NON-ABRASIVE POTTERY SURFACE ATTRITION: BLAGOTIN EVIDENCE[1*]

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Abstract: *Attrition of interior walls is often visible in the form of pitting and surface erosion. This is mostly wrongly interpreted as being a result of depositing of friable, underfired pottery in the acid environment. However, these traces are in fact the effects of aggressive acid contents on the vessel walls, resulting from the fermentation or effervescence process. The analysis of appearance, distribution and frequency of such attrition in the group of vessels from Blagotin has pointed to the importance of functional analysis of pottery in identification and interpretation of food preparation related activities in the Early Neolithic.*

Key words: *Blagotin, pottery, function, non-abrasive processes, use-wear traces, fermentation, Early Neolithic*

Апстракт: *На унутрашњим зидовима посуда често се јављају оштећења у виду јамица или љуспања површине, која се углавном погрешно тумаче као последица депоновања трошне, недопечене керамике у киселом окружењу. Ради се, међутим, о траговима насталим услед агресивног деловања киселог садржаја на зидове посуда, као што су процеси ферментације и врења. Проучавањем изгледа, дистрибуције и учесталости оваквих оштећења на групи здела са Благотина указано је на значај функционалне анализе грнчарије за идентификацију и тумачење активности везаних за припрему хране током старијег неолита.*

Кључне речи: *Благотин, грнчарија, функција, неабразивни процеси, трагови употребе, ферментација, старији неолит.*

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As the most numerous kind of archaeological finds, pottery is always the key material for explanation of the genesis and evolution of prehistoric cultures. The interpretations are mostly based on typological analyses, which are usually confined to classification and description of the material, and comparison of certain morphological and stylistic features. On the other hand, the functional analysis aims at determining the purpose of pottery vessels and reconstructing the activities related to the mode of use. When the pottery vessel was understood to have been a tool (Braun 1983), it became clear that different activities may have left different traces – attrition or accretion - on pottery vessels. Following the example of traseological analyses of chipped stone industry, pottery functional analysis has developed a specific field of research focused on the analysis of different use-wear traces and their distribution, with one of the goals being reconstruction of the activities due to which those traces appeared.

In the traditional typological analysis of pottery, vessels for food preparation are exclusively identified as pots designed for exposure to fire. Their main characteristics are often said to be somewhat coarse fabric and a relatively big size, as well as the presence of handles. Such analyses rarely define the criteria for the function identification, and food preparation is more or less equated with cooking. However, the functional analysis has made it clear that two basic groups have to be recognized within the class of vessels for food preparation. Vessels designed for thermic treatment of foodstuffs are in the first group, which is further divided into two subgroups: vessels designed for food preparation by using water (boiling, simmering) and vessels for thermic treatment of foodstuffs without water (parching, popping, frying, roasting). The second group includes the vessels designed for food processing (stirring, crumbling, soaking). Since multifunctional and morphologically diverse vessels were mainly used for those activities, their attribution to this functional class is possible only through an analysis of the use-wear traces.

Use-wear traces resulting from non-abrasive processes

Traces resulting from non-abrasive processes, along with carbon deposits and oxidized exterior surfaces, were the first use-wear traces on pottery vessels to be identified and defined (Hally 1983). Together with damages created through mechanical processes (abrasion), they belong to a large group of traces manifesting themselves in deformation of the pottery surface. They are results of various chemical reactions. Shape, distribution and frequency of all kinds of traces left by use are dependent on many factors. Physical, mechanical and morphological properties of vessels (shape, size, weight, strength, permeability, porosity, surface treatment, fabric, etc.) are among the first factors to consider. On the other hand, as traces result from certain activities, there are other important factors too, such as the type of activity (food preparation: mechanical or thermal, storing, transport, but also handling, i.e. stirring, crumbling, washing, etc.); the

length and rate of use, on which the density and number of traces depend; the content of the vessel and the context of its use, i.e. the venue where the activities were taking place (Skibo 1992, 46–48).

