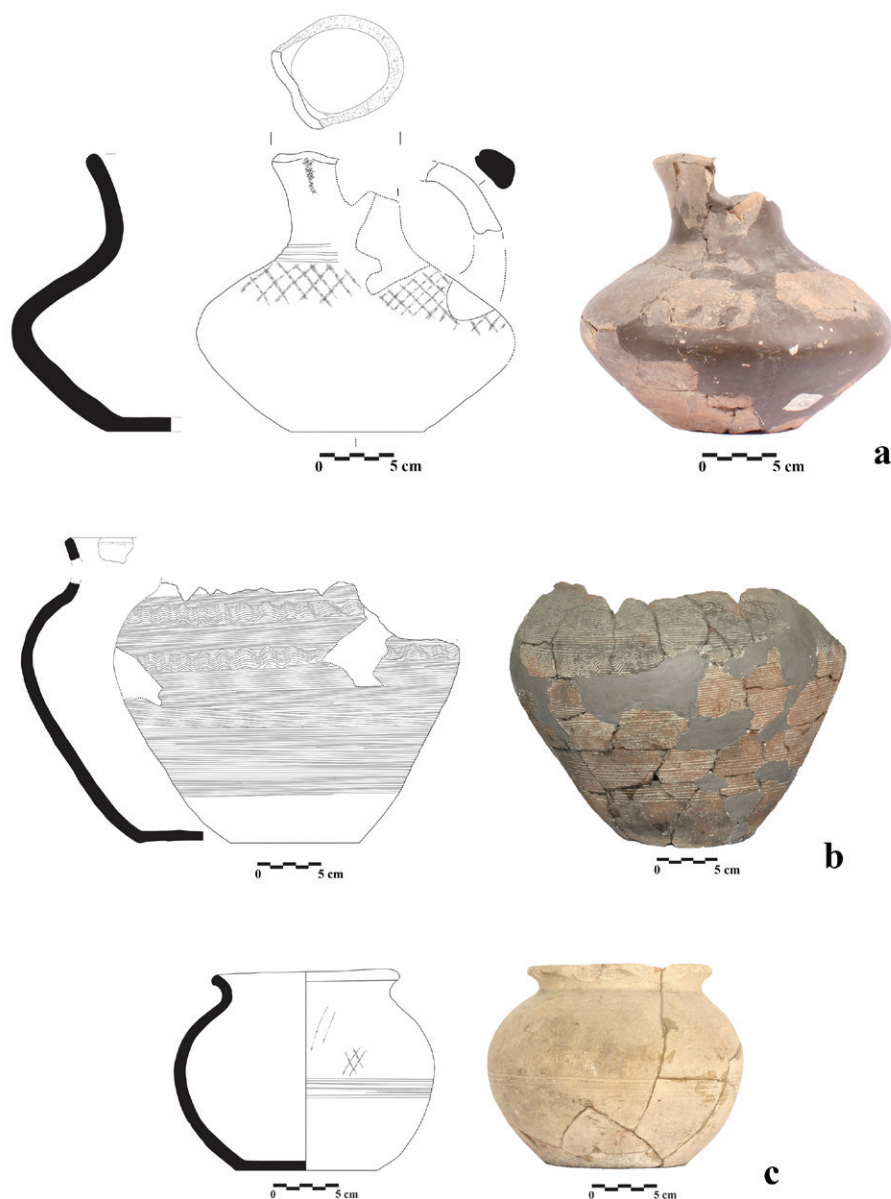


Fig. 3. Pottery from the necropolis near the village of Razdelna: a. Jug – grave offering in Grave No. 29; b. Pot – urn from Grave No. 50; c. Pot – urn from Grave No. 89

Обр. 3. Керамика от некропола при с. Разделна: а. Кана – гробен дар в гроб № 29; б. Гърне – урна от гроб № 50; с. Гърне – урна от гроб № 89

Sherds from the Early Medieval settlement near the village of Topola, Kavarna municipality
(fig. 5, fig. 6 ; Table 2: 1 – 6 ; Cat. Nos. 11 – 16)

The studied group of pottery sherds has a similar composition and similar technological features. It is made of hydromica-based groundmass with varying color – brown-red, light to dark brown and black and is optically isotropic. The inclusions are represented by the following minerals: quartz (mainly), white and brown mica, ore grains (ilmenite, titanomagnetite), feldspar, epidote, amphibole, tourmaline, zircon. The size of most of them are below 0.01 to 0.005 mm. There are

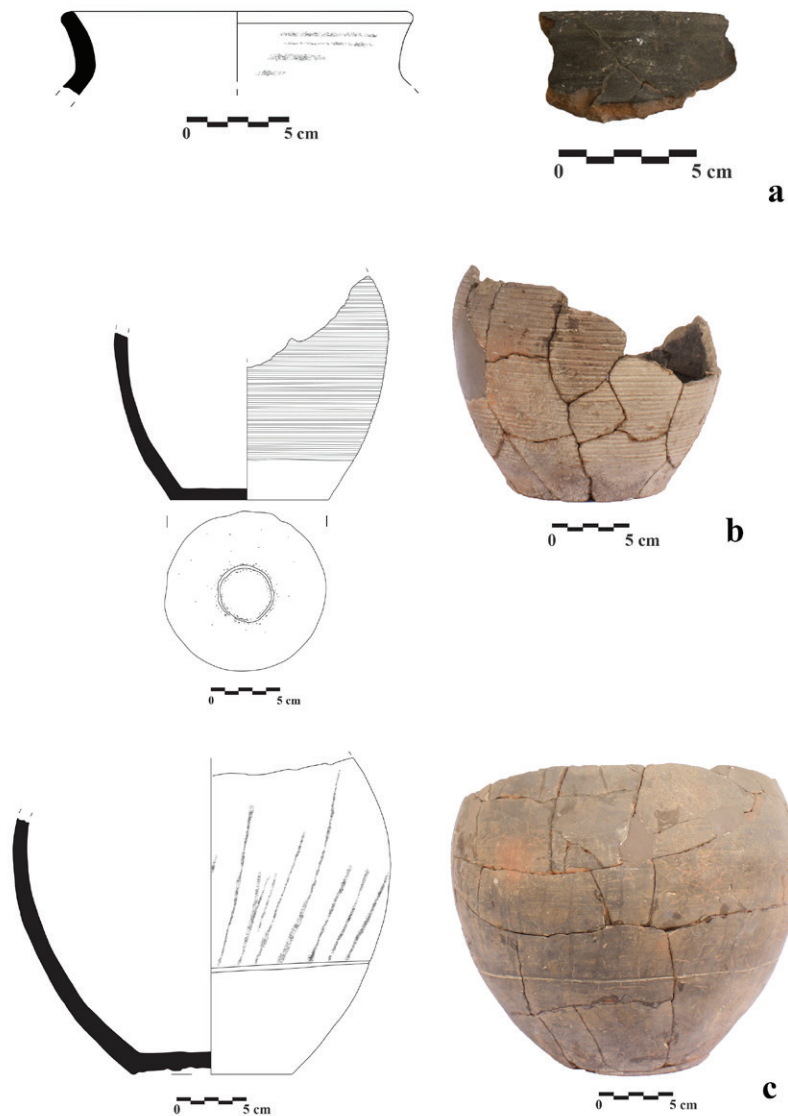


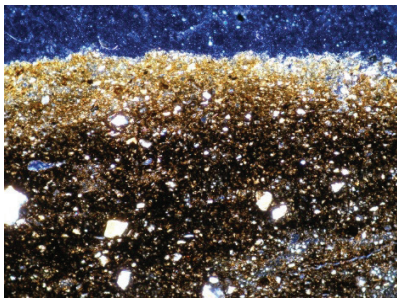
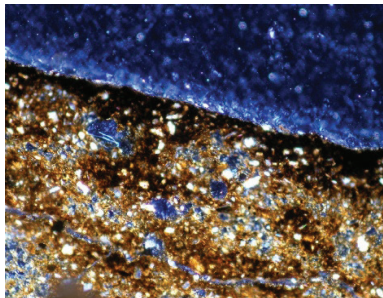
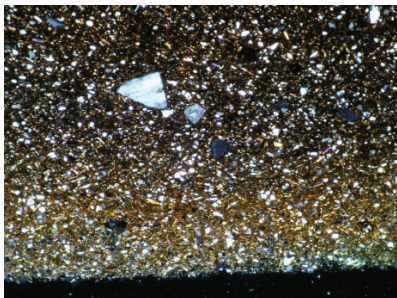
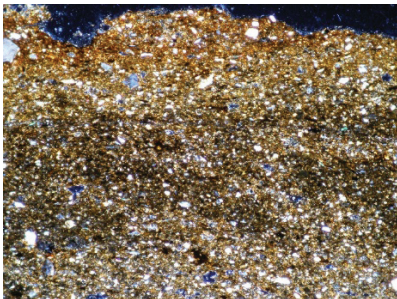
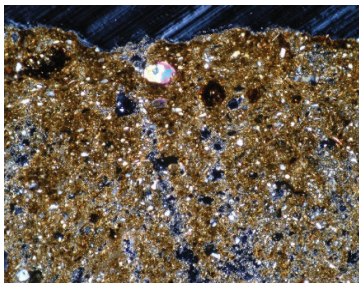
Fig. 4. Pottery from the necropolis near the village of Razdelna: a. Pot – urn from Grave No. 136; Pot – urn from Grave No. 140; c. Pot – urn from Grave No. 142

