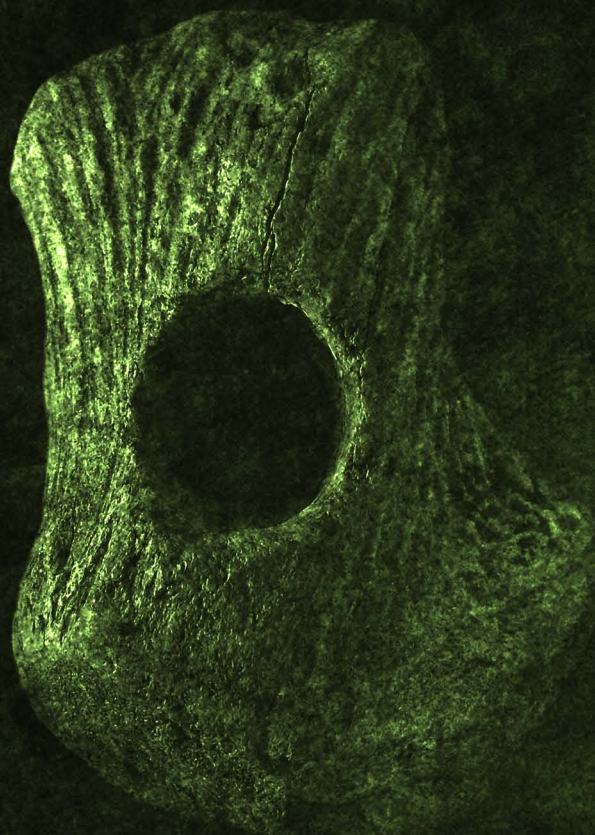


# ARCHAEOLOGY

*studying technology from prehistory  
to the Middle Ages*



**Editors**

*Selena Vitezović*

*Dragana Antonović*

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**ARHEOTEHNOLOGIJA:**  
**proučavanje tehnologije od praistorije**  
**do srednjeg veka**

**Urednici:**  
**Selena Vitezović**  
**Dragana Antonović**

**Beograd, 2014**

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## THE STUDY OF POTTERY TECHNOLOGY IN SERBIA: FIRST EXPERIENCES

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**Abstract:** *The article analyzes the current state of pottery research in Serbia. The material studied is chiefly from the Middle Ages, and from the experiences we have so far certain recommendations for future interdisciplinary study of pottery technology can be drawn. On the basis of already conducted petrographic and physical-chemical analyses we point to a combination of methods which should provide optimal results. It is stated that in Serbia there are both good potential for such study and specific equipment for archaeometric analyses of pottery. However, there is still a need to train specialists, mostly from the field of archaeology, competent to engage in all aspects of the study of pottery. The aim should also be to build interdisciplinary teams for the research of pottery technology, a subject of growing importance precisely because of the application of different analytical methods.*

**Key words:** *pottery studies, Middle Ages, technology, petrography, physical-chemical analyses, interdisciplinary research*

**Apstrakt:** *U tekstu se analizira trenutno stanje keramičkih studija u Srbiji, prevashodno u vezi s materijalom iz razdoblja srednjeg veka, iz čega proističu preporuke za interdisciplinarna izučavanja tehnologije keramike. Na primeru do sada urađenih petrografskih i fizičko-hemijskih analiza, ukazano je na metode koje, kombinovane, daju najoptimalnije rezultate u ispitivanju keramike. Konstatuje se da u Srbiji postoji ozbiljan istraživački potencijal, kao i odgovarajuća oprema za arheometrijske analize keramike, ali da bi trebalo ozbiljnije raditi na stvaranju stručnog kadra, pre svega arheologa koji bi se usmerili na izučavanje keramike u svim njenim aspektima. Takođe, trebalo bi težiti ka stvaranju interdisciplinarnih timova profilisanih za izučavanje tehnologije keramike, jer je to tema čija aktuelnost vremenom raste, upravo zbog primene različitih analitičkih metoda u istraživanjima.*

**Ključne reči:** *studije keramike, srednji vek, tehnologija, petrografija, fizičko-hemijske analize, interdisciplinarna istraživanja*





Regardless of the epoch of one's concern, pottery constitutes an exceptionally important class of archaeological finds. Its importance derives from a millennia-long tradition of craftsmanship, which represents an overwhelming research potential. As the most numerous class of findings, it usually provides solid foundations for establishing archaeological contexts, for understanding their nature, and for presenting statistical ratios. In Prehistoric archaeology, pottery represents a critical cultural and chronological marker, while in historical periods, among other issues, it speaks of economy, especially of production and trade.