Traces created by non-abrasive processes are results of a number of chemical processes. They are often associated with fermentable foodstuffs, such as cereal grains or dairy products (Arthur 2002, 339; Skibo and Blinman 1999, 182). Ethnoarchaeological research has confirmed that the fermentation process in different kinds of gruel, dairy products and beer, triggered by preparation and storing, produces the effect of increased acidity, which causes attrition of interior walls. The damage appears as pitting and surface erosion (Arthur 2002; Hally 1986, 286).

These damages, however, can often have the same shape as some other damages which may occur during the technological process of pottery production (firing of insufficiently dried vessel the walls of which still hold some water), (Rye 1981, 105–106), or after depositing, as in the case of, for example, salt crystallization (Skibo et al. 1997, 312). Similar damages can occur if friable, underfired pottery remains in high pH soils. For that reason, the distribution of traces is an extremely important indicator for their identification and interpretation. In case that they can be found on the internal surface only, and in a clearly marked zone, there is no doubt that those traces are a result of chemical reactions related to vessel use.

Vessels with traces of non-abrasive processes: an example from Blagotin

Over many years of investigation of the Early Neolithic site at Blagotin, near Trstenik, a number of architectural units have been defined. An extraordinary large amount of the excavated material provides the opportunity for different analyses to be done. The functional analysis (archaeometric, morphologic, and use-wear trace analysis) has been done focusing on the material collected from the unit marked as structure 03 (Vuković 2006). The structure can be regarded as a typical archaeological context of the Early Neolithic. It was probably a dwelling structure which was later abandoned and used as a waste pit. This hypothesis is corroborated by the fact that fragments of vessels from the whole structure and all depths match and can be assembled together**.** However, atypical fragments prevail, and less frequent, partly assembled, vessels. The results of the functional analyses have shown that those were mainly “worn” vessels or discarded fragments of broken vessels dumped here as waste.

Within the pottery material from structure 03, a group of vessels with use–wear traces resulting from non-abrasive processes stands out. Unlike the other functional classes, most vessels from that group (total eight specimens) were found either in one piece or it was possible to reconstruct them. They display identical characteristics in morphological and archaeometric parameters, as well as in distribution of the use-wear traces.

The analysis of that group of vessels has proved to what extent stylistic and typological analyses fall short of providing a comprehensive insight into pottery material. Typologically they belong to different types of vessels: to deeper conical, non-profiled globular and semi-globular bowls (fig. 1). However, in terms of their function, they belong to the same class of vessels characterized by open profiles. Openness or closeness of vessels is the main parameter in the analysis of morphological characteristics required