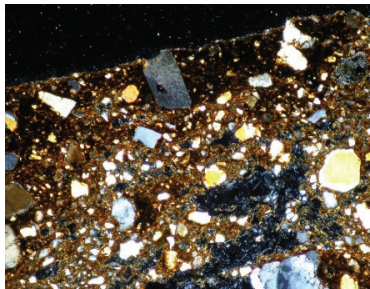
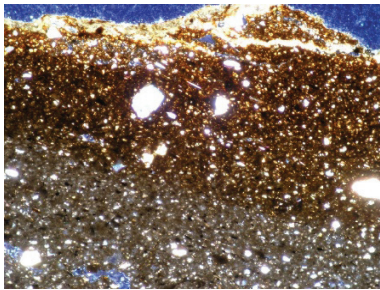
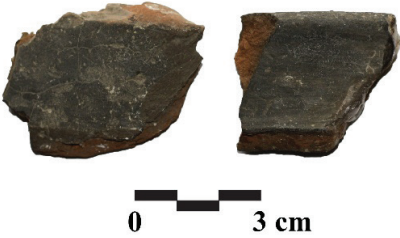
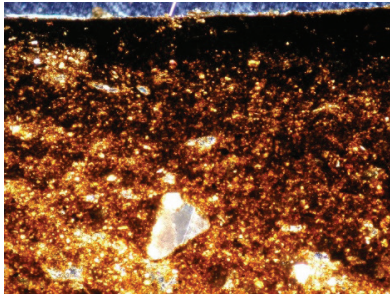
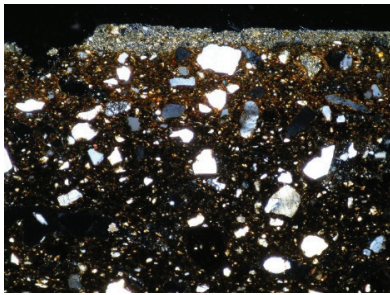
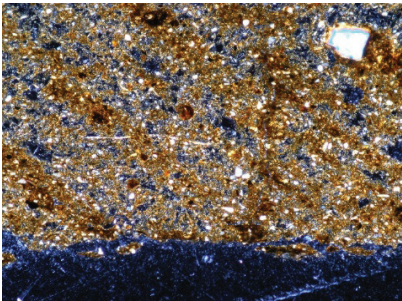
Обр. 4. Керамика от некропола при с. Разделна: а. Гърне – урна от гроб № 136; б. Гърне – урна от гроб № 140; с. Гърне – урна от гроб № 142

inclusions of micritic limestones and pieces of bivalves (mussels) in the fabric of most of the pottery sherds from this site (Table 2: 2, 3, 7). The presence of crushed mussel shells distinguishes the vessels under consideration from the ceramic assemblage of the Early Medieval biritural necropolis near Balchik, where no such inclusions were documented (Дончева-Петкова и др. 2016, 113).

Spectrometric analyses with JEOL JSM-6010 PLUS/LA and analyzer type EDS (energy-dispersion-spectrometer) were performed on the ceramics from both sites in order to define the structure of the ceramics and to determine the composition and distribution of some main elements and mineral phases. Some of the obtained results are shown in fig. 7. By making images of the distribution of the basic chemical elements (X-ray mapping) a uniform distribution of the main chemical elements in the fabric of the pottery sherds (in cross sections of the ceramic body) was established. This suggests that they were made of homogeneous material, and the observed layers of different color in the cross-sections results from the firing conditions (oxidation-reduction).

Table 1. Sherds from the necropolis near the village of Razdelna, Beloslav municipality
Таблица 1. Материали от некропола при с. Разделна, общ. Белослав

Cat. No.	Archaeological context	Photo of the pottery sherd	Microscopic photo*
1	Necropolis near the village of Razdelna Grave No. 183 <i>No Inv. No. RMH – Varna</i>	 0 3 cm	
2	Necropolis near the village of Razdelna Grave No. 183 <i>No Inv. No. RMH – Varna</i>	 0 3 cm	
3	Necropolis near the village of Razdelna Grave No. 185 <i>No Inv. No. RMH – Varna</i>	 0 3 cm	
4	Necropolis near the village of Razdelna Grave No. 24 <i>Inv. No. IV 798 RMH – Varna</i>	 0 3 cm	
5	Necropolis near the village of Razdelna Grave No. 29 <i>Inv. No. IV 804 RMH – Varna</i>	 0 3 cm	

6	Necropolis near the village of Razdelna Grave No. 50 <i>Inv. No. IV 808</i> <i>RMH – Varna</i>		
7	Necropolis near the village of Razdelna Grave No. 89 <i>Inv. No. IV 848</i> <i>RMH – Varna</i>		
8	Necropolis near the village of Razdelna Grave No. 136 <i>Inv. No. IV 885</i> <i>RMH – Varna</i>		
9	Necropolis near the village of Razdelna Grave No. 140 <i>Inv. No. IV 888</i> <i>RMH – Varna</i>		
10	Necropolis near the village of Razdelna Grave No. 142 <i>Inv. No. IV 891</i> <i>RMH – Varna</i>		

* All photos of the thin sections have a field of view = 3980 μm , samples Nos. 2, 3, 7 were taken in cross-polarized light; samples Nos. 4, 5, 6 – in parallel polarized light.

The conducted analyses of crushed material from the sherds with X-ray powder diffraction confirmed the already optically identified main part of the mineral phases (fig. 8a, b). Based on the registered clay mineral montmorillonite in the fabric of the pots from the necropolis near the village of Razdelna, we can assume that the firing temperature during their production did not exceed 550 °C. At higher temperatures, this mineral would decompose into another mineral phase. No clay mineral is registered in the fabric of the pottery from the settlement near the village of Topola, which suggests a higher firing temperature, but the considerable amount of carbonate phases in it suggests a firing temperature not higher than 700 – 750 °C.

In the present study, attention was paid to ceramic vessels and pottery sherds with dark gray to black in color outer and, in some cases, inner surfaces, in which a thin layer of clay with a finer fraction of inclusions is observed (Table 1²: 2, 4, 8; Table 2: 2, 3, 6). This layer visually resembles an additionally applied clay solution (slip) on the surface of the vessels. This prompted the authors to perform additional research on this thin less than 0.5 mm layer. The ceramics in question are made of extremely well-refined clay and are characterized by the presence of mineral inclusions with predominant size below 0.01 mm. The structure of the presented items from the necropolis near the village of Razdelna is highly porous, and crumbly and the microscopically shows the presence of a grid of

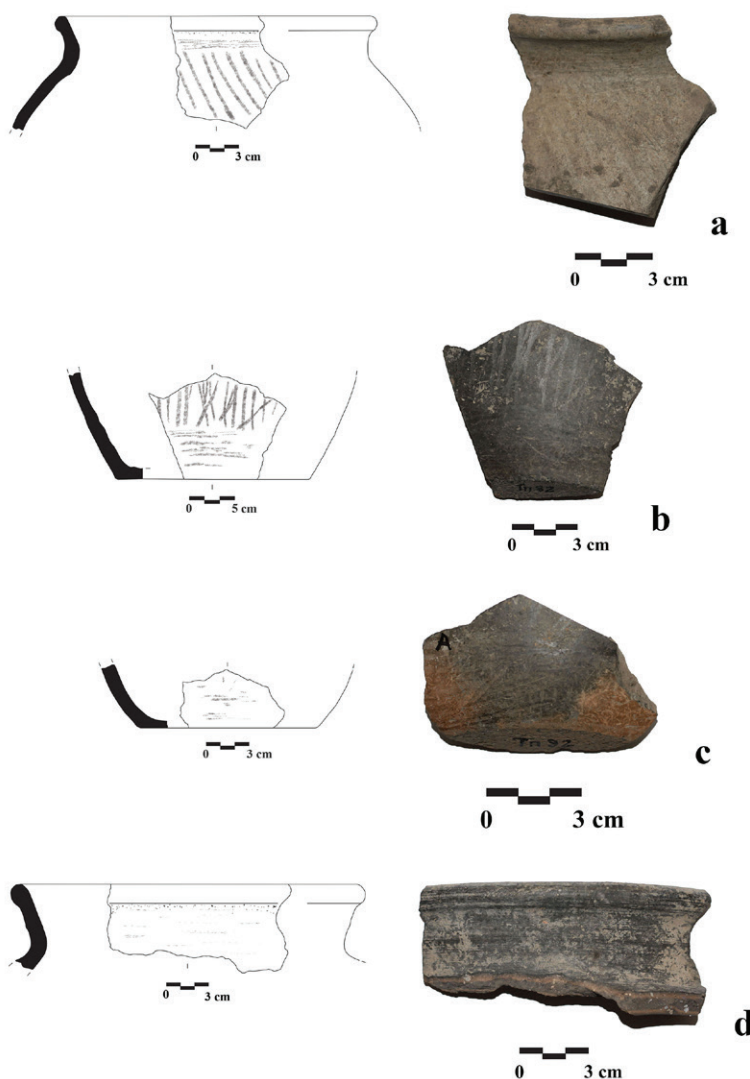


Fig. 5. Pottery from the Early Medieval settlement in Kovanlaka locality near the village of Topola: a. Pottery sherd from the rim of a pot with refined fabric (1982 excavation campaign, Grid sq. 13); b. Pottery sherd from the base of a vessel with refined fabric (1982 excavation campaign, Grid sq. 2); c. Pottery sherd from the base of a vessel with refined fabric (1982 excavation campaign, Grid sq. Y); d. Pottery sherd from the rim of a pot with refined fabric (1982 excavation campaign, Grid sq. 14)

Обр. 5. Керамика от ранносредновековното селище в м. Кованлъка при с. Топола: а. Фрагмент от устие на гърне от пречистена глина (разкопки от 1982 г., кв. 13); б. Фрагмент от дъно на съд от пречистена глина (разкопки от 1982 г., кв. 2); в. Фрагмент от дъно на съд от пречистена глина (разкопки от 1982 г., кв. У); г. Фрагмент от устие на гърне от пречистена глина (разкопки от 1982 г., кв. 14)

² The layer in question could not be detected on the photos of the pottery sherds from Graves Nos. 24 and 29 that were taken under a microscope. Due to the thinness of this layer, as well as the fact that it could be easily chipped away, there was a danger of desintegration when sampling. This necessitated further analyses of the pottery sherds in question.

