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Natalia Khamaiko
Arheološki institut Nacionalne akademije znanosti Ukrajine
Institute of Archeology of the National Academy of Science of Ukraine
Kyiv, Ukraine
Leibniz Institut za povijest i kulturu istočne Europe (GWZO)
The Leibniz Institue for History and Culture of Eastern Europe (GWZO)
Leipzig, Germany
khamajko@gmail.com

Olena Zhurukhina
Znanstveno-istraživački odjel Muzeja povijesti Desjatinske crkve
Scientific research department of the Museum of Desiatynna church history
Kyiv, Ukraine
Leibniz Institut za povijest i kulturu istočne Europe (GWZO)
The Leibniz Institue for History and Culture of Eastern Europe (GWZO)
Leipzig, Germany
lenzhurukh@gmail.com

Viktor Nesterovskyi
Kijevsko nacionalno sveučilište Taras Ševčenko
Taras Shevchenko National University of Kyiv
v.nesterovski@ukr.net

Nakit od ametista i fluorita u srednjovjekovnom Kijevu – problem identifikacije

U ovom radu proučavaju se arheološki nalazi ametista i fluorita pronađeni u srednjovjekovnim kompleksima Kijeva. Iako su arheološki predmeti izrađeni od ovih minerala poznati diljem Europe, dugo su postojale poteškoće u preciznoj identifikaciji proizvoda od fluorita. Taj problem djelomično proizlazi iz dobro poznate upotrebe ametista u izradi bizantskog nakita, pri čemu je ljubičasta boja, karakteristična za ametist, često korištena kao kriterij za identifikaciju. S druge strane, fluorit se odlikuje prilično širokim rasponom boja, koji uključuje žutu, plavu, zelenu, ružičastu, ljubičastu pa čak i nijanse sive. Unatoč tome, u 10. i 12. stoljeću za izradu perli najčešće su korišteni ljubičasti i ljubičasto-zeleni fluorit. To je dovelo do zabune, pa je kod većine nakita, koju su arheolozi samo vizualno identificirali, kao materijal izrade bio zabilježen ametist. Tek nakon što su provedene ponovne stručne analize ovih predmeta, utvrđeno je da je korišteni materijal zapravo fluorit. Ova precizna identifikacija podudara se s nalazima sličnih perli pronađenih u Moravskoj, Poljskoj, Mađarskoj i Bugarskoj, što ukazuje na to da su perle od fluorita bile širo*ko popularne u Europi u razdoblju od 10. do 12. stoljeća. Još jedna značajna karakteristika je da su umetci od ametista nađeni u Kijevu bili elementi skupocjenog zlatnog nakita dok se fluorit koristio za izradu pristupačnijih ogrlica*.

Ključne riječi: *nakit, ametist, fluorit, Kijev, Rana Rusija.*

Amethyst and Fluorite Jewellery of Medieval Kyiv – Problem of Identification

The article studies the archaeological finds of amethyst and fluorite discovered in medieval complexes in Kyiv. Despite the fact that archaeological objects made of these minerals are widely known throughout Europe, there have long been difficulties in the precise identification of fluorite products. This was partly due to knowledge of the use of amethyst in Byzantine jewellery. The purple colour inherent in this mineral became a reference marker for such determinations. While fluorite has a fairly wide range of colours, including yellow, blue, green, pink, purple and even shades of grey. However, in the 10th and 12th centuries, it was

mainly purple or purple-green fluorite that was used to make beads. This caused some confusion and most of the jewellery identified by archaeologists by eye was recorded as amethyst. Professional re-examination of these objects allowed the material to be accurately defined as fluorite. These definitions coincide with those of similar beads in Moravia, Poland, Hungary and Bulgaria, reflecting the general trend of fluorite beads in Europe in the 10th-12th centuries. Another feature is that amethyst inlays are found in Kyiv as an element of expensive gold jewellery, while fluorite is used for more democratic necklaces.

Keywords: *jewellery, amethyst, fluorite, Kyiv, Early Rus'.*

Uvod

Nakit izrađen od ametista i fluorita iz razdoblja Kijevske Rusi još uvijek predstavlja nedovoljno istraženo područje, ponajprije zbog rijetkosti takvih nalaza u arheološkim istraživanjima. No, svakako se radi o estetski vrlo atraktivnim predmetima, od kojih su neki pronađeni kao dio nakita u sklopu otkrivenog blaga.

Nažalost, metodologija za pouzdano razlikovanje ametista i fluorita rijetko se obrađivala u arheološkim publikacijama i izvještajima s arheoloških iskopavanja, što je dovelo do neprovjerenih informacija o tim materijalima. Zapisi sastavljeni tijekom ili neposredno nakon iskopavanja često su temeljeni na utvrđivanju materijala golim okom, pri čemu je boja predstavljala glavnu dijagnostičku karakteristiku.

Ljubičasta boja u raznim stupnjevima zasićenosti najčešće se povezuje s ametistom, međutim, ona nije svojstvena isključivo tom mineralu. Aleksandrit, almandin, apatit, fluorit, kunzit, safir, spinel, turmalin, tanzanit samo su neki od dragih kamenja koji također imaju ljubičastu boju različitih nijansi i zasićenosti. Za točno određivanje potrebno je primijeniti posebne znanstvene metode. Prema postojećim metodologijama, klasifikacija dragog kamenja može se odrediti pomoću četiriju različitih karakteristika: tvrdoće, gustoće, loma svjetlosti i boje minerala[1]. Ipak, zbog velike varijabilnosti boja, čak i za stručnjake, vizualno utvrđivanje fluorita dugo je bilo problematično.[2]

S vremenom je ametist među arheolozima postao najpoznatiji ljubičasti mineral. U arheološkoj literaturi prilično se često spominje njegova upotreba, primjerice, u izradi nakita u Bizantu, koji je bio ključni kreator i promotor modnih i kulturnih trendova, ne samo u zemljama Bizantskog Commonwealtha već i u susjednim regijama izvan izravnog bizantskog utjecaja. Zbog toga je većina predmeta izrađenih od ljubičastog dragog kamenja, primjenom najjednostavnije metode, tj. putem analogija, pod kategorijom „materijal“ obično bila klasificirana kao „ametist“ u arheološkim istraživanjima. Takav pristup zauzvrat je pridonio širenju ideje o prisutnosti proizvoda od ametista na nalazištima rane Rusi.

1 Hager 2003.
2 Forrest 1969.

Introduction

Amethyst and fluorite jewellery from the time of the Kyivan Rus' is an under-explored subject today, mainly due to the relative rarity of this type of find in archaeological excavations. At the same time, they are quite attractive objects, some of which come from treasures and are part of jewellery.

The methodology for determining amethyst and fluorite has been little discussed in archaeological publications and excavation reports, resulting in unverified information about these materials. Inventories made during or immediately after excavations contain definitions, mostly made by eye, based on the main diagnostic feature, which in this case was colour.

The purple colour, with varying degrees of saturation, is a reference colour for amethyst. However, the purple colour is not confined to this mineral. Alexandrite, almandine, apatite, fluorite, kunzite, sapphire, spinel, tourmaline, tanzanite is not a complete list of gemstones that also have a purple colour of varying hues and saturation. For an accurate determination, it is necessary to use special scientific methods. According to existing methodologies the classification of gemstones can be determined by four distinct characteristics: hardness, density, light refraction and colour of the mineral that constitutes the stone.[1] However, due to its considerable colour variability, the visual identification of fluorite has long been problematic, even for experts.[2]

Meanwhile, amethyst has become the most famous purple mineral for archaeologists. Information about the use of amethyst, for example, in the manufacture of jewellery in Byzantium (the founder and disseminator of fashion and cultural trends not only in the countries of the Byzantine Commonwealth, but also in neighbouring countries not directly influenced by Byzantium) is quite common in archaeological literature. Therefore, according to the simplest method available - the search for analogies - most objects made of purple gemstones usually received the definition of "amethyst" in the "material" column. And this, in turn, contributed to the spread of the idea of the presence of amethyst products on Early Rus' sites.