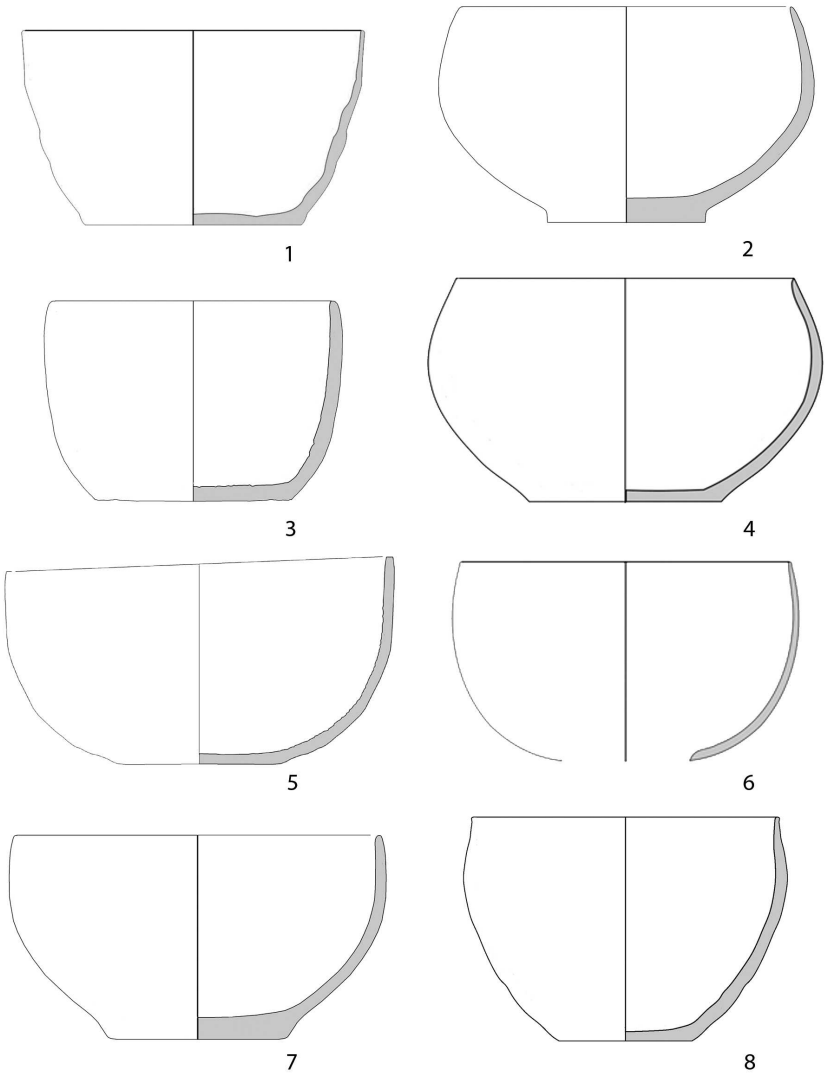

Fig. 1 Open-profile vessels with traces resulting from non-abrasive processes
Сл. 1. Посуде отвореног профила са траговима деловања неабразивних процеса

for the definition of the functional classes. If the diameter of the rim is the longest diameter of the whole vessel or is almost equal to the longest diameter, the vessel is classified as open vessel. This characteristic always indicates easy access and possibility of free manipulation of the content, which excludes the storage function. Therefore, open vessels are almost always put into the class of vessels for food preparation.

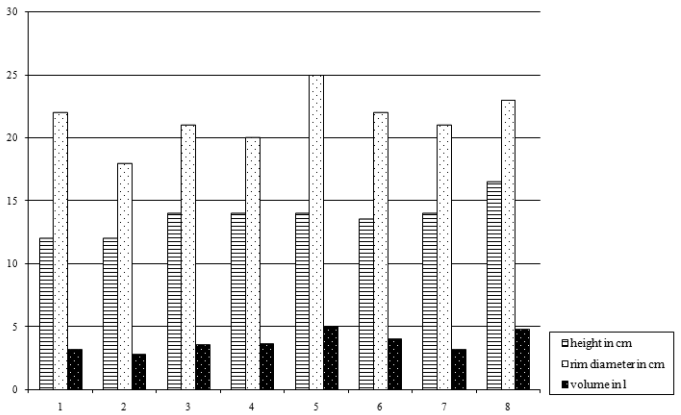

Fig. 2 Basic archaeometric parameters for vessels with damages caused by non-abrasive processes
Сл. 2. Основни археометријски параметри посуда са оштећењима насталим деловањем неабразивних процеса

The analysis of archaeometric parameters has confirmed that the vessels of this group, although insignificantly different in shape, display almost the same features (fig. 2). They all belong to the group of open vessels of medium size (rim diameter ranging from 18 to 25 cm), with the height between 12 and 16 cm, and the volume between three and five litres.

The distribution of use-wear traces is identical on all vessels. Two zones are clearly discernable on the internal surfaces. The original surface with burnished slip is preserved on the upper part of the vessel. The zone of intensive, deep damages covering the whole of internal surface starts from about 2 cm below the rim. Slip and the outer burnished layer have been removed (fig. 3). The clear boundary between these two zones reflects the so-called filling level. The most severe damages appear on the lower body, near the bottom. Deposits of whitish colour in the same zone, probably also resulting from chemical reactions in the content of the vessel, are visible on all vessels.