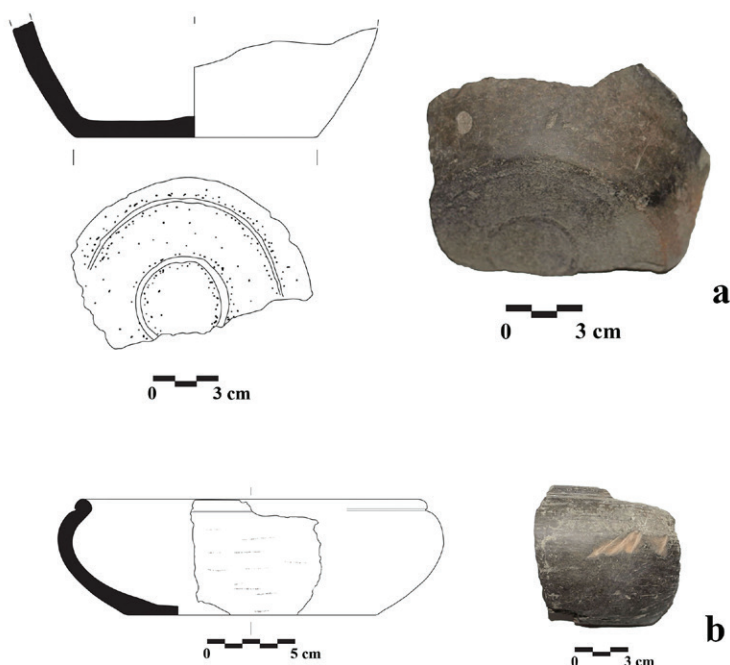


Fig. 6. Pottery from the Early Medieval settlement in Kovanlaka locality near the village of Topola: a. Pottery sherd from the base of a pot with refined fabric (1969 excavation campaign); b. Bowl with refined fabric (1972 excavation campaign, Trench I)

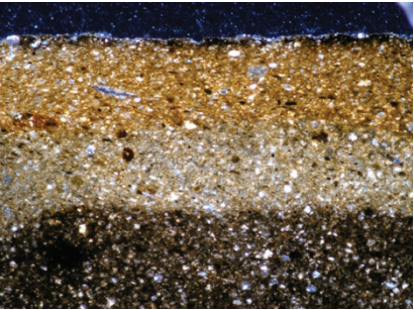
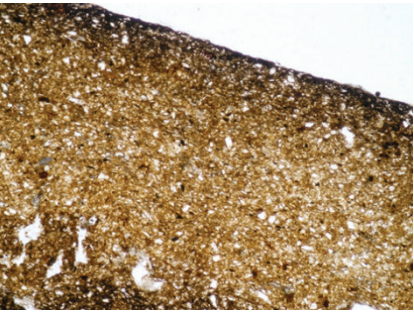
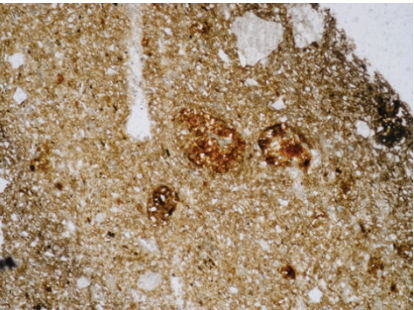
Обр. 6. Керамика от ранносредновековното селище в м. Кованлъка при с. Топола: а. Фрагмент от дъно на гърне от пречистена глина (разкопки от 1969 г.); б. Купа от пречистена глина (разкопки от 1972 г., сондаж I)

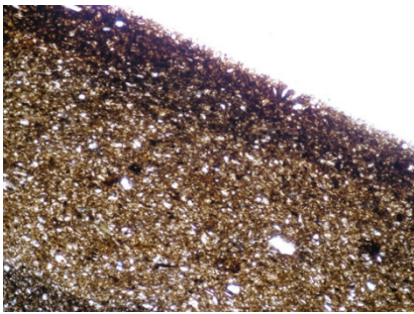
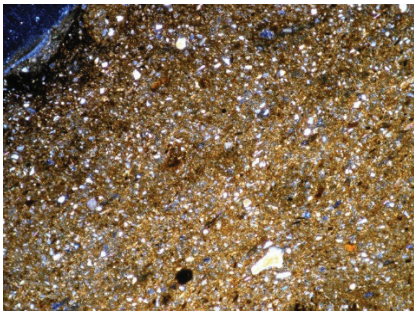
fine cracks (fig. 7a). The structure of the pottery from the Early Medieval settlement near the village of Topola is dense, slightly porous (fig. 7b) and compared to the fabric from the necropolis near the village of Razdelna it is stronger.

Optical examination of the cross-sections of the ceramic body of these pottery sherds revealed that this outer surface black layer has no sharp boundary with the main ceramic body and contains a fine fraction of mineral inclusions in it (fig. 9). The composition of these mineral inclusions is analogous to that of the inner part of the ceramic body, differing only in its smaller size and strongly rounded shapes (Table 1: 2, 8; Table 2: 2, 3, 6; fig. 9). The fabric along the entire thickness of the pottery sherds has a completely homogeneous composition (see data from spectrometric studies above), with only the size of the inclusions being

reduced. In addition, none of the pottery sherds examined showed a sharp boundary in the 'layer' in question, a feature which is characteristic of vessels coated with slip. In this case it is probably the so-called "self-slip" (Shepard 1956, 191 – 192), which is the result of additional smoothing and polishing of the surface of the vessels before they fully dry. The analyses of fabric from the surface of the pottery sherds from the necropolis near the village of Razdelna – treatment and active reaction with hydrogen peroxide (H_2O_2) suggest that an organic substance is present in the fabric's composition. This was also confirmed by the results of the X-ray powder diffraction (fig. 8c), which registered the presence of an X-ray amorphous phase. This in itself is an interesting result, as until now the gray-black and black color in the considered category of vessels was mainly attributed to the reduction conditions when firing the vessels or as the result of 'carbon trap' when inserting deliberately, or allowing a build-up of smoke into the kiln at the end of firing (Дончева-Петкова 1969, 22; Дончева-Петкова 1977, 31 – 32; Станчев, Иванов 1958, 55). According to L. Doncheva-Petkova, fabrics colored in gray or gray-bluish contain charred organic substances (Дончева-Петкова 1969, 11). Here the authors would like to add that the presence of an organic substance is registered only in the surface layer of the studied vessels. This excludes the possibility that the color of the ceramics in question is due to organic substance added to the fabric of the vessel, but rather to additional vegetation applied to the surface or added to the kiln's fuel, which in a reduced firing mode gives the characteristic gray-black color (Gillies, Urch 1983, 29; Rye 1980, 40 – 44). When an organic substance is applied directly to the surface of the vessel, it is highly likely to burn and separate from the surface (Shepard 1956, 31 – 32). Here we can ask the question – is it possible that the porosity of the vessels mentioned above helped to preserve the organic matter deep inside the fabric? Perhaps

Table 2. Sherds from the Early Medieval settlement near the village of Topola, Kavarna municipality
Таблица 2. Материали от ранносредновековното селище при с. Топола, общ. Каварна

Cat. No.	Archaeological context	Photo of the pottery sherd	Microscopic photo*
11	Early Medieval settlement near the village of Topola 1982 excavation campaign Grid sq. 13, elevation 0.40 m <i>No Inv. No.</i> <i>RMH – Dobrich</i>	 0 3 cm	
12	Early Medieval settlement near the village of Topola 1982 excavation campaign Grid sq. 2, elevation 0.80 m <i>No Inv. No.</i> <i>RMH – Dobrich</i>	 0 3 cm	
13	Early Medieval settlement near the village of Topola 1982 excavation campaign Grid sq. Y, elevation 0.60 m <i>No Inv. No.</i> <i>RMH – Dobrich</i>	 0 3 cm	
14	Early Medieval settlement near the village of Topola 1982 excavation campaign Grid sq. 14, elevation 0.60 m <i>No Inv. No.</i> <i>RMH – Dobrich</i>	 0 3 cm	

15	Early Medieval settlement near the village of Topola 1969 excavation campaign No context of discovery <i>RMH – Dobrich</i>		
16	Early Medieval settlement near the village of Topola 1972 excavation campaign Trench I, elevation 0.80 m No Inv. No. <i>RMH – Dobrich</i>		

* All photos of the thin sections have a field of view = 3980 μm , samples Nos. 2, 3, 7 were taken in cross-polarized light; samples Nos. 4, 5, 6 – in parallel polarized light.