1 Hager 2003.
2 Forrest 1969.

Arheolozi su, bez relevantnih geoloških vještina, opisivali pronađeni nakit s perlama od ljubičastog kamenja, a pri određivanju materijala izrade preferirali su naziv ametist (ponekad su takve perle čak smatrali staklom). Ovakve netočne procjene rezultirale su pogrešnim podatcima o nalazima ametista u naseljima i na grobljima srednjovjekovnih arheoloških nalazišta u Europi, koji su bili objavljeni u arheološkim publikacijama čiji autori nisu konzultirali geološke stručnjake. Jedno od mogućih objašnjenja za ovaj fenomen jest relativna rijetkost fluorita kao materijala za izradu nakita u usporedbi s ametistom, koji je i danas najpoznatiji ljubičasti dragi kamen.

Problem arheološkog određivanja minerala

Kasnija neovisna istraživanja čeških, mađarskih, poljskih i bugarskih geologa i mineraloga pokazala su da su ranije identifikacije minerala u srednjovjekovnom nakitu kao ametista često bile netočne. Tek suradnjom stručnjaka iz geologije i primjenom specijaliziranih znanstvenih metoda postalo je moguće dobiti pouzdane rezultate ili, kada je bilo potrebno, ispraviti prethodne pogreške.

U svom proučavanju dragog kamenja češki geolog Ivan Mrazek ne samo da je prikupljao podatke o arheološkim nalazima sa srednjovjekovnih lokaliteta u Moravskoj i Šleskoj nego ih je i uspoređivao sa sličnim nalazima u Poljskoj i Slovačkoj. Iako se u arheološkim publikacijama materijal srednjovjekovnih ljubičastih perli često navodi kao ametist, testiranja su pokazala da su takve identifikacije bile netočne. Kao stručni geolog s odgovarajućim znanjem i vještinama, Mrazek je utvrdio da su se perle od fluorita na području Moravske i Šleske počele pojavljivati tek nakon posljednje trećine 10. stoljeća.[3]

Sličan problem identificirala je i Ágnes Ritoók tijekom prikupljanja podataka o sličnom nakitu u Mađarskoj. Utvrdila je da su i tamošnje identifikacije često bile netočne u slučajevima kada se materijal perli određivao bez suradnje s geološkim stručnjacima. Mađarski arheolozi, poput svojih kolega, oslanjali su se isključivo na vizualne karakteristike pri utvrđivanju ametista. Prisutnost fluorita u većini slučajeva potvrđena je tek kada su gemolozi, primjenom odgovarajućih znanstvenih metoda, pouzdano identificirali materijal predmeta.[4]

Archaeologists, without relevant geological skills, described archaeological jewellery with beads made of purple stones, also preferring to use amethyst in their definitions (sometimes such beads were even identified as glass). As a result, archaeological publications, whose authors did not use the help of geological experts, contained information about the presence of amethyst finds in settlements and burial grounds of medieval archaeological sites in Europe. One possible explanation for this phenomenon is the relative scarcity of fluorite as a material used in the production of jewellery, in comparison to amethyst, which is the most renowned modern purple gemstone.

The problem of determining the mineral by archaeologists

Subsequent independent studies by Czech, Hungarian, Polish, and Bulgarian geologists and mineralogists have shown that the initial mineral identification of medieval jewellery as amethyst were often wrong. It was only through the involvement of relevant experts and special scientific analyses that they could be made reliable or, where necessary, corrected.

In his study of precious stones, the Czech geologist Ivan Mrazek not only collected information on archaeological finds from medieval archaeological sites in Moravia and Silesia, but also compared them with similar finds in Poland and Slovakia. In archaeological publications, the material of medieval purple beads is usually identified as amethyst. However, the test showed that such definitions were wrong. I. Mrazek, as a professional geologist with the necessary knowledge and skills, stated instead that fluorite beads spread in Moravia and Silesia after the last third of the 10th century.[3]

Ágnes Ritoók collected information about similar jewellery in Hungary and found that in cases where the material of the beads was determined without the involvement of geological experts, they were also wrong. Like other colleagues, the Hungarian archaeologists relied solely on visual characteristics to identify amethyst. Only gemmologists, using appropriate methods, determined the material in a provable way, in most cases stating the presence of fluorite.[4]

3 Mrázek 2000, str. 90.
4 Ritoók 2020, str. 158–159.

3 Mrázek 2000, p. 90
4 Ritoók 2020, pp. 158-159.

Ostava iz 10. stoljeća, otkrivena u blizini Preslava (Bugarska), sadržavala je bizantski nakit, a neki predmeti čak su pripisivani članovima kraljevske obitelji. Među raznolikim predmetima, poput tijare, medaljona, privjesaka, naušnica, prstenja, kopči i pojasnih ukrasa, pronađena je i zlatna ogrlica ukrašena emajliranim medaljonima, biserima te bezbojnim i sivoljubičastim perlama, povremeno isprepletenim svijetlim ljubičastim prugama. Početna gemološka istraživanja pokazala su da su mineralne perle u ovoj ogrlici izrađene od kvarca, točnije od gorskog kristala i ametista, te da su ametistne perle bolje obrađene od kristalnih perli (odnosno onih od silicijevog karbida). Jedna od tih perli bila je djelomično ljubičasta, a djelomično bezbojna, što je rezultat sektorske distribucije boje unutar ametistnog kvarca. Važno je napomenuti da su druge ljubičaste mineralne perle u nakitu iz iste ostave identificirane kao ljubičasti safiri i crvenkasto-ljubičasti granati.[5]

Nova istraživanja dragulja s ogrlice iz Preslava, provedena u okviru njemačko-bugarske suradnje korištenjem rendgenoluminescencije, omogućila su precizno određivanje njihove kemijske kompozicije, čime je potvrđena njihova točna identifikacija. Analize su otkrile da su prozirni kamenčići na ogrlici zapravo fluoriti.[6]

U svojoj disertaciji o eksploataciji i trgovini kamenim sirovinama u Donjoj Šleskoj u ranom srednjem vijeku, koja je 2013. godine ponovno objavljena kao monografija, Ewa Lisowska istaknula je slične trendove u poljskoj arheološkoj literaturi. Naime, arheološki stručnjaci smatrali su da je, prvenstveno zbog ljubičaste boje nakita, materijal korišten u izradi bio ametist. Međutim, stručna ispitivanja pokazala su da se radilo o fluoritu. Osim boje, Lisowska je istaknula da su početne identifikacije također zanemarivale razlike u tvrdoći između tih minerala.[7]

Još ranije je O. Kákay Szabó proučavala tehniku izrade perli pronađenih u blizini Szekesfehervára (Mađarska) te je analizirala upotrebu alata za bušenje rupa. Zaključila je da je te perle moguće izraditi samo od minerala znatno mekših od ametista. S druge strane, fluorit, koji je identificiran kao materijal za izradu sličnih perli s istovremenih lokaliteta u Mađarskoj, bio je prilično prikladan za taj način obrade.[8]

A 10th century hoard discovered near Preslav (Bulgaria) contained jewellery of Byzantine origin, some of which was even attributed to a member of the royal family. Among other items (a tiara, medallions, pendants, earrings, rings, a buckle, and belt ornaments), the hoard included a gold necklace decorated with enamel medallions, pearls and beads of colourless and greyish lilac, sometimes with brighter streaks of violet. Initial gemmological research has shown that the mineral beads in this necklace are of quartz, namely rock crystal and amethyst, and that the latter are better worked than the crystal (sic!) beads. One of these beads was partly purple and partly colourless, which was explained by the sectoral distribution of colour in amethyst quartz. It is noteworthy that other purple mineral beads in the jewellery of the same hoard have been identified as purple sapphires and reddish-purple garnets.[5]

New studies of the gems in the Preslav necklace, carried out as part of a German-Bulgarian collaboration using X-ray fluorescence analysis, allowed their chemical composition to be determined and thus their identification to be verified. The transparent stones in the necklace turned out to be fluorite.[6]

Ewa Lisowska, in her dissertation on the extraction and trade of stone raw materials in Lower Silesia in the early Middle Ages, republished as a monograph in 2013, noted similar trends in Polish archaeological literature. Archaeological experts preferred to identify the material as amethyst, mainly because of the purple colour of the jewellery. However, professional testing revealed fluorite. In addition to the colour, Ewa Lisowska has pointed out that the initial determinations were made without considering the difference in hardness between the two minerals.[7]

Even earlier, O. Kákay Szabó studied the technique of bead making found near Szekesfehervár (Hungary) and analysed the use of tools for drilling holes. She concluded that this was only possible for minerals much softer than amethyst. In contrast, fluorite, which has been identified as the manufacturing material for similar beads from synchronous sites in Hungary, is quite suitable for their use.[8]

The distribution map of fluorite jewellery compiled by A. Ritoók for Central and Eastern Europe

5 Strack, Kostov 2010, str. 110, 119.
6 Strack, Kostov 2018.
7 Lisowska 2013, str. 147.
8 Kákay Szabó 1974, str. 339–342.