However, the extent of damage is not the same everywhere. Deeper and more frequent damages are present on the vessels where only this kind of traces has been noted. They are often accompanied by mechanical damages in the forms of pitting on the lower parts of the internal surfaces. The bottoms of these vessels are almost completely "worn" on both internal and external side. The differences in number and depth of damages can

be explained in the light of unequal frequency of use. Some other use-wear traces of different kinds have been noted on several vessels with shallow damages. Oxidation discoloration and sooting clouds on the vessel external walls mainly indicate effects of exposure to fire.

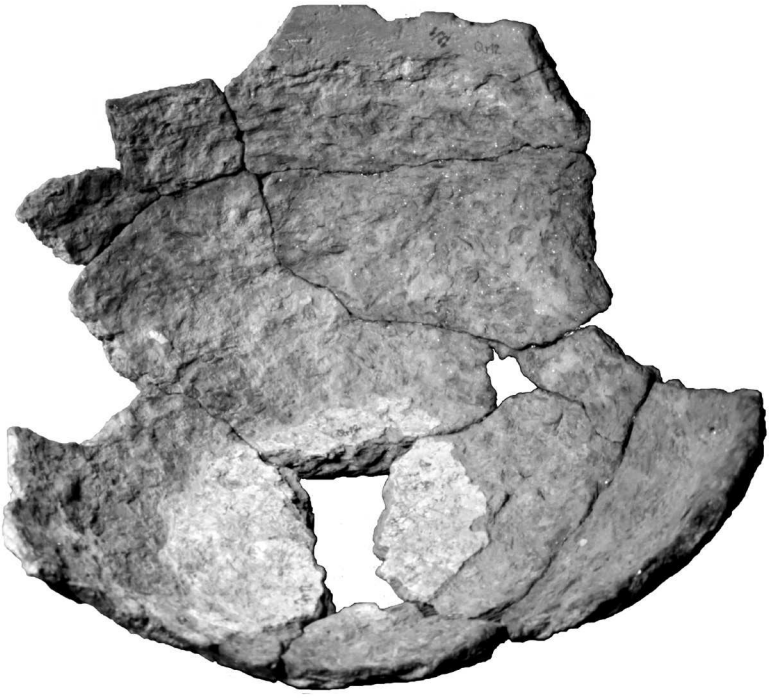

Fig. 3 Internal vessel surface completely worn out by effects of non-abrasive processes; original burnished surface is preserved immediately under the rim
Сл. 3. Унутрашња површина зделе у потпуности истрошена деловањем неабразивних процеса; првобитна глачана површина очувана је у зони непосредно испод обода

The only example which stands out for its characteristics from the vessels described above is a fragment of a slightly biconical bowl, small in size, with fine fabric and polished surface. Attrition appearing as pitting, created as a result of non-abrasive processes, can be seen on the internal walls. The attrition starts immediately below the rim and cover the whole internal surface. Based on the characteristics of form, small size and fabric, the food preparation function seems to be unlikely and should be excluded. Therefore, for the time being, the issue of function of this sample should remain open.

The analysis of the group of vessels with traces left by non-abrasive processes, recovered from structure 03, would not be sufficient unless they were considered within

the context of the whole pottery material. First of all, pottery from structure 03 is characterized by excessive fragmentation. After the meticulous work on assembling the vessels, more data on shapes and dimensions emerged, but the number of whole vessels remained insignificant. Therefore, at first glance, the fact that the biggest number of whole