In the course of time pottery studies have undergone serious changes, from simple evidence and description of specific classes (such as Neolithic painted ware, Roman *terra sigillata* or Chinese porcelain) to comprehensive analyses of all ceramic finds from archaeological layers and units. A similar process can be observed also in Serbian archaeology, in which a breakthrough was made in the 1970s with the introduction of a genuine school of pottery processing, led by Ana Premk and, especially, Ljiljana Bjelajac.

The achieved best practice is incorporated into numerous publications dealing with ceramics and pottery contexts from Antiquity and the Middle and Modern Ages (e.g. Bjelajac 1990; 1996; Nikolić-Đorđević 2000; Bikić 1994; 2003). At present, pottery is mostly analyzed in a traditional way, based on observation of the ware morphology and decoration. The archaeological (visual) analyses can also provide certain information on technology, i.e. on the clay composition, finishing techniques, and temperature of firing. These results are, however, not only incomplete but also not precise enough, both in the qualitative and quantitative sense; therefore archaeology has turned to analytical methods of the natural sciences.

Scientific analyses of pottery composition have been performed for decades now, dealing with both technology (the sequence of actions starting with the preparation of the clay and finishing with the heating of a vessel) and the organization of pottery production in particular communities and settlements. The promoters of the application of such analyses of archaeological ceramics were A. Shepard (Shepard 1956; 1964) and D. P. S. Peacock (Peacock 1967; 1968; 1969; 1970), and, later on, a number of researchers specialized for different issues in pottery technology (e.g. Rye 1977; 1981; Rice 1987; Freestone 1995; Tite 1999; Tite et al. 1998; 2001; 2008; Kilikoglou et al. 1998; Livingstone Smith 2001; Colomban 2005; Schwedt, Mommsen 2007; Sterba et al. 2009).

The impression that in past years particularly important results were achieved in the fields of the early stages of pottery production and

the organisation of pottery craft in traditional communities is corroborated by a list of articles published in relevant scientific journals (not presented here for obvious reasons). On the other hand, one can observe an increasing interest in the research of pottery from the Roman domination period, but also in that of pottery technology in Mediaeval and Modern times. At present, petrographic, physical and chemical analyses are planned as an integral part of pottery studies, complementing the detailed archaeological ones.

Regretfully, one must note that the situation in Serbia is not even close to the one described. It would not be wrong to state that pottery study here is, as a whole, a largely neglected segment of archaeology. The unavoidable presence of ceramics in archaeological publications, due to its importance for stratigraphic, chronological and other conclusions, may give an impression of developed pottery studies. Yet there are only a few experts in such research, although some colleagues are well trained in the systematization of ceramics, being familiar with its morphology and basic technological features. This influences the attitudes towards pottery studies, their range and, consequently, the quality of the results.

As regards the ceramics from historical epochs, i.e. from the periods of Roman domination and the Middle and Modern Ages, which is the field of my expertise, we can also speak of a relatively low interest in pottery studies. Although there is a widespread explanation for the lack of such interest in the fact that there are other (more reliable) chronological and cultural markers, as a long-standing insider I think that the real reason lies in a superficial understanding of the research potentials of archaeological pottery. The somewhat reserved attitude towards it may be accepted insofar as there exist overwhelming quantities of pottery, having as a consequence a long process of systematization; compared to other classes of finds, one has to wait relatively long for the results of the archaeological analyses. However, as a result of such excuses enormous amounts of pottery have still not been processed (and by processing one should not mean just inventorying vessels or 'interesting' fragments in museums). A long-term consequence is that we are all deprived of more elaborate information, not only on the function and use of pottery, i.e. the food culture, but also on different technical and socio-cultural aspects of the production of pottery in Antiquity and the Middle and Modern Ages.