5 Strack, Kostov 2018, pp. 110, 119.
6 Strack, Kostov, 2018.
7 Lisowska 2013, 147.
8 Kákay Szabó 1974, pp. 339-342.

Karta prostorne distribucije nakita od fluorita, koju je A. Ritoók izradila za srednju i istočnu Europu, s ukupno 108 označenih točaka pokazuje značajnu rasprostranjenost u toj regiji, s najvećom koncentracijom nalaza u jugozapadnim Karpatima.[9]

Mineraloške karakteristike ametista i fluorita

Stručno ispitivanje artefakata ključno je za identifikaciju minerala. Pouzdani parametri za brzu dijagnostiku uključuju relativnu Mohsovu ljestvicu tvrdoće, gustoću, adheziju i fluorescenciju. Ti ključni parametri značajno se razlikuju za ametist i fluorit. Na primjer, ametist ima Mohsovu tvrdoću 7, a fluorit 4 (zbog čega ametist može ogrepsti obično staklo, a fluorit ne može). Ametist (kvarc) je otprilike 1,2 puta lakši od fluorita (gustoća kvarca je 2,65, a fluorita 3,18). Ametist nema kubičnu strukturu, dok fluorit ima savršenu oktaedarsku strukturu. Fluorit je krhak i karakteriziraju ga fluorescencija i fosforescencija, a ametist te karakteristike nema.

Raspon boja tih dvaju minerala znatno se razlikuje. Ametist obuhvaća crvenkasto-ljubičaste tonove, koji se kreću od vrlo svijetlih ili gotovo bezbojnih nijansi do intenzivnih i duboko ljubičastih. Fluorit, s druge strane, ima mnogo širi spektar boja, ovisno o nečistoćama, zračenju i veličini središta boja, te može biti crvene, narančaste, žute, zelene, tirkizne, plave, ljubičaste ili sivkaste boje. Raspodjela tih boja često je zonalna ili nejednaka.[10] Zbog toga vizualne karakteristike nisu pouzdana osnova za identificiranje minerala u većini slučajeva.

Njemački znanstvenik Georg Bauera (latinizirano ime Georgius Agricola) prvi je upotrijebio pojam „fluorit“ u 16. stoljeću. U antičkim pisanim izvorima ovaj se mineral naziva „murrina“ ili „myrrhina“. Poznato je da je Plinije Stariji znao za fluorit, ponajprije zbog njegovih masivnih oblika koji su se koristili za rezbarenje pribora i posuđa. Također, on navodi da je ta sirovina potjecala iz Partije (današnji Iran) i da su najizuzetniji primjerci bili podrijetlom iz pokrajine Kerman .[11] Sve do sredine 16. stoljeća fluorit je često bio pogrešno identificiran brojnim drugim mineralima, prvenstveno zbog njegove kromatske raznolikosti. Glavne varijante boja fluorita,

[9] Ritoók 2020, sl. 2–3, Dodatak.

[10] Biletskyi, Omelchenko, Horvanko 2016, str. 9, 420–421; Korbal, Novak 1999, str. 66, 73–74, 88–91; ametist; fluorit.

[11] Thoresen 2017, str. 181.

has a total of 108 points, which shows a rather high distribution in the region, with the highest concentration in the South-Western Carpathians.[9]

Mineralogical Characteristics of Amethyst and Fluorite

A professional examination of the artefacts helps to identify the mineral. Reliable parameters for quick diagnostics are: relative Mohs hardness, density, adhesion, fluorescence. These are crucial and fundamentally different for these two minerals. For example, amethyst has a Mohs hardness of 7, while fluorite has a hardness of 4 (that's why the former scratches ordinary glass, while the latter does not). Amethyst (quartz) is approximately 1.2 times lighter than fluorite (the density of quartz is 2.65, and that of fluorite is 3.18). Amethyst does not have a cubic structure, while fluorite has a perfect octahedral structure. Fluorite is fragile and characterised by fluorescence and phosphorescence, while amethyst is not.

The colour range of both minerals is much more variable. In amethyst it includes reddish-purple hues from pale or almost colourless shades to deep, saturated pure purple. Fluorite has a much wider range of colours, depending on impurities, irradiation, and the size of the colour centres. The colour can be red, orange, yellow, green, turquoise, blue, purple, or greyish. The colour distribution is often zonal or patchy.[10] Therefore, visual characteristics cannot be a reliable basis for mineral identification in most cases.

The term "fluorite" was first used in the 16th century by the German scientist Georg Bauer (Latinised name Georgius Agricola). In ancient written sources, this mineral is referred to as "murrina" or "myrrhina". Pliny the Elder is known to have been aware of fluorite for its massive shapes, which were used to carve utensils and crockery. He reports that the raw material originated from Parthia (modern Iran), and the most exceptional specimens were sourced from the province of Kerman.[11] Until the mid-16th century, fluorite was frequently misidentified with numerous minerals. The primary reason for this was its chromatic diversity. The principal

[9] Ritoók 2020, Figs. 2, 3, Appendix.

[10] Biletskyi, Omelchenko, Horvanko 2016, pp. 9, 420-421; Korbal and Novak 1999, pp. 66, 73, 74, 88-91; amethyst; fluorite.

[11] Thoresen 2017, p. 181.

koje su kasnije dobile vlastita imena, uključuju antozonit (ljubičasta do crna), klorofan (zelena), smaragdno zelena, ratovkit (lila, ružičasta) i itrofluorit (žuta, žuto-narančasta). Fluorit je često zonalan i polikromatski, čak i unutar istog uzorka. Prethodno navedena svojstva fluorita čine ga prikladnim za izradu krivotvorenog dragog kamenja, kao što su ametist, oniks, smaragd, krizopras i safir.

Povijesna pozadina slučaja

Zbunjenost oko definicije dragog kamenja seže još u antička vremena. Tijekom starog i srednjovjekovnog razdoblja glavni kriterij za određivanje vrste dragulja bio je njihov vanjski izgled, osobito boja, dok se tvrdoća rijetko uzimala u obzir.[12]

Ametist je opisan u djelima Teofrasta, Plinija Starijeg i Mihaela Psela, u kojima autori spominju njegove različite vrste, nalazišta te navodna magična i ljekovita svojstva.

Teofrast opisuje ametist kao prozirni kamen boje vina koji se koristi za izradu pečata. Prema njemu, ametisti se pronalaze u pukotinama drugih stijena, zajedno s gorskim kristalom.[13] E. Caley i J. Richards, koji su preveli i komentirali Teofrastov tekst, smatrali su ove informacije vjerodostojnima. Naime, i gorski kristal i ametist su varijante kvarca te se uistinu mogu nalaziti zajedno u žilama ili šupljinama masivnih stijena. Također su primijetili raznolikost boja ametista u Plinijevim opisima. Opisane boje sezale su od tamno crvene boje vina do gotovo prozirne, što ih je dovelo do zaključka da se naziv ametist možda koristio i za, primjerice, ružičasti kvarc kao i drugo kamenje ljubičaste boje, poput ljubičastog safira ili ljubičastog fluorita. Međutim, na temelju onoga što se u to vrijeme znalo o prisutnosti određenih minerala u arheološkim nalazima (i mogućih pogrešaka u takvim određivanjima), pretpostavljeno je da je ametist bio jedini ljubičasti kamen poznat u antici.[14]

U Birunijevoj raspravi ametist (jamast, جَمَسْتَ) se opisuje kao kamen koji se lako reže nožem, koji je lomljiv, topljiv u vatri poput olova i višebojan.[15] Zapravo, ova svojstva karakteristična su za fluorit. Među navedenim nalazištima „jamasta“, Biruni spominje Vashjird (područje rijeke Kafirnigana),

[12] Biruni 2011; Harrison 2015, str. 30; Drauschke 2010, str. 50; Amar, Lev 2017, str. 378.
[13] Caley, Richards 1956, str. 51–52.
[14] Caley, Richards 1956, str. 121–122.
[15] Biruni 2011, str. 226–227.

colour varieties of fluorite, which subsequently received their own names, include anthozonite (purple to black), chlorophane (green), emerald green, ratovkite (lilac, pink), and ittrofluorite (yellow, yellow-orange). Fluorite frequently exhibits zonation and polychromy, even within the same sample. The aforementioned properties of fluorite could be employed to create counterfeit gemstones, including amethyst, onyx, emerald, chrysoprase, and sapphire.