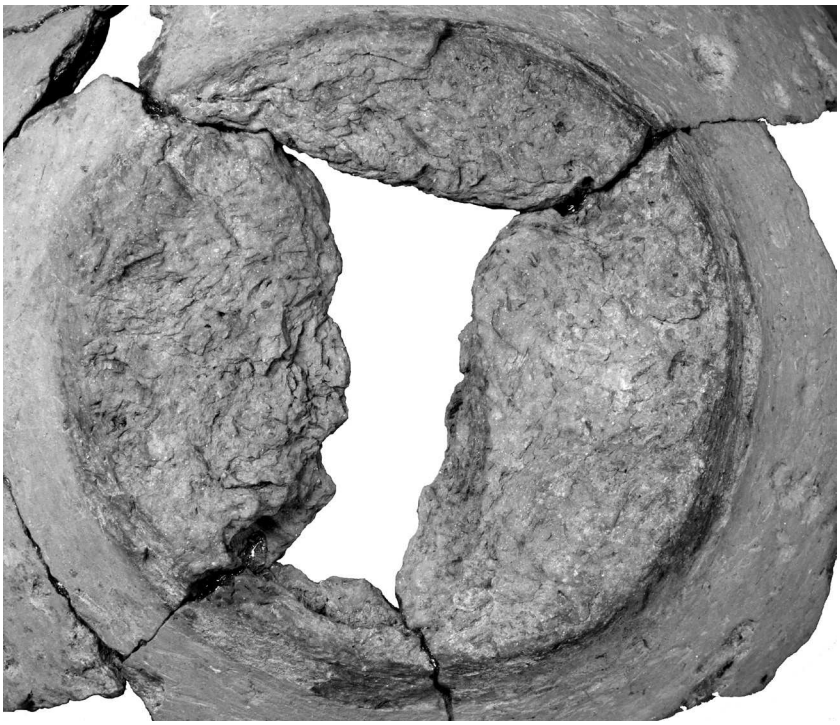

Fig. 4 External side of vessel bottom where cracks first appeared due to the effect of non-abrasive processes
Сл. 4. Пукотине настале деловањем неабразивних процеса на спољашњој страни дна зделе

vessels, both those found *in situ* and those assembled later, actually belong to the vessels with damages occurred as a result of non-abrasive processes may appear surprising. It seems not to be accidental, though. The process of fermentation results in increased acidity, which has an aggressive effect on the porous walls and causes the surface to start peeling. If the vessel is used for a long period the internal surfaces will be continuously exposed to adverse effects of the process until they become so worn that the vessel is not suitable for further use. A few samples of bottom of these vessels (fig. 4) provide the best example. The bottoms are so thinned that at first cracks may have appeared at that very spot, eventually causing it to break. The situation at the lower parts of the body, where the preserved wall thickness often does not reach 1 mm, is similar. Even in case that the

vessels had not broken in use, with this extent of damage they would not have been suitable for any other secondary use. Consequently, having become unusable they are likely to have been discarded as waste.

Discussion

The discussions on the Neolithic diet are usually based on archaeo-zoological analyses and analyses of macro plant remains. However, the functional analysis of pottery can add to understanding and knowledge gained through interdisciplinary research, not only in identification of the kind of food, but also in reconstruction of the ways it was prepared. The attrition resulting from non-abrasive processes hold an important set of data in this context. In the light of the fact that it probably appeared due to the effects of chemical reaction in the fermentation process, the question arises as to what food (drink?) could have been prepared in that way in the Early Neolithic.

Since the fifties of the last century the possibility that the activity of growing cereals, wheat and barley, was related to beer production has been explored in the studies of early farming communities (e.g. Braidwood et al. 1953). Some reject such possibility, relating beer production to stratified societies and emergence of social elite. The results of ethno-archaeological research have shown that beer was considered luxury in some traditional communities and it was consumed on special occasions only, and even then exclusively by the elite (Arthur 2002; 2003). On the other hand, new hypotheses suggest that beer was produced as early as in the initial stages of cultivation. These hypotheses are supported by the fact that wild yeast is present in the air, and that simple soaking of cereal grains in water results in generation and growth of yield cells (Katz and Voigt 1986). There is no doubt that early farmers were not able to produce flour, but only coarsely ground grains. Such a mixture could only be consumed as gruel. Coarsely ground grains may have been soaked in water and left for a few hours, or they may have been cooked. Ethnographic data shows that, for example, the Indians in the south-east of USA used to practice cooking of coarsely ground corn for several hours, which was then left to spoil – to sour or ferment (Hally 1986, 269).