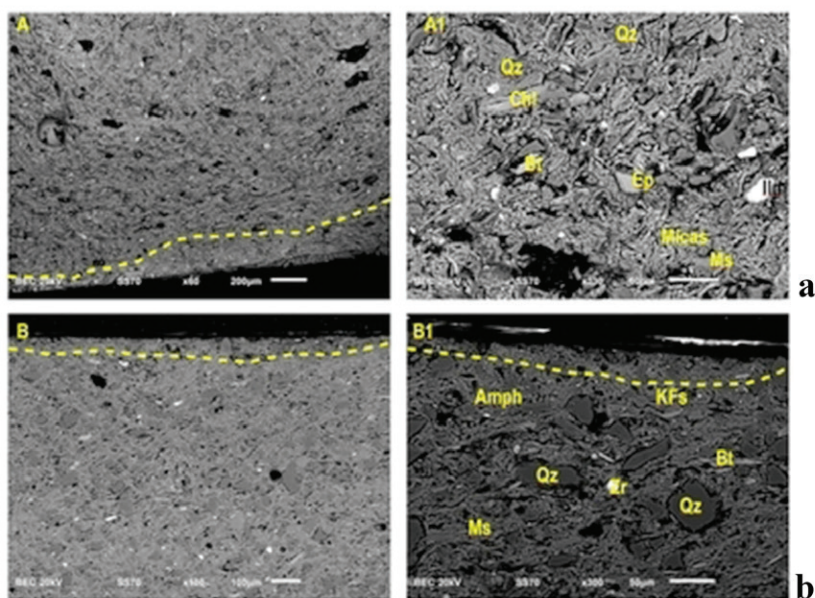


Fig. 7. Backscatter images of the cross-sections of the pottery by scanning electron microscopy with determined mineral phases: a. A/A1. Pot – urn from Grave No. 24 (necropolis near the village of Razdelna); b. B/B1. Pottery sherd from the base of a vessel with refined fabric (Early Medieval settlement near the village of Topola, Cat. No. 12). Abbreviation of the minerals: Qz – quartz; Amph – amphibole; Bt – biotite; Ms – muscovite; Micas – mica; Chl – chlorite; KFs – K-feldspar; Ilm – ilmenite; dotted line – boundary of the layer of fine fraction of the inclusions

Обр. 7. Снимки на напречни разрези на керамичното тяло от сканиращ електронен микроскоп с определени минерални фази: а. А/А1. Гърне – урна от гроб № 24 (некропол при с. Разделна); б. В/В1. Фрагмент от дъно на съд от пречистена глина (ранносредновековно селище при с. Топола, кат. № 12). Означения на определени минерали: Qz – кварц; Amph – амфибол; Bt – биотит; Ms – мусковит; Micas – слюда; Chl – хлорит; KFs – К-фелдшпат; Ilm – илменит; пунктирна линия – граница с пласта от фина фракция на примесите

this should explain the different thickness and depth of the coloring border. The weakly represented X-ray amorphous phase in the sherds from the settlement near the village of Topola (fig. 8b) leads the authors to conclude that most of the pottery sherds belong rather to the second variant, in which the additional use of fresh vegetation in the kiln's fuel had contributed to the coloring of the vessels. For now, it is difficult to answer why in some of the studied materials the X-ray amorphous phase is more readily detectible, as can be seen from the results of the X-ray powder diffraction of the sherds from Graves Nos. 24 and 29 from the necropolis near the village of Razdelna (fig. 8a, c). In any case, it is clear from the analyses performed that no additional layer of clay was registered on the surface of the vessels under consideration. According to this feature, the vessels from the two sites differ from the burnished ceramics from the area of the so-called Saltovo-Mayaki culture, in which the presence of such a layer was identified by V. Flerov³ (Флёрв 1980, 56; Флёрв 2000, 111).

Another interesting result that should be noted here, is the presence of an additionally applied layer of diluted clay with a thickness of less than 0.5 mm, that showed no traces of being fired, and that was most likely applied after the firing. This layer was documented on a pottery sherd from the urn in Grave No. 140 from Razdelna (pot of sandy fabric decorated with incised decoration) (Cat. No. 9; fig. 4b, fig. 10). There are no traces of deposits on the surface of the pot as a result of a mineral-forming process due to the fact that it stayed buried in the soil. About 60 similar vessels are known from the necropolis near Razdelna, in which such a coating was applied only on pots of sandy fabric with incised decoration (fig. 11). In most cases, the surface layer is poorly preserved or almost completely destroyed during the cleaning of the vessels and their restoration. No such examples are known in Bulgarian scholarly literature at this stage. In the publication of the medieval settlement in Grindur locality near Antimovo village, Vidin district, it is mentioned that there are vessels of sandy fabric with incised decoration whose outer surface was additionally smoothed with a coating of diluted clay (slip?) (Лалов 2012, 104). Whether and to what extent the two sites can be compared so far is difficult to say.

In conclusion, the following can be resumed:

1. The pottery sherds of both sites have a similar composition of the fabric from which they are made with predominant size of natural inclusions below 0.1 mm. A peculiarity of the pottery from the settlement near the village of Topola is the presence of crushed mussel shells in the fabric. For both sites, in some of the analysed sherds, a limited presence of grog added as temper, was documented.

2. The presented materials from the necropolis at Razdelna can be divided into two groups: first – rich in mineral inclusions (mainly quartz, feldspar and mica) and second – poor or almost free of inclusions. Due to the limited amount of studied pottery sherds, it is difficult to draw more general conclusions regarding the ceramic complex of the necropolis.

3. The studied ceramic artifacts are fired at low – to medium temperature – up to 550 °C for the necropolis near the village of Razdelna and up to 700 °C for the sherds from the settlement near the village of Topola.

4. The sherds from the Early Medieval settlement from Kovanlaka locality near the village of Topola demonstrated higher density of the fabric used and a higher and relatively more uniform firing temperature in comparison with those from Razdelna, thus pointing out to a specialized production.

³ During his study on burnished pottery from the area of the Saltovo-Mayaki culture, the Russian archaeologist V. Flerov documented the presence of a layer of diluted clay on which the burnishing was applied. The vessels were coated with this diluted clay both on the outside and on the inside (Флёрв 1980, 56; Флёрв 2000, 111). According to him, this coating should not be confused with the term “slip”. Judging by the jugs with trefoil rim (the so-called Baklin type) and amphorae of Crimean origin on the surface of which the slip was laid, he notes that the slip is of insignificant thickness and differs in composition and color from the fabric of the vessel itself. For this coating, he proposes to use the term „слой под лощение” or translated from Russian – “layer under the burnishing”. This definition is also accepted by V. V. Майко (Майко 2020, 44). We do not currently know of any published mineralogical-petrographic or chemical analyses that would help clarifying the nature of the coating in question.

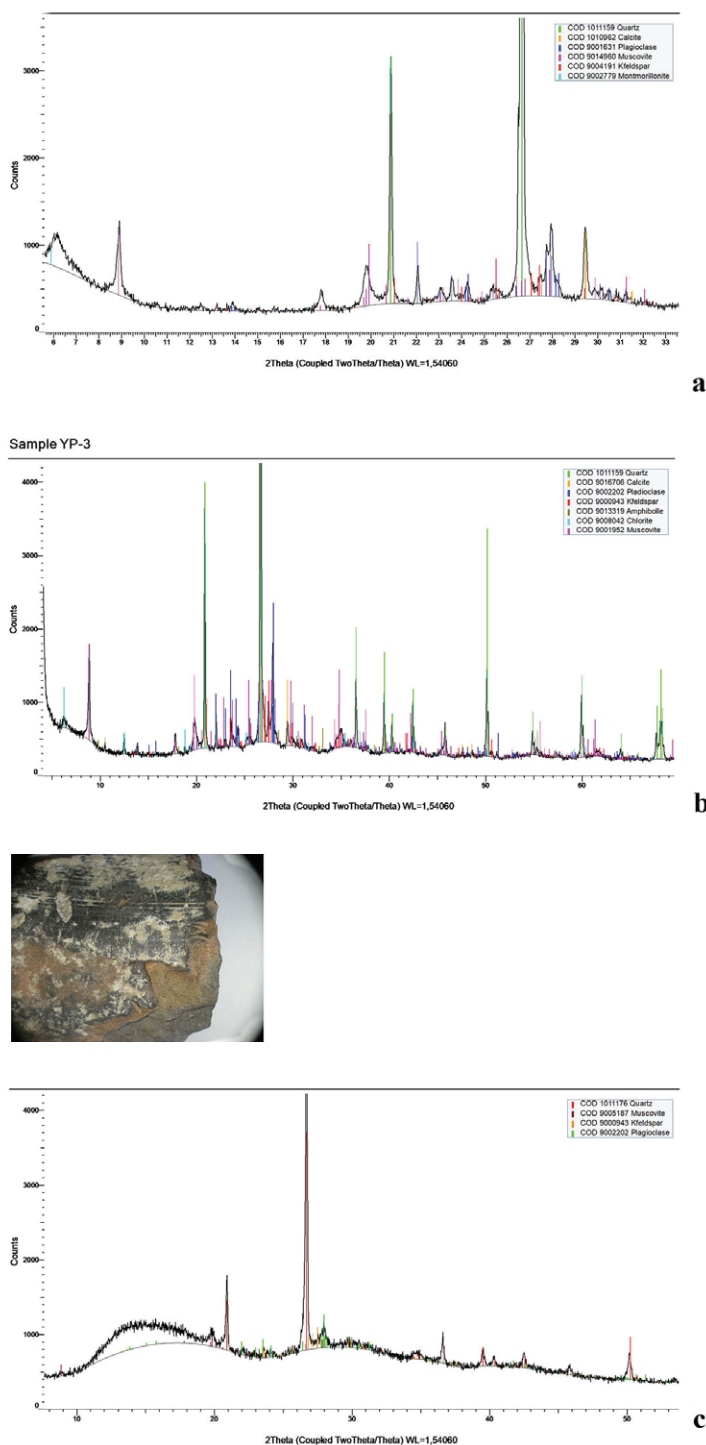


Fig. 8. Representative results of the powder XRD analyses of the pottery sherds: a. Jug – grave offering in Grave No. 29 (necropolis near the village of Razdelna); b. Pottery sherd from the base of a vessel (the Early Medieval settlement near Topola, fig. 5b, Cat. No. 12); c. Pot – urn from Grave No. 24 (necropolis near the village of Razdelna)

Обр. 8. Представителни резултати от прахова рентгенова дифракция на изследвани фрагменти: а. Кана – гробен дар от гроб № 29 (некропол при с. Разделна); б. Фрагмент от дъно на съд (ранносредновековно селище при с. Топола, обр. 5b, кат. № 12); в. Гърне – урна от гроб № 24 (некропол при с. Разделна)

5. In the case of the studied ceramics made of refined fabric with burnished decoration, no additionally applied coating of clay was registered. The finer surface fraction can be explained by the smoothing and burnishing of the vessels, which further grinds the inclusions into smaller fractions. This distinguishes the studied ceramics from the burnished pottery from the area of the so-called Saltovo-Mayaki culture, for which is characteristic the additional application of a coating of diluted clay – the so-called “Layer under the burnishing” (Флѐров 1980, 56; Флѐров 2000, 111).