Some historical background to the case

Confusion over the definition of gemstones has existed since ancient times. In ancient and medieval times, the main characteristic of identification was appearance (mainly colour), and only in rare cases the comparative hardness of stones among themselves.[12]

Amethyst is described in the works of Theophrastus, Pliny the Elder and Michael Psellus, where the authors mention its various types, locations and alleged magical and healing properties.

Theophrastus describes amethyst as a transparent stone used to make seals. It has the colour of wine. Amethysts are found together with rock crystal in the opening of other stones.[13] E. Caley and J. Richards, who translated and commented on Theophrastus' text, considered this reference to be credible. Both rock crystal and amethyst are varieties of quartz, and indeed can be found side by side in the veins or cavities of massive rocks. They also noted differences in the colour of amethysts in Pliny's descriptions - from deep wine to almost transparent - which led them to conclude that the name amethyst could have been used for pink quartz, for example, as well as other purple-coloured stones such as purple sapphire or purple fluorite. However, based on what was known at the time about the presence of certain minerals in archaeological finds (and the possible error in such definitions), it was assumed that amethyst was the only purple stone known in antiquity.[14]

In Biruni's treatise, information about amethyst (jamast, جَمَسْتَ) is presented as being easy to cut with a knife, fragile, melting in fire like lead, and

[12] Biruni 2011; Harrison 2015, p. 30; Drauschke 2010, p. 50; Amar and Lev 2017, p. 378.
[13] Caley and Richards 1956, pp. 51-52.
[14] Caley and Richards 1956, pp. 121-122.

područje bogato nalazištima fluorita u današnjem Tadžikistanu. To sugerira da je autor traktata možda smatrao „jamast" ljubičastim fluoritom, a ne ametistom.[16] Međutim, u drugim orijentalnim lapidarijima (opisima dragog kamenja) naziv „jamast" zapravo se smatrao sinonimom za ametist. Takve reference mogu se pronaći u djelima arapskih pisaca, enciklopedista i liječnika poput Juhanne ibn Masawaiha, koji je na latinskom poznat kao Janus Damascene (Ibn Māsawayhi ili Jūhannā ibn Māsawaih), Ahmada al-Tīfāshīja i Muhammada ibn Ibrahima ibn al-'Akfānīja.[17]

Plinije Stariji također spominje lokacije nalazišta i kvalitetu ametista. On uz to navodi da je, zbog svoje superiorne kvalitete, indijski ametist zamijenio egipatski.[18]

Zbog svoje ljubičaste boje koja podsjeća na vino, ametistu se pripisivala sposobnost zaštite od opijanja. Sam naziv dolazi od starogrčkog „ἀμέθυστος". Ta riječ sastavljena je od „α", koje označava negaciju, i „μέθυστος", „μεθύσκω" (novogrčki μεθώ), što znači opiti se. Takvo značenje imena odražava vjerovanje da je vlasnik ametista bio zaštićen od pijanstva.[19] Stari Grci aktivno su prakticirali to vjerovanje, pa su nosili ametist kao amajliju i čak od njega izrađivali posude za piće u nadi da će spriječiti pijanstvo. Moguće je da je ovo vjerovanje proizašlo iz običaja razrjeđivanja crnog vina vodom, čime je vino dobivalo crvenkasto-ljubičastu boju nalik ametistu, a takav napitak omogućavao je konzumaciju veće količine bez prekomjernog opijanja ili mamurluka.

Vjerovanje u ljekovita svojstva ametista i njegovu zaštitu od opijanja nastavilo se i u bizantskom razdoblju. Opisujući ametist, Mihael Psel također navodi da on ima boju zumbula, liječi glavobolju i sprječava pijanstvo.[20] Zbog toga se nakit od ametista pronađen među arheološkim nalazima često tumači i kao apotropejska amajlija. Na primjer, tijekom istraživanja vinograda iz 7. stoljeća u blizini Yavneha (Izrael) pronađen je zlatni prsten s ametistom, pa arheolozi pretpostavljaju da je njegov vlasnik vjerovao u zaštitna svojstva ovog kamena.[21]

[16] Biruni 2011, str. 226–227; Lemmlein 2011, str. 408, 411.
[17] Amar, Lev 2017, str. 379.
[18] Harrison 2015, str. 366–367.
[19] Rudler 1911, str. 852.
[20] Harrison 2015, str. 366–367.
[21] Schuster 2021.

polychrome.[15] In fact, these properties are inherent to fluorite. Among the listed "jamastu" deposits, Biruni mentions Vashjird (Kafirnigan River area). This is the territory of modern Tajikistan, which is rich in fluorite deposits. Perhaps the author of the treatise considered Jamast to be a purple fluorite rather than an amethyst.[16] However, in other oriental lapidaries (descriptions of precious stones), the name "jamast" could be understood by the authors as amethyst. Such references can be found in the works of Arab writers, encyclopaedists, and physicians such as Juhanna ibn Masawaih and in Latin Janus Damascene (Ibn Māsawayhi or Jūhannā ibn Māsawaih), Ahmad al-Tīfāshī, Muhammad ibn Ibrahim ibn al-'Akfānī.[17]

Pliny the Elder also mentions the locations of the deposits and the quality of the amethysts. He also states that Indian amethyst replaced Egyptian amethyst due to its superior quality.[18]

Because of its purple colour, like the colour of wine, amethyst was also associated with the ability to protect against intoxication. The name comes from the ancient Greek ἀμέθυστος. This word is composed of "α", which means negation, and "μέθυστος", "μεθύσκω" (modern Greek μεθώ), which means to intoxicate. The meaning of the word expressed the belief that amethyst protected its owner from excessive drinking.[19] The ancient Greeks made active use of this belief, wearing amethyst as amulets, and even carving drinking vessels from it in the hope that it would prevent intoxication. This may have originated in the practice of diluting red wine with water to give it the reddish-purple colour of amethyst. This allowed people to drink much more without getting drunk or even suffering from a hangover.

The belief that amethyst had medicinal properties and protected against intoxication survived into the Byzantine period. Michael Psell, describing amethyst, also briefly mentions that it has the colour of hyacinth, cures headaches and prevents drunkenness.[20] Therefore, archaeological finds of amethyst jewellery are sometimes interpreted as apotropaic amulets. For example, archaeologists suggested

[15] Biruni 2011, pp. 226-227.
[16] Biruni 2011, pp. 226-227; Lemmlein 2011, pp. 408, 411.
[17] Amar, Lev 2017, p. 379.
[18] Harrison 2015, p. 366-367.
[19] Rudler 1911, p. 852.
[20] Harrison 2015, str. 366-367.

Vjerovanje u magijska svojstva dragog kamenja bilo je uobičajeno u mnogim drevnim kulturama. Iako se prvenstveno povezuje s drevnim društvima, ono je također dobro poznato kao dio sinkretičkih vjerovanja monoteističkih religija. No, religijska komponenta percepcije dragog kamenja bila je nedvojbeno najznačajnija za europski srednji vijek. Srednjovjekovni crkveni relikvijari, oltarski križevi, kaleži i drugi dragocjeni predmeti obično su bili ukrašeni brojnim umetcima od dragog kamenja, i to ne samo zbog dekoracije.

Fascinacija Crkve dragim kamenjem proizlazi prvenstveno iz biblijskih referenci, a ne toliko iz pukog prestiža. Osim prilično realističnih opisa, poput priče o izlasku Židova iz Egipta, koji su sa sobom ponijeli drago kamenje kao posebnu vrijednost (Izl 3, 22; 12, 35–36), ili spomena da su nakon doseljenja u zemlju Izrael počeli dobivati drago kamenje od karavana koji su putovali iz Babilona ili Perzije u Egipat ili iz Sabe i Ra'ama u Tiru (Ezekiel 27, 22), postoji i nekoliko drugih spomena povezanih s religijskim vjerovanjima.