An ideal scenario for the study of pottery technology would include, first of all, a clear archaeological context of the finds, the standard typological-statistical processing of ceramics with the archaeological analysis of the pottery ensemble, and finally physical-chemical analyses. As has been

shown in practice, operating in such a sequence of actions should lead to a better definition of research goals. Both the current status of pottery from the excavations and the modest level of publications so far can be discouraging when we are faced with such a massive undertaking. On the other hand, this should not be seen as an obstacle for the study of pottery technology, which could in fact stimulate an interest in the subject, bearing in mind the possibilities that archaeometric research offers to archaeologists. One should also remember that, in addition to analyses of the composition of raw material, the interdisciplinary approach to ceramics also applies to analyses of organic residues on vessels, as pointed out in Serbian literature by J. Vuković (Vuković 2005).

The title of this article includes the phrase 'first experiences'. This does not refer to chronology – there have been some analyses preceding those to be described here – but it marks the general impression one gets after the sum of activities have been undertaken to study pottery technology. Furthermore, this was the most comprehensive set of tests performed so far in Serbia, and therefore it may be considered relevant to show our capacities for the application of archaeometry in the study of archaeological pottery technology. The time span of the analyzed samples lies in the widest framework of the Mediaeval period, from the Late Roman/Early Byzantine time to the Late Middle Ages.

Our engagement in physical-chemical analyses of pottery started in 2009, within the scope of the *Development and Use of the Modern Archaeometric – Non-destructive Methods in Analyses of the Cultural Heritage Artefacts* (TP19046) research project of the Institute of Physics in Belgrade, funded by the Ministry of Science and Technological Development of the Republic of Serbia. One of the project's goals was to prepare the ground for a comprehensive, long-term research project devoted to pottery technology, which would also result in establishing an archaeometry database in Serbia. Unfortunately, this was not achieved, and petrographic and physical-chemical examinations are still being performed, although seldom and in low quantities. On the other hand, composing a team of researchers interested in pottery technology is a very important legacy of that project. Although in the course of time there were some personal changes, the institutional backing of the project was not affected. It brings together associates of the Institute of Archaeology (the present author), the Faculty for Physical Chemistry, Belgrade (Ivanka Holclajtner Antunović, Ljiljana Damjanović, Ubavka Mioč and Danica Bajuk-Bogdanović), the Faculty for Mining and Geology, Belgrade (Dragan Milovanović, Kristina Šarić and Suzana Erić), and the National Museum of Belgrade (Milica Stojanović). Since 2011, the

work on petrographic and physical-chemical analyses has been conducted within the *Urbanisation Processes and Development of Mediaeval Society* project of the Institute of Archaeology (see Acknowledgments).

The aim of our work is to characterize pottery from different periods of the Middle and Modern Ages from the technological point of view, i. e. to determine the composition of raw material (clay and non-plastic additions), to recognize the tools used to make vessels and the manufacture techniques, and to identify mutual influences between the composition of ceramics, ware shaping and temperature of firing. Testing of mineralogical and chemical composition of the ceramics body and glaze has been performed according to standard methodology, using almost all available methods, namely optical (petrographic) analysis, scanning electron microscopy with energy dispersive spectrometry (SEM-EDS), micro-Raman spectroscopy, Fourier transform infrared spectroscopy (FTIR), powder X-ray diffraction (PXRD), X-ray Fluorescence (XRF) and inductively coupled plasma mass spectrometry (ICP-MS). As can be seen, the list of methods applied is quite long. All of them can be performed in Serbia, on equipment housed in the Faculty for Physical Chemistry, the Faculty for Mining and Geology, and the Institute of Nuclear Sciences 'Vinča'.