Thus, the first step in preparing cereal foods was to soak grains in water; if whole grains were soaked germination would begin. Later they could have been parched, and aerated grains crushed and put again in water to get the mixture necessary for brewing beer: malt (Katz and Voigt 1986, 30–33). Surely, beer brewed in this way was low-alcohol beer (i.e.), and in case that it was brewed from grains that had not germinated the produced mixture was more like food than drink (Manglesdorf, P. C., comment on Braidwood et al. 1953, 520). Regardless of whether a porridge-like mixture or a kind of low alcohol beer was produced, in both cases a mild fermentation would occur. It would doubtless cause damages on the walls of pottery vessels in which the mixture was prepared.

Speaking about the eating habits, the possibility of preparation of milk and dairy products should not be excluded. Although dairy production, in the light of the thesis about "secondary product revolution" (Sheratt 1981), was usually associated with later periods, today it seems beyond any doubt that the population of the Early Neolithic used this food (Craig 2003, 98). With regard to this, the damages on the walls of pottery vessels could only be an indirect indicator, because identification of diary product has to be done first by lipid analysis. GC/MS methods and stable isotope analyses have been used for examination of fragments of Neolithic vessels from, for the time being, only west and north-west Europe (Copley et al. 2005; Spagenberg et al. 2006), while such analyses of Neolithic material from the Balkans are completely lacking.

Conclusion

The analysis of attrition appearing on the internal walls of pottery vessels has proved to be very useful for identification of the activities related to preparation of food (such as paste, and perhaps beer and dairy products) by fermentation process. So far, this functional class of vessels has been identified at Blagotin only, but this does not exclude the possibility of its presence at contemporary sites. Evidently, there is a need to repeat investigation of the pottery materials from other Early Neolithic sites. A comparative functional analysis of pottery from several sites is necessary if we are to understand eating habits in the Early Neolithic better. With the analysis done, we could be in a better position to shed light on some important issues concerning everyday life of the people of the Starčevo culture.

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ОШТЕЋЕЊА НА ПОВРШИНИ КЕРАМИКЕ ИЗАЗВАНА ДЕЛОВАЊЕМ НЕАБРАЗИВНИХ ПРОЦЕСА – ПРИМЕР СА БЛАГОТИНА

Резиме

Оштећења настала услед деловања неабразивних процеса, као и механичким путем (абразија), спадају у групу трагова употребе који се манифестују деформацијом површине керамике. Јављају се као последица низа хемијских процеса и обично се доводе у везу са намирницама које могу да ферментирају, као што су житарице или млечни производи. Етноархеолошким истраживањима потврђена је чињеница да се припремом и складиштењем разних врста каша, млечних производа и пива због ферментације ствара велика киселост, која изазива оштећења на унутрашњим зидовима посуда. Она се испољавају стварањем јамица и љуспањем површине. У керамичком материјалу из објекта 03 са Благотина посебно се издваја група посуда са траговима употребе насталим деловањем неабразивних процеса. Оне типолошки припадају различитим врстама; то су дубље коничне, непрофилисане лоптасте и полулоптасте зделе, док у функционалном смислу чине исту класу посуда, коју пре свега карактерише отвореност профила. У погледу археометријских параметара, одликују их готово идентичне особине: то су посуде средњих димензија, са пречником обода од 18 до 25 cm, висином између 12 и 16 cm и запремином од 3 и 5 литара. Дистрибуција трагова употребе је на свим посудама истоветна. На унутрашњим површинама јасно се разликују две зоне. На горњем делу очувана је првобитна површина са глачаним премазом. Око 2 cm испод обода почиње зона интензивних дубоких оштећења, која прекрива читаву унутрашњу површину. Премаз и спољни, глачани слој потпуно су уклоњени. Јасна граница између ове две зоне показује ниво до кога је посуда током употребе била напуњена. Оштећења су најгушћа на доњим деловима трбуха, при дну. Јачина оштећења, међутим, није на свим посудама иста. Разлике у њиховој количини и дубини могу се објаснити неједнаком учесталошћу употребе, а на неким примерцима констатовани су трагови који указују и на друге функције. За сада су посуде за ферментацију идентификоване само на Благотину, што не значи да недостају на истовременим налазиштима. Стога су потребна ревизиона истраживања керамичког материјала и са других старијенеолитских локалитета.

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