Dva ključna primjera u ovom kontekstu predstavljaju opis naprsnika velikog svećenika Izraela ukrašen s 12 dragocjenih kamenčića (Izlazak 28, 19; Izlazak 39, 12) i opis Novog Jeruzalema, čiji temelji sadrže 12 dragih kamenja (Tobit 13, 16–17 u grčkom prijevodu i detaljnije u Otkrivenju 21, 18–21). Svaki od tih kamenčića nije bio samo dragocjeni ukras, već je imao i duboko simboličko značenje. Na primjer, 12 vrsta kamenja od kojih su sačinjeni temelji Novog Jeruzalema povezano je u Bibliji s 12 apostola, a kamenčići na haljini velikog svećenika predstavljali su 12 plemena Izraela.

Od 12 dragocjenih kamenja koja su ukrašavala naprsnik velikog svećenika Aarona, jedan je povezan s ametistom. On je naveden kao treći kamen u trećem redu, koji predstavlja Isaharovo pleme (Izlazak 28, 19; Izlazak 39, 12). Također, u opisu zidova Novog Jeruzalema spominje se da je dvanaesti i posljednji kamen u temeljima ametist (Otkrivenje 21, 20). Međutim, oko toga postoje nesuglasice koje se ne mogu zanemariti.

Ne zna se sa sigurnošću koje se kamenje spominje u Bibliji. Grčki prevoditelji oslanjali su se samo na tradiciju prevođenja i podatke iz tekstova antičkih autora.[22] Na primjer, u prijevodu Septuaginte hebrejski nazivi kamenja više se nisu mogli

[22] Reader 1981, str. 434–441, 455; Harrison 2015, str. 385.

that the discovery of a gold ring with an amethyst inlay during the excavation of a 7th century vineyard near Yavneh (Israel) could be linked to the owner's belief in the stone's properties.[21]

Such magical thinking is common in ancient cultures. It is primarily associated with ancient societies but is also well known as part of the syncretic beliefs of monotheistic religions. However, the religious component of the perception of gemstones is undoubtedly the most significant for the European Middle Ages.

Medieval church reliquaries, altar crosses, chalices and other precious objects were usually decorated with numerous precious stone inlays. And not just for decoration.

The Church's fascination with precious stones is usually associated not so much with prestige as with biblical references. In addition to quite realistic descriptions, such as the story of the Jews' exodus from Egypt, when they took precious stones with them as a special value (Exodus 3:22; 12:35-36), or the mention that, after settling in the land of Israel, they began to receive precious stones from caravans travelling from Babylon or Persia to Egypt, or from Sheba and Ra'am to Tyre (Ezekiel 27:22), there are several others that are associated with religious beliefs.

Two of the most important in this case are the descriptions of the breastplate of the high priest of Israel, decorated with 12 precious inlays (Exodus 28:19; Exodus 39:12), and of the New Jerusalem, the foundation of which contains 12 precious stones (Tobit 13:16-17 in the Greek translation, and more fully in Revelation 21:18-21). Here each stone was not only of value and decoration, but also had a symbolic meaning. For example, the 12 stones of the foundation of New Jerusalem are also associated in the Bible with the 12 apostles, and the stones of the high priest's robe represented the 12 tribes of Israel.

Of the 12 precious stones that adorned the breastplate of the high priest Aaron in several rows, one is associated with amethyst. It is listed here as the third in the third row, representing the tribe of Issachar (Exodus 28:19; Exodus 39:12). And the description of the walls of New Jerusalem says that the twelfth and last stone in its foundation is amethyst (Revelation 21:20). However, there is a conflict here that cannot be ignored.

[21] Schuster 2021.

točno identificirati, kao ni u povijesnom djelu Josipa Flavija, koji je pak tvrdio da ih je osobno vidio. Naposljetku, i sami biblijski tekstovi mijenjali su se zbog brojnih prepisivanja, posljedica čega je da su imena koja se pojavljuju u izvornom hebrejskom tekstu prevedena djelomično ili čak samo asocijacijom, što njihovu identifikaciju čini vrlo teškom. Osim toga, u drevnim vremenima drago kamenje dobivalo je imena uglavnom prema svojoj boji, a njihov mineralni sastav ili kristalna struktura pritom su se zanemarivali. To je razlog zbog kojeg kamenje iste ili gotovo iste boje, iako različitog sastava ili oblika kristala, može imati isto ime. Svakako, i činjenica da su se imena kamenja mijenjala tijekom vremena dodatno komplicira ovu temu, tako je, na primjer, drevni krizolit moderni topaz, safir je moderni lapis lazuli itd.[23]

Arheološki podatci

Ametist je poludragi kamen koji je već tisućama godina popularan zbog svoje boje. U Egiptu se iskapao tijekom Srednjeg kraljevstva, kada su ametisti bili atributi visoke mode, a najčešće su se koristili u izradi nakita s perlama. Rimski rudnici i rudnici iz Srednjeg kraljevstva istraživani su u Wadi el-Hudiju blizu Aswana i Gebel el-Asru blizu Safage u području Crvenog mora. Također postoje dokazi o proizvodnji iz tih i drugih rudnika u rimsko doba.[24]

Fluorit je kao ukrasni kamen bio poznat još od preddinastijskog razdoblja Egipta. U rimsko doba uglavnom se koristio za izradu vaza, a bio je popularan i u bizantskom razdoblju.[25] Zbog svoje svijetle boje, prozirnosti i lakoće obrade koristio se za izradu nakita i amuleta te za ukrašavanje predmeta za osobnu njegu i pribora za jelo. Istovremeno, fluorit se također koristio kao tehnički materijal, tj. kao dodatak u proizvodnji stakla, keramike, glazure i emajla.[26]

U Bizantskom Carstvu drago kamenje intenzivno se koristilo u izradi svih vrsta nakita i predmeta osobne pobožnosti, a imalo je istaknuto mjesto i na carskoj odjeći te je nosilo posebno sveto značenje. Međutim, od posebne važnosti bilo je korištenje različitih dragih kamenja za različite vrste nakita.

[23] Souvay 1912.
[24] Fahkry 1952; Shaw, Jameson 1993; Klemm, Klemm, Murr 2002.
[25] Butini 2019; Williams 2004; Tressaud, Vickers 2007.
[26] Rapp 2009, str. 119; Thoresen 2017, str. 181; Zhou *et al*. 2022, str. 1138–1147.

It is not known for certain which stones are mentioned in the Bible. The Greek translators relied only on translation traditions and information from the texts of ancient authors.[22] For example, in the translation of the Septuagint, the Hebrew names of the stones could no longer be accurately identified, just as in Josephus' History, who nevertheless claimed to have seen them himself. Finally, the texts of the Bible themselves have changed through numerous rewrites. As a result, the names appearing in the original Hebrew text have been translated in part or even by association, making their identification very difficult. In addition, ancient names for gemstones were given mainly for their colour, ignoring their mineral composition or crystal structure. This is why stones of the same or almost the same colour, but of different composition or crystal shape, can have the same name. A further complication is that the names have changed over time: for example, ancient chrysolite is modern topaz, sapphire is modern lapis lazuli, and so on.[23]

Archaeological data

Amethyst is a semi-precious stone that has been popular for thousands of years because of its colour. In Egypt, they were mined during the Middle Kingdom, when amethysts were attributes of high fashion and were most used in bead sets. Middle Kingdom and Roman mines have been explored at Wadi el-Huda near Aswan and Gebel el-Asri near Safaga in the Red Sea region. There is also evidence of production from these and other mines in Roman times.[24]

Fluorite has been known as an ornamental stone since the pre-dynastic period of Egypt. In Roman times it was mainly used to make vases.[25] Fluorite was also popular in the Byzantine period. Because of its bright colour, transparency, and ease of working, it was used to make jewellery, amulets and to decorate toiletries and cutlery. At the same time, fluorite was also used as a technical material - as an additive in the production of glass, ceramics, glaze, and enamel.[26]

[22] Reader 1981, pp. 434-441, 455; Harrison 2015, p. 385.
[23] Souvay 1912.
[24] Fahkry 1952; Shaw, Jameson 1993; Klemm, Klemm, Murr 2002.
[25] Butini 2019; Williams 2004; Tressaud, Vickers 2007.
[26] Rapp 2009, p. 119; Thoresen 2017, p. 181; Zhou et al. 2022, pp. 1138-1147.