6. In the case of some of the ceramic artifacts with refined fabric and burnished decoration, the presence of an X-ray amorphous phase related to the application of an organic substance on the surface or the addition of organics (probably fresh vegetation) to the kiln’s fuel was registered. As a result of the firing, performed under reduction mode the vessels attained their characteristic gray, gray-black to pitch-black color.

7. Some of the vessels of sandy fabric and with incised decoration from the necropolis near the village of Razdelna, were coated with diluted clay, which was applied after the firing of the vessel – probably intending to additionally smooth the surface.

The comprehensive study of pottery sherds from the two sites allowed further information to be obtained about their mineral composition, structural features, approximate firing temperature and composition of the surface layer of some of the vessels. The obtained results allow correlation between the two sites regarding the technology of the production of the studied ceramics.

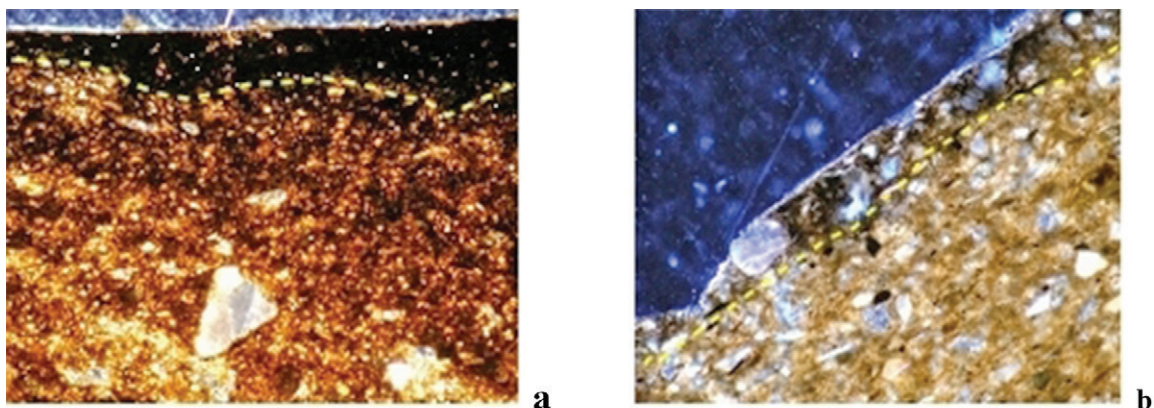


Fig. 9. Microscopic photos of pottery sherds: a. Pot – urn from Grave No. 136 (necropolis near the village of Razdelna); b. Pottery sherd from the base of a vessel (Early Medieval settlement near the village of Topola, fig. 5b, Cat. No. 12)

Обр. 9. Микроскопски снимки на фрагменти: а. Гърне – урна от гроб № 136 (некропол при с. Разделна); б. Фрагмент от дъно на съд (ранносредновековно селище при с. Топола, обр. 5b, кат. № 12)

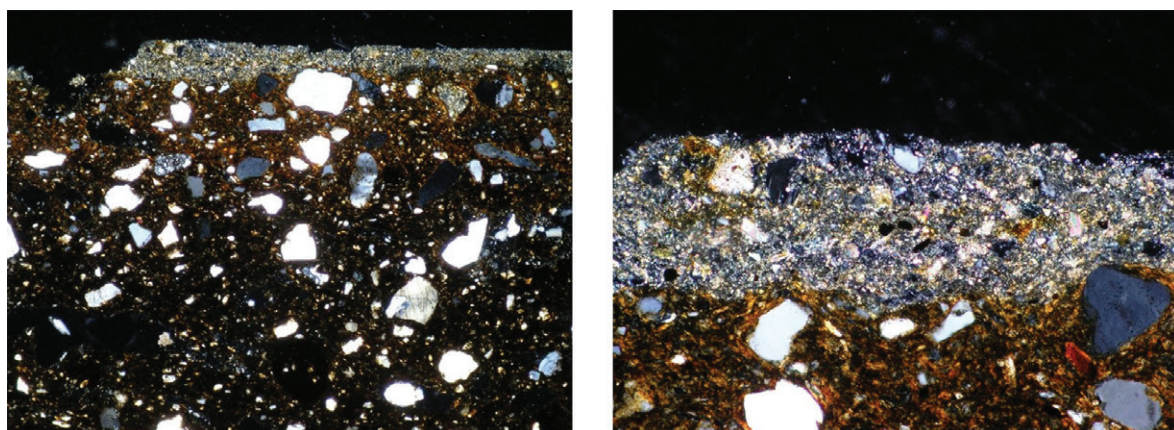


Fig. 10. Microscopic photo of a pottery sherd from a pot from Grave No. 140

Обр. 10. Микроскопска снимка на фрагмент от гърнето от гроб № 140

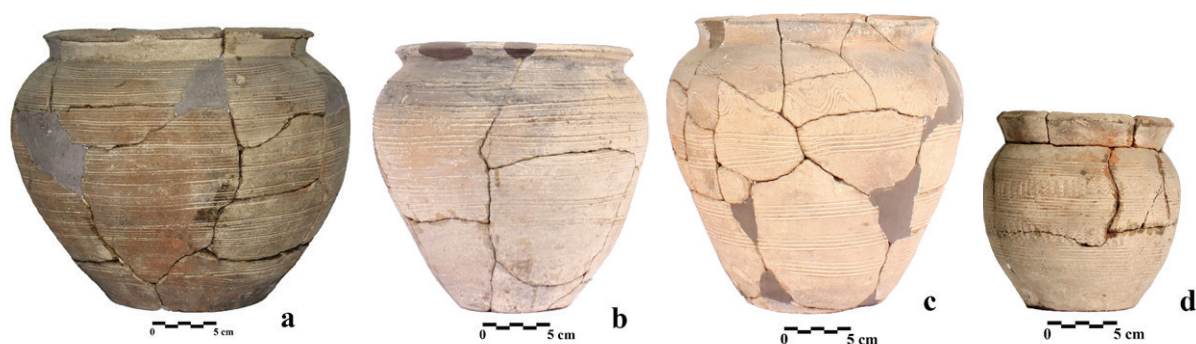


Fig. 11. Examples of vessels from the necropolis near the village of Razdelna with similar coating as the pot from Grave No. 140: a. Grave No. 44 (Inv. No. 817 – RMH – Varna); b. Pot – urn from Grave No. 161 (Inv. No. 909 – RMH – Varna); c. Pot – urn from Grave No. 135 (Inv. No. IV 884 – RMH – Varna); d. Pot – urn from Grave No. 126 (Inv. No. IV 879 – RMH – Varna)

Обр. 11. Примери на съдове от некропола при с. Разделна със сходно покритие като гърнето от гроб № 140: а. Гроб № 44 (инв. № IV 817 – РИМ – Варна); б. Гърне – урна от гроб № 161 (инв. № IV 909 – РИМ – Варна); в. Гърне – урна от гроб № 135 (инв. № IV 884 – РИМ – Варна); г. Гърне – урна от гроб № 126 (инв. № IV 879 – РИМ – Варна)

CATALOGUE

Necropolis near the village of Razdelna

Димитров 1978, 128 – 151; Fiedler 1992, 463 – 485

1. Lower part of a pot – Grave No. 183 (Table 1: 1, fig. 2a)

Pottery sherd from a vessel with refined fabric thrown on a tournette. Sherds from the base and parts of the walls from the same pot have been preserved. The body is most probably globular. The outer surface is orange in color and is covered by oblique burnished strips. A horizontal line is incised below them.

No inventory number.

RMH – Varna

- Results from the petrographic analysis (microscopic description):

Matrix: Hydromica mass with brownish-red color in the periphery and central part – dark brown to black in color, optically isotropic.

Proportion of matrix/clasts: ca. 35 – 40 / 55 – 60 %

Clastic component: It is represented only by mineral inclusions with size below 0.1 – 0.2 mm. Single quartz grains reach sizes up to 0.4 mm. They all have an angular shape, which suggests that they were added to the fabric as temper (?). Mica is also present – muscovite, biotite, ore minerals and sporadic grains of feldspar and epidote.

Characteristic features: Fabric rich in quartz inclusions with silt-size that are unevenly distributed in it.

2. Pot – urn from Grave No. 183 (Table 1: 2, fig. 2b)

Sherds of rim, walls and base from the same vessel. Most probably this is the urn from Grave No. 183, described by D. Il. Dimitrov.⁴

The surface is gray-black in color and is covered with vertical burnished stripes. The rim is slightly turned outwards and the lip is rounded.

No inventory number.

RMH – Varna

- Results from the petrographic analysis (microscopic description):

Matrix: Brown-black in color, optically isotropic, cryptocrystalline hydromica mass.

Proportion of matrix/clasts: 60 – 70 / 40 – 30 %

Clastic component: Represented by mineral inclusions of quartz (mainly) and mica – biotite and muscovite and rock quartzite. Quartz inclusions are clearly divided into two fractions – less than 0.1 – 0.05 mm (predominant quantitatively) and 0.2 – 0.4 mm, represented by single grains.

Characteristic features: Presence of a fine fraction of inclusions, which is documented as a layer on the outer periphery of the pottery sherd.