A total of four sets of archaeometric analyses have been executed so far. The two earlier ones aimed at characterization of Middle Byzantine glazed (sgraffito) pottery from the Fortress of Ras and Braničevo (Damjanović et al. 2011; Holclajtner-Antunović et al. 2012), while more recent results, in preparation for publication, present the analyses of pottery composition and manufacture characteristics of Early Byzantine ceramics from Caričin Grad (Damjanović et al. 2014). Characterization of painted pottery from the Modern Age, i. e. from the period of Austrian domination, is in process, initiated by the need to better define the technology groups and, consequently, production regions in Central Europe, especially for Haban pottery (Janjić et al. 2013). This particular research is part of a larger study of pottery from the Modern Age, aiming to contribute to our knowledge of the Austrian domination in Belgrade and Northern Serbia (1688–1690 and 1717–1739).

The examination of the technology started with the category of pottery which raises a range of specific research questions, not only about the composition of raw material, but also about the techniques of glaze making and the production of glazed ware in general, both lasting for a very long time. The choice of the topic was also partly stimulated by the preliminary results of the research of such material from the core regions of the Byzantine Empire, which gave some indications of the production sites (Megaw,

Jones 1983; Waksman, Spieser 1998) or, more specifically, implied its production in local workshops in the Balkans – in Prilep and Skopje (Tanevska et al. 2009). For that reason, and to see if there were similarities in technological processes, together with samples of Middle Byzantine glazed pottery from the Fortress of Ras (near Novi Pazar in southwest Serbia) and Braničevo (Kostolac in the Danube region), glazed sgraffito ceramics from the beginning of the fifteenth century has been tested too, as well as the potential raw material from the immediate vicinity of the Mediaeval fortress of Ras.

The already existing characterization of this category of finds has facilitated the interpretation of the results obtained. It was shown that Middle Byzantine glazed pottery, particularly ware decorated with sgraffito, is in terms of technology comparable to contemporary finds from other Byzantine regions; thus it was not a local product. In contrast, similarities between Late Mediaeval sgraffito pottery and the geological base of the Raška region have been proved, which supports the assumption that it was produced locally (Damjanović et al. 2011; Holclajtner-Antunović et al. 2012).

On the other hand, testing ceramics from Caričin Grad has been somewhat more extensive, as the site is undoubtedly representative of the Early Byzantine period and rich in clearly defined and precisely dated ceramic contexts. The goal of our research was to characterize pottery, clay and non-plastic additions and to locate the place of its production, on the assumption that it was manufactured in the area of the city (samples from potential clay sources were collected). These examinations should also have contributed to answering the question of the level of pottery standardization in the Early Byzantine period (Damjanović et al. 2014).

Taken as a whole, the application of archaeometry has yielded very satisfactory results so far, both as regards the data obtained and the potential of methods for testing archaeological ceramics. A combination of several methods has proved to give the most comprehensive results. These are petrography and SEM-EDS for deducing the mineralogical and chemical composition, then Raman spectroscopy for glazes and FTIR for determining the temperature of firing. Raman spectroscopy and XRD then considerably improve the precision of assessment of the mineralogical and chemical composition. By using Raman spectroscopy, in addition to other results, one can determine traces of carbon which reveal the use of organic ash as a fluxing agent in the raw material.

The results of examination of the technology of pottery from Late Antiquity and the Middle Ages confirm beyond any doubt that Serbia has

substantial research potential, as well as the equipment required for archaeometric analyses of pottery. Despite such favourable preconditions, for conceiving larger projects on pottery technology perhaps we should think first of training specialists. Bearing in mind that in such studies it is archaeology which must both open the discussion and conclude it, solid training in processing archaeological pottery would be necessary, at least to the point at which a candidate could recognize the chronology and cultural/stylistic features of the finds. Work on pottery should be popularized in all its aspects – first the archaeological and then the technological ones – and at the same time it should be harmonized according to a single methodology. This could at least result in better and more comprehensive proposals for research topics and projects.

As mentioned before, the study of pottery technology requires interdisciplinary research, in which experts in other disciplines – geologists, physicists, chemists – provide different angles on the problem, bring in different methodology and, lastly, different terminology. So mutual harmonization is needed, which inevitably reflects on the rather slow working dynamics. Insufficient and irregular financing adds to the burden. This can be partly overcome by better design of archaeometry programs, in which a larger number of relevant institutions might be interested.