Sl. 1. Imitacija perli od dragog kamenja iz groba datiranog u razdoblje od kraja 10. do prve polovice 11. stoljeća u Kijevu

Fig. 1 Imitation of gemstone beads from the late 10th – first half of 11th century burial in Kyiv

Na primjer, od 5. stoljeća nadalje rameni jastučići s ukrasima od dragog kamenja nisu se koristili u privatnim okolnostima, ali su bili uobičajeni u crkvenoj i carskoj odjeći. Nakon razdoblja ikonoklazma ustalila se praksa izrađivanja kameja s likovima Krista, Djevice Marije i svetaca od mekših i lakše obradivih kamenčića, poput jaspisa, dok su se safir i ametist, kao dragocjeniji, koristili za izradu nakita. Ametist i jaspis slični su po tvrdoći, ali se ljubičasta boja ametista asocirala s imperijalnom moći te je predmet od ametista simbolično prožimala snagom i veličanstvom.[27]

Kako bi se spriječila imitacija i krivotvorenje dragocjenih odjevnih predmeta, uvedena su pravila koja su ograničavala upotrebu određenih dragocjenih kamenja isključivo na odjeću carske obitelji.[28] Ipak, ograničenja obično dovode do većeg interesa i potražnje, pa su takve imitacije česte među arheološkim nalazima. Jedan takav primjer predstavlja grob u Kijevu s kraja 10. i početka 11. stoljeća. U skupnom nalazu pronađene su staklene perle bizantskog i bliskoistočnog podrijetla kao i perle od karneola. Također su otkrivene dvije elipsoidne perle od tamnoplavog i ljubičastog prozirnog stakla, koje su oblikom i bojom podsjećale na safir i/ili ametist u obliku kapljice. Ti materijali bili su uobičajeni u izradi privjesaka u Bizantskom Carstvu. Skupni nalaz sadržavao je i ogrlice te naušnice (sl. 1).[29]

[27] Harrison 2015, p. 327.
[28] Drauschke 2010, str. 50.
[29] Ivakin et al. 2016, p. 221; Drauschke 2010, p. 50, 52, 54.

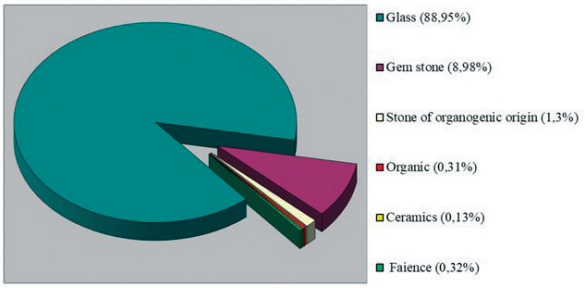
The Byzantine Empire actively used precious stones in all types of jewellery and objects of personal piety, attaching particular importance to their presence in imperial dress and filling it with sacred meaning. However, the use of different precious stones for different types of jewellery is of particular importance. For example, from the 5th century onwards, shoulder pads with precious decorations were absent in private contexts but were common in church and imperial dress. After the period of iconoclasm, it became common to make cameos with images of Christ, the Virgin Mary and saints from softer, easier to work with stones (for example, jasper), while sapphire and amethyst, being more precious, were used for jewellery. Amethyst and jasper are similar in hardness, but the purple colour of amethyst was associated with imperial power and symbolically imbued the amethyst object with power and majesty.[27]

In order to prevent the imitation and counterfeiting of precious garments, orders were passed that required the use of certain gemstones to be restricted to the clothing of the imperial family.[28] Nevertheless, restrictions always increase interest and demand, and such imitations are not uncommon among archaeological finds. An example is a Kyivan burial from the late tenth and early eleventh centuries. The assemblage included glass beads of Byzantine and Middle Eastern origin, as well as carnelian beads. In addition, two ellipsoidal beads of dark blue and purple translucent glass were discovered, which, in terms of both shape and colour, resembled sapphire and/or drop-shaped amethyst. These were common pendant materials in the Byzantine Empire. The assemblage included necklaces and earrings (Fig. 1).[29]

Glass products were more prevalent than gemstones in general. Indeed, glass objects imitating precious stones, including amethyst, were particularly common in excavations. Consequently, the ratio of beads from the Early Rus'ian period from the territory of the Middle Dnipro region by material shows a clear predominance of glass products over stone products by almost 10 times (Fig. 2).[30]

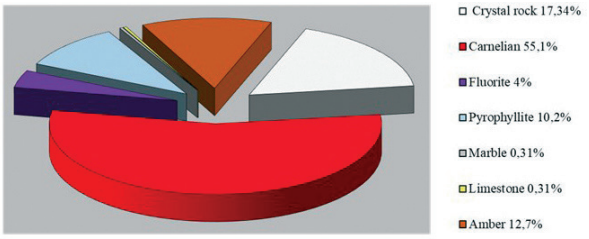
Finds that resemble objects made of stone date back to ancient times, when glassblowers attempted to convey the beauty of stone in their products

[27] Harrison 2015, p. 327.
[28] Drauschke 2010, p. 50.
[29] Ivakin et al. 2016, p. 221; Drauschke 2010, p. 50, 52, 54.
[30] Zhurukhina 2021, p. 205.



Sl. 2. Prostorna distribucija perli iz srednjeg Dnjepra prema materijalu od kojeg su izrađene

Fig. 2 Distribution of the beads of Middle Dnieper region by the material they are made of



Sl. 3. Raspodjela perli unutar skupine „kamenih perli“ (vrste tvrdog i mekog kamena)

Fig. 3 Distribution of the number of beads within the «stone beads» group (hard and soft rock types)

Proizvodi izrađeni od stakla općenito su bili zastupljeniji od onih od dragog kamenja. Doista, stakleni predmeti koji imitiraju drago kamenje, uključujući ametist, bili su posebno česti nalazi. Stoga, vezano za materijal, omjer perli iz razdoblja rane Rusi s područja srednjeg Dnjepra jasno pokazuje da su stakleni proizvodi bili gotovo deset puta češći od kamenih (sl. 2).[30]

Nalazi koji podsjećaju na predmete od kamena datiraju još u antičko razdoblje, kada su staklari nastojali prenijeti estetsku privlačnost kamena u svoje proizvode, poput posuđa, ploča, nakita i drugih predmeta. Već u 1. stoljeću pr. Kr. kombinirali su tehnike puhanja stakla s mozaikom. Jedan od primjera takvih imitacija strukture kamena postignut je tako što se baza staklenog proizvoda oblikovala puhanjem, a zatim valjala u šarene komadiće drobljenih staklenih štapića. Ova tehnika omogućila je oponašanje materijala s prugama ili mrljama, poput jaspisa, kaledonita, karneola, oniksa i agata. Tijekom postupka oblikovanja posuda je zagrijavana te se u nju puhalo, čime su se na površini proizvoda stvarali uzorci pruga i mrlja.[31]

Područje srednjeg Dnjepra, koje obuhvaća središte ranoruske države, Kijev i njegovu okolicu, kao i geopolitički povezana područja kijevske, černihivske i perejaslavske zemlje, iznjedrilo je značajan broj artefakata od dragog kamenja, od kojih je većina nakit (uglavnom od karneola i gorskog kristala). Među tim artefaktima najzastupljenije su perle, dok su privjesci i umetci rjeđi.[32] Od ukupnog broja perli izrađenih od dragog kamenja (koje uključuju silikatne minerale, druge stijene i kamenje organskog podrijetla) s arheoloških lokaliteta na području

(dishes, panels, jewellery and other items). As early as the 1st century BC, they combined the blowing technique with the mosaic technique. One such example is the imitation of the structure of a stone, which was achieved by blowing out the base of the product, which was then rolled in multi-coloured crumbs from crushed glass rods. This technique was employed for the imitation of jasper and chalcedony, which have stripes or spots in the section, as well as carnelian, onyx, and agate. Subsequently, during the moulding process, the vessel was heated and blown, resulting in the formation of spots and stripes on the vessel's surface.[31]

The territory of the Middle Dnipro region, which encompasses the centre of the Early Rus' state – Kyiv and its environs, as well as the lands connected with it in geopolitical terms (parts of Kyiv, Chernihiv and Pereyaslav lands) – has yielded a significant number of artefacts made of precious stones, the majority of which are jewellery (mainly carnelian and rock crystal). The most numerous of the artefacts were beads, while pendants and inserts were much less common.[32] Among the total number of beads made of gemstones (including the silica group, other rocks and stones of organogenic origin) for the archaeological sites of the Middle Dnipro region, fluorite beads account for slightly more than 4% (Fig. 3).

Amethyst products were recorded in Kyiv (ring inserts and links of a headdress), while fluorite items originate from the territory of Kyiv (beads) and Shestovytsia (beads). Additionally, isolated references to fluorite jewellery have been documented in publications, including in Chernihiv.[33] However, these references have not been scientifically confirmed for finds from other locations.