3. Lower part of a pot of refined fabric from Grave No. 185 (Table 1: 3, fig. 2c)

Sherd from the wall of a vessel made from purified fabric from Grave No. 185 (urn placed in a well-built brick-stone chamber). The vessel has no inventory number. From the descriptions in the publication, as well as from the available field documentation, it is clear that the urn in which the human remains were placed (a pot of sandy fabric with incised decoration) was placed in the lower half of a pot of gray purified fabric.

No inventory number.

RMH – Varna

- Results from the petrographic analysis (microscopic description):

Matrix: Cryptocrystalline hydromica mass, optically isotropic, light to dark brown, gray in the central parts of the pottery sherd.

Proportion of matrix/clasts: 45 – 50 / 55 – 60 %

Clastic component: Mineral inclusions of quartz, white and brown mica with subparallel orientation, feldspar (plagioclase with lamellar structure and K-feldspar), epidote, titanite, ore minerals. The size of the inclusions is less than 0.1 mm and sporadic quartz and feldspar grains reach 0.3 – 0.4 mm.

⁴ Pottery sherds of two vessels with no inventory numbers were found in the depot of RMH – Varna. The note with which they were found indicates the date of discovery and the number of the grave from which they originated. The pottery sherds have a different fabric, as well as a different color due to firing. The only description given by D. Il. Dimitrov for Grave No. 183 is that there was a highly fragmented urn whose fabric was dark gray in color and refined (Димитров 1978, 147). No additional information was found from the researcher's field diary.

Characteristic features: Pottery rich in mineral inclusions of mica. The presence of fresh feldspars of magmatic rocks, epidote and titanite is also characteristic. Evenly distributed mineral inclusions (tempers?).

4. Pot – urn from Grave No. 24 (Table 1: 4, fig. 2d)

Only one pottery sherd of the rim has been preserved. According to the publication of D. Il. Dimitrov, there were two urns in the grave – one of sandy fabric and incised decoration, and another – a pot of gray refined fabric decorated with vertical burnished stripes (Димитров 1978, 130). Probably the pottery sherd in question is part of the urn of refined fabric. The rim is short and slightly turned outwards, the lip is rounded.

- Diameter of the rim: 21 cm

Inv. No. IV 798

RMH – Varna

- Results from the petrographic analysis (microscopic description):

Matrix: Light brown in color, fine crystalline hydromica mass.

Proportion of matrix/clasts: 60 / 40 %

Clastic component: Mineral inclusions of quartz, white and brown mica with no distinct orientation, epidote, titanite, ore minerals. The size of the inclusions is below 0.05 mm and sporadic quartz grains reach 0.3 mm.

Characteristic features: Pottery rich in mineral inclusions of quartz and mica. As a composition it is very close to the sherd from Grave No. 185, except for a smaller quantity of feldspars. An even distribution of quartz mineral inclusions, with a pronounced angular shape, most likely used as temper.

5. Jug – used as grave offering in Grave No. 29 (Table 1: 5, fig. 3a)

Biconical body with a high cylindrical neck and trefoil rim. The lip is slightly thickened and rounded. The handle (individual pottery sherds are preserved) has an elliptical cross-section and it is not clear how it was attached to the rim of the jug. The well-refined fabric is of dark gray color after firing. The surface is well-smoothed and is covered with intersecting burnished stripes forming a diamond grid pattern. There are three incised lines immediately below the neck. The decoration is preserved mainly in the upper half of the vessel.

- Height: 18.8 cm
- Diameter of the rim: impossible to be measured
- Diameter of the base: 9 cm
- Maximum diameter: 21.3 cm

Inv. No. IV 804

RMH – Varna

- Results from the petrographic analysis (microscopic description):

Matrix: Light brown to reddish-brown hydromica mass.

Proportion of matrix/clasts: 80 / 20 %

Clastic component: Mineral inclusions of quartz, white and brown mica with no distinct orientation, epidote, ore minerals and grog. The size of the inclusions is less than 0.05 mm and sporadic quartz grains reach 0.2 mm.

Characteristic features: Pottery poor in mineral inclusions of quartz and mica. As a composition it is very close to that of the vessels from Graves Nos. 185 and 24, except for the significantly smaller quantity of mineral inclusions. Distinct presence of two fractions of different size, those below 0.05 mm being predominant. Probably the same source of raw materials was used, but the quantity of temper added is smaller (?).

6. Pot – urn from Grave No. 50 (Table 1: 6, fig. 3b)

Conical body with bulging shoulders. The rim is not preserved. The pot is thrown on a tournette (improved hand propelled wheel) of sandy fabric with brown color after firing. The surface is covered with densely applied horizontal incised lines. Above them, on the shoulders, there are two bands of wavy lines.

- Height (preserved): 20.7 cm
- Diameter of the base: 10.8 cm
- Maximum diameter (as measured at the shoulders): 27.6 cm

Inv. No. IV 808

RMH – Varna

- Results from the petrographic analysis (microscopic description):

Matrix: Red-brown, cryptocrystalline hydromica mass.

Proportion of matrix/clasts: 60 / 40 %

Clastic component: Mainly quartz, quartz aggregates, feldspars and a limited amount of fine white and brown mica and epidote grains. The presence of quartzites and aggregates of chalcedony type quartz is characteristic.

Characteristic features: This is the coarsest pottery included in the present study, in which the size of the inclusions reaches 1 mm and is also the only one with the presence of inclusions from chalcedony aggregates.

7. Pot – urn from Grave No. 89 (Table 1: 7, fig. 3c)

Spherical body with short neck, curved outwards, and rounded lip at the rim. The surface is well-smoothed and decorated with intersecting burnished stripes forming a grid of diamonds. There is a band of incised lines in the middle part of the vessel. At the base there is a relief sign – a circle with an “X” inscribed in it. The pot is thrown on a tournette. The fabric is refined and turned to dark gray color after firing.

- Height: 14.7 cm
- Diameter of the rim: 13.2 cm
- Diameter of the base: 10.6 cm
- Maximum diameter: 19.2 cm

Inv. No. IV 848

RMH – Varna

- Results from the petrographic analysis (microscopic description):

Matrix: Cryptocrystalline hydromica mass, from dark brown to deep gray in color in the central areas.

Proportion of matrix/clasts: 60 / 40 %

Clastic component: Mineral inclusions of quartz and ore mineral – basic, subordinate presence of mica flakes (muscovite and biotite), epidote, brown-green amphibole, feldspar. The predominant size of the inclusions is below 0.1 and 0.05 mm and single quartz and feldspar grains reach 0.3 – 0.4 mm. There are also single inclusions of quartz aggregates and grog.

Characteristic features: Pottery rich in evenly distributed mineral inclusions of quartz fine with zonation in the color of the matrix (probably the result of different oxygen saturation during firing). Presence of late carbonate deposits.

8. Pot – urn from Grave No. 136 (Table 1: 8, fig. 4a)

Sherds of the rim and walls have been preserved. Spherical body. The rim is funnel-shaped and slightly turned outward, with a high neck ending with a rounded rim. The surface is smoothed, with traces of burnishing in the horizontal direction. Thin horizontal burnished stripes are also visible on the neck. The pot is thrown on a tournette. The fabric is well-refined and has turned to gray-black color after firing.

- Diameter of the rim: 17 cm

Inv. No. IV 885

RMH – Varna

- Results from the petrographic analysis (microscopic description):

Matrix: Brown to reddish-brown cryptocrystalline hydromica mass, optically isotropic.

Proportion of matrix/clasts: 80 / 20 %

Clastic component: Mineral inclusions of quartz, white and brown mica without a distinct orientation, feldspars, ore minerals. The size of the inclusions is below 0.05 mm and sporadic quartz grains reach 0.2 – 0.3 mm, and single up to 2 mm.

Characteristic features: Pottery poor in mineral inclusions of quartz and mica. As a structure it is very close to that of the jug from Grave No. 29 (Inv. No. IV 804 – RMH – Varna). Distinct presence of two fractions of different size, those below 0.05 mm are predominant.

9. Pot – urn from Grave No. 140 (Table 1: 9, fig. 4b)

Only part of the walls and the base are preserved. Ovoid body. There is a relief sign on the base of the vessel – a circle, as well as traces of sand grains. The entire surface of the vessel is decorated with horizontal incised lines applied with a comb tool. The sandy fabric has turned to ocher-red color after firing.

- Height (preserved): 16.2 cm
- Diameter of the base: 11.3 cm
- Maximum diameter: 19.8 cm

Inv. No. IV 888

RMH – Varna

- Results from the petrographic analysis (microscopic description):

Matrix: Pale brownish, reddish-brown to black, cryptocrystalline hydromica mass, optically isotropic.

Proportion of matrix/clasts: 60 / 40 %

Clastic component: Mainly mineral inclusions of angular quartz grains, feldspar grains (plagioclase and microcline), fine flakes of fine white and brown mica and epidote grains. There are also rock inclusions of quartzite and grog. It is similar in composition to the pot from Grave No. 50 (Cat. No. 6). The size of the inclusions vary from 1 – 1.5 mm to 0.1 mm.

Characteristic features: This is the only studied artifact with a well-defined subparallel order of the inclusions, the result of its production. The outer surface of the artifact is covered with a layer of diluted clay with the same composition as the main body, but is colorless and there are signs that it was not subjected to heating (fig. 10).

10. Pot – urn from Grave No. 142 (Table 1: 10, fig. 4c)

Spherical body. The rim is not preserved. The surface is smoothed and covered with sloping burnished stripes. At the lower part of the vessel, there is a single horizontal incised line at ca. 8 cm from the base. The fabric is well-refined with gray color after firing.

- Height: 22.6 cm
- Diameter of the base: 11.5 cm
- Maximum diameter: 27 cm

Inv. No. 891

RMH – Varna

- Results from the petrographic analysis (microscopic description):

Matrix: Brown to reddish-brown cryptocrystalline hydromica mass, optically isotropic.