Such research is about to start, in co-operation of the Institute of Archaeology and the National Museum in Belgrade, and the UCL Qatar (Material Science laboratory), on characterization of pottery from the Early Ottoman Period in the Balkans and its relations with technological features of the Late Mediaeval Balkan production.<sup>1</sup>

Considering all our potentials, large as they are even on the world scale, we should aim at training experts and building interdisciplinary teams for research of pottery technology, a subject of growing importance precisely due to the application of different analytical methods. As shown in practice, with convincing examples from the more recent literature as well, the best results in the study of pottery technology are obtained exactly from programs which combine archaeological (ethnological and ethnoanthropological) research with geological-petrological and physical-chemical analyses.

*Translated by Ivan Bugarski*

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<sup>1</sup> The analytical part of the study will be presented in the Jelena Živković's PhD thesis "Early Ottoman local ceramic production in the Central Balkans" at UCL Qatar, a partner of Hamad bin Khalifa University, Doha.

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## **ISPITIVANJE TEHNOLOGIJE KERAMIKE U SRBIJI: PRVA ISKUSTVA**

Naučna analiza sastava keramike traje već niz decenija, pri čemu se uporedo izučava tehnologija (postupci koji počinju pripremom gline a završavaju se pečenjem posude) i organizacije grnčarske proizvodnje u određenim zajednicama i naseobinama. Utisak je, a to potkrepljuje lista radova objavljenih u relevantnim naučnim časopisima, da se u proteklom periodu došlo do naročito značajnih rezultata u vezi s ranom istorijom keramičke proizvodnje i organizacijom grnčarskog zanata u tradicionalnim zajednicama. Takođe, uz keramiku iz vremena rimske dominacije primetno je povećanje interesovanja za izučavanje tehnologije keramike srednjeg i novog veka. Danas se petrografske, hemijske i fizičke analize planiraju kao sastavni deo izučavanja keramike, i to kao svojevrsna nadgradnja osnovnih detaljnih arheoloških analiza.

Proučavanje keramike je vremenom prošlo kroz ozbiljan preobražaj, od evidencije i opisivanja pre svega specifičnih vrsta (poput neolitske slikane keramike, rimske tere sigilate ili kineskog porcelana), do sveobuhvatne analize kompletnog materijala koji čini sadržaj arheoloških slojeva i celina. Sličan proces se može pratiti i u našoj sredini, sa napretkom koji je ostvaren sedamdesetih godina prošlog veka, pre svega stvaranjem svojevrsne škole obrade keramike koju su predvodile Ana Premk i, naročito, Ljiljana Bjelajac. Tekovine tada uspostavljene metodologije ugrađene su u brojne publikacije koje razmatraju keramiku i keramičke kontekste iz razdoblja antike, srednjeg i novog veka. Keramici se i danas pristupa, u najvećoj meri i pre svega, na tradicionalan način, koji se zasniva na morfologiji i dekoraciji posuda. U tom smislu, arheološke (vizuelne) analize takođe mogu pružiti određene podatke u vezi s tehnologijom, pre svega sastavom gline, finalnom obradom i temperaturom pečenja. Međutim, ta saznanja su ne samo nepotpuna nego i neprecizna u kvalitativnom i kvantitativnom smislu. Stoga se arheologija okrenula analitičkim metodama koje se primenjuju u prirodnim naukama.

Za ispitivanje tehnologije keramike idealan scenario podrazumeva, pre svega, jasan arheološki kontekst nalaza, potom i obavljenu tipološko-statističku obradu materijala po važećim parametrima sa arheološkom analizom keramičke celine i, na kraju, fizičko-hemijske analize koje bi zaokružile ceo proces. Ovakav sled postupaka doprinosi boljem definisanju istraživačkih ciljeva. U tom smislu, keramičke studije su prilično zapostav-