30 Zhurukhina 2021, str. 205.
31 Kunina 2001, str. 157, 163; Valiulina 2001.
32 Zhurukhina, Nesterovskyi 2020, str. 135.

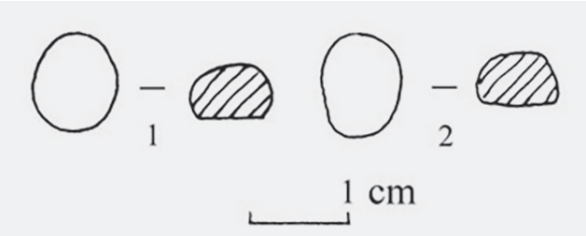
31 Kunina 2001, pp. 157, 163; Valiulina 2001.
32 Zhurukhina, Nesterovskyi 2020, p. 135.
33 Korzukhina 1954, p. 92, no. 35.

srednjeg Dnjepra, perle od ametista i fluorita čine nešto više od 4% (sl. 3).

Proizvodi od ametista pronađeni su u Kijevu (umetci za prstenje i karike korištene kao ukras za glavu), dok predmeti od fluorita (perle) potječu s područja Kijeva i Shestovytsije. U literaturi se spominju i drugi pojedinačni primjeri nakita od fluorita, uključujući onaj iz Černihiva, iako ti nalazi nisu znanstveno potvrđeni. [33]

Materijali, metode i rezultati

Predmeti od **ametista**, otkriveni tijekom arheoloških istraživanja u Kijevu, koncentrirani su na području zlatnovršnog manastira sv. Mihovila. Među njima su umetci za prstenje i dijelovi traka za glavu. U sklopu istraživanja nekropole, koja je prethodila izgradnji manastira, u jednoj ženskoj grobnici pronađena su dva plosnata, konveksna umetka od ametista (kabošoni) (sl. 4: 1–2). Dimenzije umetaka iznosile su 8 × 10 mm, a njihova visina bila je 5 mm. Grobnica (br. 12) potječe s kraja 10. i iz prve polovice 11. stoljeća.[34] Grobni kompleks bio je bogato opremljen, a većina pronađenih predmeta bila je uvezena. Ova kultura, poznata kao kultura *vigilante*, bila je dio elite rane Rusi.



Sl. 4. Umetci od ametista, inventar groba datiranog u razdoblje od kraja 10. do prve polovice 11. stoljeća u Kijevu (Ivakin *et al*. 1998, sl. 5: 22–23)

Fig. 4 Amethyst inserts. Inventory of burial the late 10th – first half of 11th century in Kyiv (Ivakin et all 1998, fig. 5: 22–23)

Daljnjim istraživanjima manastirskog dvorišta otkrivena je ostava nakita iz 12. i 13. stoljeća u jednoj jami, koja je najvjerojatnije sadržavala dva zlatna prstena s umetkom iz 12. stoljeća (sl. 5) i karike zlatne narukvice s okruglim prozirnim umetcima (promjera oko 5 mm) ljubičaste i lila boje iz 13. i 14. stoljeća. Te karike najvjerojatnije su bile

[33] Korzukhina 1954, str. 92, br. 35.

[34] Ivakin *et al*. 1998, str. 70, sl. 5, 22–23; Zhurukhina 2020, str. 8.

Materials, Methods and Results

The **amethyst** items discovered during the archaeological research conducted in Kyiv are concentrated on the territory of St. Michael's Golden-Domed Monastery. These are inserts in rings and headband. During the study of the necropolis site, which functioned here before the construction of the monastery, two oval-shaped amethyst flat-convex inserts (Fig. 4: 1-2) (cabochons) were recorded in one of the women's chambers. These were 8x10 mm and 5 mm high, respectively. The chamber burials (No. 12) date to the late tenth and first half of the eleventh centuries.[34] The funerary complex was richly furnished, with most imported items. This culture, known as the vigilante culture, was represented by a portion of the Early Rus' elite.

Further investigations of the monastery grounds revealed a treasure of 12th and 13th century jewellery in a pit, which probably included two 12th century gold rings (Fig. 5) with an inlay and links of a 13th and 14th century gold bracelet with round (approximately 5 mm in diameter) transparent inlays of purple and lilac. The links probably belong to a headband, a women's headdress common in the twelfth and thirteenth centuries. Natalia Zhylina, analysing the technological, typological and stylistic aspects of the product, tentatively dated these finds to the middle of the 12th century at the earliest.[35] According to the authors of the excavations, the analyses allowed to assume that the stones of the jewellery belonged to the quartz group, one of the most common representatives of which in Early Rus' were amethysts.[36]

The only form of **fluorite** jewellery represented among the archaeologicl findes is that which takes the form of beads, all of which were sourced from Kyiv and Shestovytsia.

Two fluorite beads (Fig. 6) have been reported from Shestovytsia (Chernihiv region). However, it should be noted that no mineralogical examination of these finds was carried out, and the material was identified by eye. The beads (dimensions: h 16.0 mm; d 4.0-12.0 mm; a hole d 2.0-3.0 mm) are multifaceted, transparent, and very light, which may be attributed to the conditions of their storage.

[34] Ivakin et al. 1998, p. 70, Fig. 5, 22-23; Zhurukhina 2020, p. 8.

[35] Zhylina 2010, pp. 217-219.

[36] Ivakin et al., 1998, pp. 172, 183-184; Bogdanova 2008, p. 114.

Sl. 5. Nakit s područja zlatnovršnog manastira sv. Mihovila (Bohdanova 2008, str. 114)
Fig. 5 Jewelry treasure from the territory of the Monastery of St. Michael of the Golden Domes (Bohdanova 2008, p. 114)

dio trake za glavu, ženskog pokrivala koje se često nosilo tijekom 12. i 13. stoljeća. Natalia Zhylina, proučavajući tehnološke, tipološke i stilističke značajke ovih predmeta, okvirno ih je datirala najranije u sredinu 12. stoljeća.[35] Arheolozi koji su proveli istraživanja temeljem analiza zaključili su da su kamenčići u nakitu pripadali kvarcnoj grupi, unutar koje su ametisti bili najzastupljeniji u ranoj Rusi.[36]

Perle su jedini oblik nakita od **fluorita** koji je pronađen među arheološkim nalazima, a sve su potjecale iz Kijeva i Shestovytsije. Dvije fluoritne perle (sl. 6) pronađene su na području Shestovytsije (regija Černihiv), no treba napomenuti da nad njima nije provedeno mineraloško ispitivanje, već je materijal utvrđen golim okom. Perle (dim.: v: 16 mm, d: 4 – 12 mm, otvor d: 2 – 3 mm) imaju više lica, prozirne su i vrlo lagane, što se može pripisati uvjetima njihova čuvanja. Kanali u perlama cilindričnog su oblika, a bušeni su s jedne strane. One potječu iz mješovitog kulturnog sloja koji obuhvaća razdoblje od 10. do 12. stoljeća.[37] Oblik ovih bikoničnih šesterokutnih perli vjerojatno je bio inspiriran prirodnim oblikom kristala ametista, koji se pojavljuje kao prizma heksagonalnog presjeka s piramidalnim završecima.

Predmeti iz Kijeva kategorizirani su kao „višestrani“ i dijele se na dvije različite vrste: „prizmatične“ i „bikonično rezane“.[38] Dva prizmatična primjerka perli, koje su imale pet do šest faseta, pronađena su u fragmentima tijekom iskopavanja slojeva iz 12. stoljeća na lokacijama Khoryva ulica

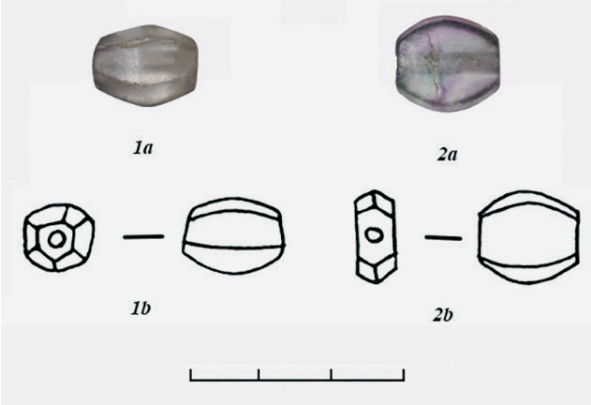
35 Zhylina 2010, str. 217–219.
36 Ivakin *et al*. 1998, str. 172, 183–184; Bogdanova 2008, str. 114.
37 Kovalenko, Motsia, Sytyi 1998, str. 33, 43.
38 Zhurukhina 2021, str. 71–72, 105.