Proportion of matrix/clasts: 80 / 20 %

Clastic component: Mineral inclusions of quartz, white and brown mica with no distinct orientation, feldspars, epidote, titanite, ore minerals, single grains of amphibole and grog. The size of the inclusions is below 0.05 mm and sporadic quartz grains reach 0.2 – 0.3 mm.

Characteristic features: Pottery poor in mineral inclusions of quartz and mica. As a composition and manufacturing technology it is very close to the jug from Grave No. 29 (Cat. No. 5) and the pot used as an urn from Grave No. 136 (Cat. No. 8). Quartz mineral inclusions with dimensions below 0.05 mm are predominant.

Early Medieval settlement near the village of Topola, Kavarna municipality

The items are from the Research and Secondary Depot of RMH – Dobrich.⁵

11. Pottery sherd from the rim of a pot of refined fabric – 1982 excavation campaign, Grid sq. 13, elevation 0.40 m (Table 2: 1, fig. 5a)

The rim is slightly thickened and rounded. The neck is short and cylindrical. The fabric is refined, turned to gray color after firing. The surface is smoothed and covered with sloping burnished stripes that start just below the neck. Above them, i.e. on the neck – there are traces of horizontal burnished stripes.

- Diameter of the rim: 21 cm
- Results from the petrographic analysis (microscopic description):

Matrix: Black in color cryptocrystalline hydromica mass, optically isotropic central part and peripheral – pale brown with a sharp border between the areas.

Proportion of matrix/clasts: 50 / 50 %

Clastic component: Represented by mineral inclusions of quartz (mainly) and mica – biotite and muscovite, epidote, tourmaline, amphibole and a distinct presence of inclusions of micritic limestone and pieces of bivalves (mussels). All inclusions are less than 0.01 mm in size.

Characteristic features: Presence of distinct areas with a sharp border between them. Presence of limestone and pieces of bivalve shells.

12. Pottery sherd from the base of a vessel of refined fabric – 1982 excavation campaign, Grid sq. 2, elevation 0.80 m (Table 2: 2, fig. 5b)

The surface is black, well-smoothed; with traces of burnishing in the horizontal direction (this is best noticeable just above the base). The decoration consists of sloping burnished stripes, and in places there is a criss-crossing of the stripes (a grid of rhombuses?). The base is flat with traces of sand lining. On the inside there are traces of smoothing with a textile in the vertical direction.

- Diameter of the base: 13 cm
- Results from the petrographic analysis (microscopic description):

Matrix: Cryptocrystalline hydromica mass, optically isotropic, with three differently colored area (central – black, intermediate – brown, outer – red).

Proportion of matrix/clasts: 55 – 60 / 45 – 40 %

⁵ Information about the context in which the pottery sherds were discovered is available only on the museum tags. The information comprises only the year of the excavation campaign, the location in relation to the grid-square plan and the approximate elevation measured from the modern ground level.

Clastic component: Mineral inclusions of quartz, white and brown mica with subparallel orientation, feldspars, epidote, amphibole, titanite, ore minerals and many pieces of micrite limestone and mussel shells. The size of the inclusions is less than 0.01 mm and sporadic limestone pieces and pieces of shells reach 0.05 – 0.1 mm. Single inclusions of grog are also observed.

Characteristic features: Pottery rich in mineral inclusions of quartz, mica and carbonate. The mineral inclusions (temper?) are evenly distributed. The areas of different color resulted probably of the firing conditions.

13. Pottery sherd from the base of a vessel with refined fabric – 1982 excavation campaign, Grid sq. Y, elevation 0.60 m (Table 2: 3, fig. 5c)

The walls at the base are rounded. The surface is dark gray in color and burnished. Lighter color areas are observed as a result of the uneven firing environment. The walls are decorated with oblique burnished stripes.

- Diameter of the base: 18 cm
- Results from the petrographic analysis (microscopic description):

The composition and the characteristic features are similar to those of sherd No. 12 (Cat. No. 12).

Matrix: Cryptocrystalline hydromica mass, optically isotropic, with three differently colored areas (central – black, intermediate – brown, outer – red).

Proportion of matrix/clasts: 55 – 60 / 45 – 40 %

Clastic component: Mineral inclusions of quartz, white and brown mica with subparallel orientation, feldspars, epidote, amphibole, titanite, ore minerals and pieces of limestone. The size of the inclusions is below 0.01 mm.

Characteristic features: Pottery rich in mineral inclusions of quartz, mica and carbonate. The mineral inclusions (temper?) are evenly distributed. The areas of different color resulted probably of the firing conditions. Unlike the pottery sherd from the rim of a pot with refined fabric (Cat. No. 14), mussel shells and grog were not used as tempers.

14. Pottery sherd from the rim of a pot with refined fabric – 1982 campaign, Grid sq. 14, elevation 0.60 m (Table 2: 4, fig. 5d)

Rim slightly curved outwards. The lip is slightly thickened and rounded. The surface is gray-black in color and burnished in a horizontal direction. On the inside of the rim, the horizontal traces from the throwing on a potter's wheel are clearly visible.

- Diameter of the rim: 23 cm
- Results from the petrographic analysis (microscopic description):

Matrix: Light brown to reddish-brown hydromica mass.

Proportion of matrix/clasts: 80 / 20 %

Clastic component: Mineral inclusions of quartz, feldspar, white and brown mica with no distinct orientation, ore minerals (highly oxidized) and rock pieces of quartzite and limestone. The size of the inclusions strongly varies from 2.5 mm to less than 0.05 mm and sporadic quartz grains reach 0.02 mm.

Characteristic features: Differs from the previous samples in composition and structure. Distinct presence of two fractions of different size, those below 0.05 mm are predominant. From the inclusions of the larger fraction there are isometric in shape crystals of feldspars as well as ones with strongly rounded contours.

15. Pottery sherd from the base of a pot with refined fabric – 1969 excavation campaign. No context of discovery available. (Table 2: 5, fig. 6a)

The walls towards the base are rounded. The surface is burnished, with a gray-beige color. In some places there are areas with a lighter color, which are the result of the uneven firing conditions. There is a relief sign on the base – two concentric circles, as well as traces of sand lining. On the inside of the vessel, on the base and on the walls, there are traces of the rotation of the potter's wheel, which are interrupted in places.

- Diameter of the base: 11 cm
- Results from the petrographic analysis (microscopic description):

Matrix: Red-brown to black-brown in color, cryptocrystalline hydromica mass.

Proportion of matrix/clasts: ca. 35 – 40 / 65 – 60 %

Clastic component: It is represented only by mineral inclusions with size below 0.01 mm, mainly of quartz, white mica, biotite and ore grains. Single quartz grains up to 0.2 mm in size are present. Along with these minerals, sporadic grains of feldspar, epidote, amphibole, and tourmaline are also documented.

Characteristic features: Extremely fine pottery, rich in quartz inclusions with silt to pelite size. They are evenly distributed, with no distinct orientation. The observed areas of different color are most likely the result of the oxidation conditions under which it was fired.

16. Entirely preserved profile of a bowl – 1972 campaign, Trench I, elevation 0.80 m (Table 2: 6, fig. 6b)

The bowl has a short and wide body, with high and rounded shoulders and walls tapering to the base. The vessel has a

narrow short neck, with a wide rim with a comma-shaped curved and thickened lip. There are traces of sand lining on the base. Traces of slow rotation can be seen on the inside. The surface is gray-beige in color, with traces of burnishing in the horizontal direction.

- Diameter of the rim: 18.8 cm
- Diameter of the base: 14 cm
- Height: 6.7 cm
- Maximum diameter: 21.6 cm
- Results from the petrographic analysis (microscopic description):

In composition and characteristics it is similar to pottery sherds Nos. 13 and 14 (Cat. Nos. 13, 14).

Matrix: Cryptocrystalline hydromica mass, optically isotropic, with differently colored areas (central – red-brown, outer – red).

Proportion of matrix/clasts: 55 – 60 / 45 – 40 %

Clastic component: Mineral inclusions of quartz, white and brown mica with no distinct orientation, feldspars, epidote, amphibole, ore minerals and very rare pieces of limestone. The size of the inclusions is below 0.01 mm.

Characteristic features: Pottery rich in mineral inclusions of quartz and mica. The mineral inclusions (temper?) are evenly distributed. The areas of different color resulted probably of the application of a hematite component.

References/Цитирана литература:

- Fiedler 1992: U. Fiedler. Studien zu Gräberfeldern des 6. bis 9. Jahrhunderts an der unteren Donau, Teil 1 – 2. Bonn, 1992.
- Gillies, Urch 1983: K. J. Gillies, D. S. Urch. Spectroscopic studies of iron and carbon in black surfaced ware. – *Archaeometry*, 25 (1), 1983, 29 – 44.
- Rye 1981: O. S. Rye. *Manuals on Archaeology, 4. Pottery Technology: Principles and Reconstruction*. Washington D.C., 1981.
- Shepard 1956: A. O. Shepard. *Ceramics for the Archaeologist*. Publication 609. Carnegie Institution of Washington, Washington D.C., 1956.
- Бобчева 1976: Л. Бобчева. Жилищни и стопански сгради в средновековното селище при с. Топола, Толбухински окръг. – *Известия на Народния музей – Варна*, 12 (27), 1976, 122 – 130. [Bobcheva 1976: L. Bobcheva. Zhilishtni i stopanski sgradi v srednovekovnoto selishte pri s. Topola, Tolbuhinski okrag. – *Izvestiya na Narodniya muzey – Varna*, 12 (27), 1976, 122 – 130]
- Бобчева 1977: Л. Бобчева. Грънчарски пещи за старобългарска керамика при с. Топола, Толбухинско. – *Известия на Народния музей – Варна*, 13 (28), 1977, 172 – 177. [Bobcheva 1977: L. Bobcheva. Grancharski peshti za starobalgarska keramika pri s. Topola, Tolbuhinsko. – *Izvestiya na Narodniya muzey – Varna*, 13 (28), 1977, 172 – 177]
- Бобчева 1980: Л. Бобчева. Глинени котли от селището при с. Топола, Толбухински окръг. – *Известия на Народния музей – Варна*, 16 (31), 1980, 126 – 130. [Bobcheva 1980: L. Bobcheva. Glineni kotli ot selishteto pri s. Topola, Tolbuhinski okrag. – *Izvestiya na Narodniya muzey – Varna*, 16 (31), 1980, 126 – 130]
- Бобчева 1981: Л. Бобчева. Прабългарското селище при с. Топола, Толбухинско. – *Плиска – Преслав*, 2, 1981, 198 – 201. [Bobcheva 1981: L. Bobcheva. Prabalgarskoto selishte pri s. Topola, Tolbuhinsko. – *Pliska – Preslav*, 2, 1981, 198 – 201]
- Димитров 1959: Д. Ил. Димитров. Ранносредновековен некропол при гара Разделна – *Археология*, I, 3 – 4, 1959, 56 – 60. [Dimitrov 1959: D. Il. Dimitrov. Rannosrednovekoven nekropol pri gara Razdelna – *Arheologiya*, I, 3 – 4, 1959, 56 – 60]
- Димитров 1978: Д. Ил. Димитров. Некрополът при гара Разделна. – *Известия на Народния музей – Варна*, 14 (29), 1978, 120 – 152. [Dimitrov 1978: D. Il. Dimitrov. Nekropolat pri gara Razdelna. – *Izvestiya na Narodniya muzey – Varna*, 14 (29), 1978, 120 – 152]
- Дончева-Петкова 1969: Л. Дончева-Петкова. Технология на раннославянската и старобългарската битова керамика (края на VI – X в.). – *Археология*, XI, 2, 1969, 10 – 24. [Doncheva-Petkova 1969: L. Doncheva-Petkova. Tehnologiya na rannoslavyanskata i starobalgarskata bitova keramika (kraya na VI – X v.). – *Arheologiya*, XI, 2, 1969, 10 – 24]
- Дончева-Петкова 1977: Л. Дончева-Петкова. Българска битова керамика през ранното средновековие (втората половина на VI – края на X век). София, 1977. [Doncheva-Petkova 1977: L. Doncheva-Petkova. Balgarska bitova keramika prez rannoto srednovekovie (vtorata polovina na VI – kraia na X v.). Sofiya, 1977]
- Дончева-Петкова и др. 2016: Л. Дончева-Петкова, К. Апостолов, В. Русева. Прабългарският некропол при Балчик. София, 2016. [Doncheva-Petkova et al. 2016: L. Doncheva-Petkova, K. Apostolov, V. Ruseva. Prabalgarskiyat nekropol pri Balchik. Sofiya, 2016]

- Лалов 2012: Ч. Лалов. Средновековно селище в м. Гриндур до Антимово, Видинско. – Археология, 1, 2012, 102 – 110. [Lalov 2012: Ch. Lalov. Srednovekovno selishte v m. Grindur do Antimovo, Vidinsko. – Arheologiya, 1, 2012, 102 – 110]
- Майко 2020: В. В. Майко. Лощеная керамика Салтово-Маяцких памятников Крыма. Анализ источниковой базы. – В: Ученые записки Крымского федерального университета имени В. И. Вернадского. Серия „Исторические науки“, 6 (72), № 3, 2020, 44 – 60. [Mayko 2020: V. V. Mayko. Loshchenaya keramika Saltovo-Mayatskikh pamyatnikov Kryma. Analiz istochnikovoy bazy. – In: Uchenyye zapiski Krymskogo federal'nogo universiteta imeni V. I. Vernadskogo. Seriya "Istoricheskiye nauki", 6 (72), № 3, 2020, 44 – 60]
- Станчев, Иванов 1958: Ст. Станчев, Ст. Иванов. Некрополът до Нови пазар. София, 1958. [Stanchev, Ivanov 1958: St. Stanchev, St. Ivanov. Nekropolat do Novi pazar. Sofiya, 1958]
- Флёров 1980: В. С. Флёров. Лощеная керамика Салтово-Маяцкой культуры как исторический источник. Диссертация на соискание ученой степени кандидата исторических наук. Москва, 1980. (Архив ИА – РАН, ф-1, р-2 2288). [Flyorov 1980: V. S. Flyorov. Loshchenaya keramika Saltovo-Mayatskoy kul'tury kak istoricheskiy istochnik. Dissertatsiya na soiskaniye uchenoy stepeni kandidata istoricheskikh nauk. Moskva, 1980. (Arkhiv IA – RAN, f-1, r-2 2288)]
- Флёров 2000: В. С. Флёров. К вопросу о технологии изготовления салтово-маяцкой лощеной керамики. – Археология восточноевропейской лесостепи, 14. Воронеж, 2000, 111 – 119. [Flyorov 2000: V. S. Flyorov. K voprosu o tekhnologii izgotovleniya saltovo-mayatskoy loshchenoy keramiki. – Arkheologiya vostochnoyevropeyskoy lesostepi, 14. Voronezh, 2000, 111 – 119]

СРАВНИТЕЛНО МИНЕРАЛОГО-ПЕТРОГРАФСКО ИЗСЛЕДВАНЕ НА КЕРАМИКА ОТ РАННОСРЕДНОВЕКОВНИЯ НЕКРОПОЛ С ТРУПОИЗГАРЯНЕ ПРИ С. РАЗДЕЛНА, ОБЩ. БЕЛОСЛАВ И РАННОСРЕДНОВЕКОВНОТО СЕЛИЩЕ ПРИ С. ТОПОЛА (М. КОВАНЛЪКА), ОБЩ. КАВАРНА

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РЕЗЮМЕ

Настоящата статия представя резултати от проведено комплексно минералого-петрографско изследване на керамични фрагменти от 16 съда: десет от ранносредновековния некропол с трупоиизгаряне при с. Разделна, Варненско и шест фрагмента от ранносредновековното селище при с. Топола, общ. Каварна. Тези резултати позволиха извършване на корелация между двата обекта относно технологията при изработването на изследваната керамика.

Приложените методи в представеното изследване включват: петрографски анализи за характеризиране на микроструктурата на керамичното тяло, определяне състава на природните включения (минерали и скали) и добавени опостнители, тяхното количествено присъствие, наличие на пукнатини и каверни, третиране на външна или вътрешна повърхност на керамичното тяло; прахова рентгенова дифракция (XRD), приложена с цел установяване на кристални минерални фази, които са неопределими оптически, а присъствието на някои от тях подпомага определяне на температурния интервал на изпичане на керамичния материал; електронна микроскопия (SEM-EDX) за определяне на структурата на керамиката, химичен и минерален състав и разпределението му в керамичното тяло.

Керамичните съдове от двата обекта имат сходен състав на глината, от която са изработени, с преобладаващи размери на природните включения под 0,1 мм. При част от фрагментите от двата обекта се регистрира ограничено присъствие на шамот, добавян като опостнител.

Изследваните образци от некропола при с. Разделна се делят основно на две групи според състава

на глината: първа – богата на минерални включения (основно кварц, фелдшпати и слюди) (Кат. № 1, 3, 4, 7, 9) и втора – бедна или почти несъдържаща включения (Кат. № 2, 5, 8, 10).

Изследваните фрагменти от селището в м. Кованлъка при с. Топола са с близък състав на глината и сходни технологични особености. Изследваната група от фрагменти е изградена от хидрослюдена по състав основна маса с вариращ цвят – кафяво-червен, светло до тъмно-кафяв, черен и оптически е изотропна. Включенията са представени от минералите: кварц (основно), бяла и кафява слюда, рудни зърна (иленит, титаномagnetит), фелдшпати, епидот, амфибол, турмалин, циркон. Размерите на повечето от тях са под 0,01 до 0,005 мм. Особеност в състава на глината при някои от образците е наличието на стрити черупки от миди. Съдовете се характеризират с по-висока плътност на глинестия материал, използван за изработката им, и по-висока и сравнително по-равномерна температура на изпичане в сравнение с материалите от Разделна, което предполага по-специализирано производство.

По регистрирания глинест минерал монтморилонит при съдовете от некропола при с. Разделна можем да предположим, че температурата на изпичане при направата им не надвишава 550 °C. В керамиката от селището при с. Топола не се регистрира глинест минерал, което предполага по-висока температура, но масовото присъствие на карбонатни фази в нея предполага температура на изпичане не по-висока от 700 – 750 °C.

Установен бе характерът на външната, а при някои образци и вътрешна повърхност на съдовете от пречистена глина с излъскана украса, която наподобява допълнително нанесен слой от разводнена глина. От направените изследвания стана ясно, че по повърхността се регистрира по-фина фракция от примеси, която по-скоро може да се обясни с допълнителното оглаждане и излъскване на съдовете.

При част от керамичните съдове от пречистена глина с излъскана украса е регистрирано наличието на рентгено-аморфна фаза, свързана с нанасянето на органика по повърхността или с добавяне на органичен материал (вероятно свежа растителност) в горивото на пещта, който при редукионен режим на изпичане придава на съдовете характерния сив, сиво-черен до катраненочерен цвят.

При един от изследваните образци от некропола при с. Разделна – гърне изработено от песъчлива глина с врязана украса (Кат. № 9, обр. 10), се регистрира нанесен след изпичането на съда слой от разводнена глина. Това покритие е със същия състав като основното тяло, но без белези на термична обработка. Съдовете с подобно покритие от некропола при с. Разделна са поне 60 (гърнета от песъчлива глина с врязана украса), но поради лошата степен на запазеност на този слой, техният точен брой трудно може да се установи.

Ключови думи: Ранно средновековие, керамика, минералого-петрографско изследване