ljen segment arheologije u Srbiji. Neizbežnost keramičkog materijala za stratigrafska, hronološka i druga tumačenja i, konsekvntno, prisutnost tih nalaza u stručnim i naučnim radovima odaju utisak razvijenih studija. Istovremeno, broj istraživača profilisanih za izučavanje keramike je prilično mali (mada među kolegama ima znalaca koji su upućeni u sistematizaciju građe, oblike posuda i osnovne tehnološke osobine), što utiče na pristup i obim izučavanja keramike i, shodno tome, kvalitet rezultata. U slučaju keramike iz istorijskih epoha (perioda rimske dominacije, srednjeg veka i novog veka), može se govoriti i o relativno slabom interesovanju za keramičke studije. Iako u struci prevladava mišljenje da nedostatak interesovanja proističe delom iz činjenice da postoje drugi (pouzdaniji) hronološki i kulturni markeri, kao dugogodišnji insajder mislim da se pre može govoriti o nedovoljno širokom sagledavanju potencijala keramike kao arheološkog nalaza. Donekle je razumljivo i to, da uzdržan stav prema keramici proističe iz njene mnogobrojnosti, što podrazumeva dugotrajan proces sistematizacije, naročito u slučajevima dugogodišnjih sistematskih istraživanja, pa se na rezultate arheološke analize čeka relativno dugo (u odnosu na druge vrste nalaza). Međutim, zbog ovakvih i sličnih izgovora ogromna količina keramike nije obrađena prema važećoj tipološko-statističkoj metodologiji. Dugoročna posledica je da smo svi uskraćeni za produbljenija saznanja ne samo o funkciji i upotrebi keramičkog posuđa, odnosno kulturi ishrane, već i o različitim (tehnološkim i socio-kulturnim) aspektima izrade keramičkog posuđa u razdobljima antike, srednjeg i novog veka.

Trenutni status keramičkog materijala sa iskopavanja, kao i skroman nivo dosadašnjih studija, može delovati obeshrabrujuće, zbog velikog obima posla koji nam predstoji. To, međutim, ne treba da predstavlja prepreku za izučavanje tehnologije keramike, već bi pre svega moglo da pobudi veći interes za temu, imajući na umu mogućnosti koje se arheolozima otvaraju arheometrijskim ispitivanjima.

Rad na fizičko-hemijskim analizama keramike započeo je 2009. godine u okviru projekta *Razvoj i primena savremenih arheometrijskih – nedestruktivnih metoda u analizi artefakata kulturnog nasleđa*, čiji je nosilac bio Institut za fiziku (Ministarstvo za nauku i tehnološki razvoj –TP19046). Od 2011. godine rad na petrografskim i fizičko-hemijskim analizama odvija se u Arheološkom institutu, u okviru projekta *Procesi urbanizacije i razvoja srednjovekovnog društva* koji se realizuje pod okriljem Ministarstva prosvete, nauke i tehnološkog razvoja Republike Srbije (OI 177021). Važno dostignuće ovog projekta je nastanak tima istraživača zainteresovanih za tehnologiju keramike. Iako je vremenom doživeo izvesne personalne transformacije, u institucionalnom smislu je ostao isti, sa saradnicima iz Arheološkog in-

stituta (autor ovog teksta), Fakulteta za fizičku hemiju (Ivanka Holclajtner Antunović, Ljiljana Damjanović, Ubavka Mioč, Danica Bajuk-Bogdanović), Rudarsko-geološkog fakulteta (Dragan Milovanović, Kristina Šarić, Suzana Erić) i Narodnog muzeja u Beogradu (Milica Stojanović).

Do sada su urađena ukupno četiri seta arheometrijskih analiza. Dva ranija su imala za cilj karakterizaciju gledosane (sgrafito) keramike srednjevizantijskog doba iz tvrđave Ras i iz Braničeva, a aktuelni rezultati, koji su u pripremi za publikovanje, odnose se na analize sastava i proizvodnih karakteristika ranovizantijske keramike sa Caričinog grada. Karakterizacija slikane keramike novog (austrijskog) doba, takođe u procesu rada, inicirana je potrebom da se bolje definišu tehnološke skupine i, s tim u vezi, proizvodni regioni na području srednje Evrope, naročito za habansku keramiku (Janjić et al. 2013). To je deo šire studije o keramici novog doba, a u kontekstu izučavanja perioda austrijske uprave u Beogradu i severnoj Srbiji (1688–1690. i 1717–1739).

U celini posmatrano, dosadašnja primena arheometrije dala je veoma zadovoljavajuće rezultate, jednako u pogledu dobijenih podataka i potencijala samih metoda za ispitivanje arheološke keramike. U tom smislu, izdvojilo se nekoliko metoda koje su, kombinovane, pružile pouzdane vrednosti i time najkompletnije rezultate. Pre svega to su petrografija i SEM-EDS za mineraloški i hemijski sastav, zatim ramanska spektroskopija za glazure i FTIR za utvrđivanje temperature pečenja. Preciznosti rezultata u pogledu mineraloškog i hemijskog sastava značajno doprinose i XRD i Ramanska spektroskopija kojom je, pored ostalog, moguće utvrditi npr. prisustvo karbona koji pokazuje korišćenje pepela organskog porekla kao topitelja u sirovini.

Dosadašnji rezultati na ispitivanju tehnologije kasnoantičke i srednjovekovne keramike nesumnjivo potvrđuju da u Srbiji postoji ozbiljan istraživački potencijal, kao i odgovarajuća oprema za arheometrijske analize keramike. Iako to svakako jesu važni preduslovi, za temeljne programe istraživanja tehnologije keramike potrebno je, možda pre svega, raditi na stvaranju stručnog kadra. Imajući na umu da je reč o temi o kojoj arheologija treba da kaže prvu i poslednju reč, podrazumeva se ozbiljnije osnovno arheološko obrazovanje o keramici, svakako do stepena koji omogućava identifikaciju nalaza u hronološkom i kulturnom/stilskom pogledu. Opšte uzevši, rad na klasifikaciji i sistematizaciji keramike trebalo bi popularizovati u svim njenim aspektima (pre svega arheološkim, potom i tehnološkim), a istovremeno i disciplinovati u okviru jedinstvene metodologije. Ovo bi, u krajnjoj instanci, doprinelo boljem i sveobuhvatnijem definisanju istraživačkih tema i projekata.

Kao što je pomenuto ranije, izučavanje tehnologije keramike zahteva interdisciplinarna istraživanja, u koja stručnjaci iz drugih disciplina, geolozi, fizičari, hemičari, unose drugačiji pristup problemu, drugačiju metodologiju rada i, u krajnjoj liniji, drugačiju terminologiju. Stoga je potrebno međusobno usklađivanje i prilagođavanje, što se sve odražava na dinamiku rada koja je dosta spora. U svemu tome, nedovoljno i neredovno finansiranje dodatno otežava situaciju. Ovo sve se, donekle, može prevazići boljim promišljanjem arheometrijskih programa, za koje bi interes imalo više relevantnih institucija. S realizacijom upravo započinje još jedan takav program, koji će se odvijati u saradnji Arheološkog instituta, Narodnog muzeja u Beogradu i Londonskog univerziteta u Kataru (UCL Qatar Material Science laboratory), a odnosi se na karakterizaciju keramike ranog osmanskog perioda na Balkanu i njen odnos prema tehnološkim obrascima kasnosrednjovekovne balkanske proizvodnje (analitički deo istraživanja biće rađen u okviru teme doktorske disertacije Jelene Živković).

S obzirom na sav naš raspoloživi potencijal, koji je i u svetskim razmerama veliki, trebalo bi svakako težiti ka stvaranju stručnjaka i timova profilisanih za izučavanje tehnologije keramike, jer je to tema čija aktuelnost vremenom raste, upravo zbog primene različitih analitičkih metoda u istraživanjima. Takođe, dosadašnja praksa je pokazala, a primera ima u novijoj literaturi, da su za izučavanje tehnologije keramike najbolji rezultati dobijeni upravo u onim programima u kojima su kombinovana arheološka (etnološka i etnoantropološka) istraživanja sa geološko-petrološkim i fizičko-hemijskim analizama.

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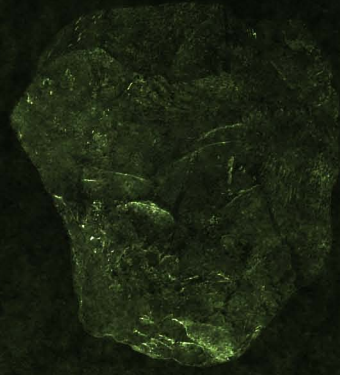
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