The channel of the beads is cylindrical, drilled on one side. The beads originate from a mixed cultural layer spanning the 10th to 12th centuries.[37] The shape of these the cut-biconical hexagonal beads was probably copied from the natural shape of the crystals of the mineral amethyst, which is a prism of hexagonal section ending in pyramids.

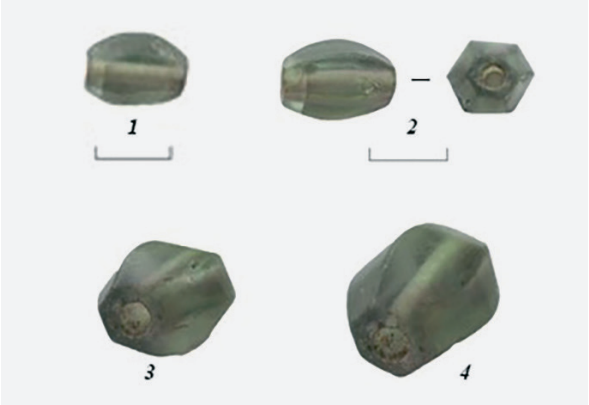
Items from Kyiv are categorised as belonging to the "multifaceted" ones and divided into two distinct types. These are classified as "prismatic" and "cut-biconical".[38] Two of prismatic beads, comprising five to six facets, have been preserved in fragments and recovered from the 12th century layer. These were retrieved from excavations conducted at 37 Khoryva Street between 2002 and 2003 and at the intersection of Nyzhniy Val and Pochainynska Streets between 2003 and 2004. The cut-biconical beads have six faces and originate from the 11th and 12th century layers. One of the specimens (Fig. 7) was unearthed in the 11th century complex at 41 Nyzhniy Val Street.[39]

The largest number of fluorite finds are beads recovered from the excavation site located at 35 Spaska Street. This deposit was initially identified during the 2007-2008 research period, and a subsequent investigation was conducted in 2011. A total of 15 specimens were recorded, with a range in size from 8 to 21 mm. The beads are of the "multifaceted" type and exhibit six faces on average. Some specimens exhibit morphological variation, displaying facets that are either cut-biconical or approximating an ellipsoidal shape with cut faces. The colour of the beads ranges from greyish-green

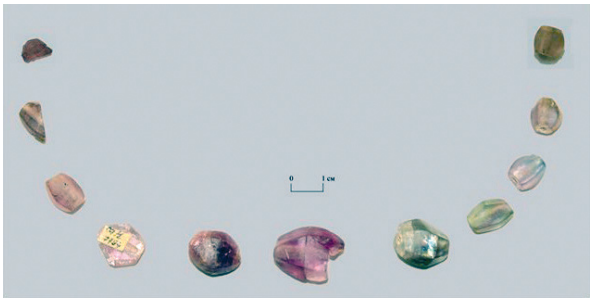
37 Kovalenko, Motsia, Sytyi 1998, pp. 33, 43.
38 Zhurukhina 2021, pp. 71-72, 105.
39 Zotsenko and Braichevska 1987, pp. 139, 142.



Sl. 6. Perle iz mješovitog sloja u Shestovytsiji
Fig. 6 Beads from the mixed layer in Shestovytsa



Sl. 7. Perla od fluorita iz kompleksa iz 11. stoljeća u Kijevu
Fig. 7 Fluorite bead from the complex of 11th century (Kyiv)



Sl. 8. Perle od fluorita iz iskopine u ulici Spaska 35 u Kijevu
Fig. 8 Fluorite beads from an excavation on Spaska 35 str. (Kyiv)

37 (2002. – 2003.) i na raskrižju ulica Nyzhniy Val i Pochainynska (2003. – 2004.). Bikonično rezane perle imaju šest lica i potječu iz slojeva 11. i 12. stoljeća. Jedan takav primjerak (sl. 7) otkriven je u kompleksu iz 11. stoljeća u ulici Nyzhniy Val 41.[39]

Najveći broj fluoritnih nalaza predstavljaju perle pronađene tijekom istraživanja u ulici Spaska 35, koja su provedena 2007. i 2008. godine, dok su dodatna istraživanja obavljena 2011. godine. Ukupno je pronađeno 15 primjeraka veličine od 8 do 21 mm. Perle pripadaju tipu „višestranih" i prosječno imaju šest lica. Pojedini primjerci pokazuju morfološke varijacije, s fasetama oblikovanim u bikonični oblik ili približno elipsoidni oblik s rezanim licima. Boja fluoritnih perli varira od sivkasto-zelene do ljubičaste, s istaknutim nijansama ljubičaste kod nekih uzoraka (sl. 8).

Velika većina perli ima ravan kanal rupe koji je bušen s jedne strane. S obzirom na to da je fluorit relativno mekan mineral, bušenje je jednostavan proces. Međutim, zbog njegove krhkosti, s njim treba pažljivo rukovati jer se može lako razbiti. Korišteni alat mogla je biti metalna igla koja je spljoštena i naoštrena. Kako bi se ubrzao proces bušenja, dodani su abrazivni materijal (kvarcni pijesak) i voda u dio gdje se bušilo. Jedan od primjeraka pokazuje precizno bušenje kanala s obiju strana, što se može vidjeti po savršeno povezanim kanalima, a to ukazuje na visoku razinu vještine izrade perli. Karakteristike pronađenih primjeraka navedene su u Tablici 1.

to violet, with some specimens displaying a violet hue (Fig. 8).

The overwhelming majority of specimens exhibit a straight hole channel that was drilled from one side. Fluorite is a relatively soft mineral, therefore drilling it is a relatively straightforward process. However, it is important to handle the stone with care, as it is fragile and can split. The tool in question could be a metal needle that has been flattened and sharpened. An abrasive material (quartz sand) and water were added to the drilling area to accelerate the process. One specimen demonstrates that the canal was drilled from both sides, but it was done well; the canals are connected to each other exactly, which may indicate the level of skill in processing. The characteristics of the specimens from the excavation are given in Table 1.

[39] Zotsenko, Braichevska 1987, str. 139, 142.

Tablica 1. *Perle od fluorita s područja srednjeg Dnjepra*

Br. 1.	Predmet	Broj faseta	Oblik	Stanje	Boja	Dimenzije (mm)				Lokalitet
						v	d maks.	d min.	d rupa	
2.	perla	*	*	fragment	svijetlo ljubičasta	*	7	*	2	ulica Spaska 35
3.	perla	6	bikonična	cijela	ljubičasta	15	13	12	2 – 3	ulica Spaska 35
4.	perla	6	bikonična	cijela	ljubičasta	10	7	5	2	ulica Spaska 35
5.	perla	6	bikonična	cijela	svijetlo ljubičasta	8	6,5	5	2	ulica Spaska 35
6.	perla	6	bikonična	cijela	svijetlo ljubičasta	12	10	7 – 8	3	ulica Spaska 35
7.	perla	6	bikonična	fragment	svijetlo ljubičasta	14,8	12	*	2	ulica Spaska 35
8.	perla	6	bikonična	fragmentirana u 3 dijela	ljubičasta	21	16	*	4	ulica Spaska 35
9.	perla	6	bikonična	cijela	ljubičasta	16	14	*	2,5 – 3	ulica Spaska 35
10.	perla	6	bikonična	cijela	ljubičasta	9	9	7	1,5 – 2	ulica Spaska 35
11.	perla	6	bikonična	cijela	ljubičasta	14	10	6	2	ulica Spaska 35
12.	perla	6	bikonična	cijela	ljubičasta	15,5	12,3	10	2,7	ulica Spaska 35
13.	perla	6	bikonična	cijela	ljubičasta	13	13	8	2	ulica Spaska 35
14.	perla	6	bikonična	cijela	sivkasto zelena i svijetlo ljubičasta	12	10	9	3	ulica Spaska 35
15.	perla	6	bikonična	cijela	ljubičasta	21	14	12	2 – 3	ulica Spaska 35
16.	perla	6	bikonična	cijela	svijetlo ljubičasta	11	9	7	2	ulica Spaska 35
17.	perla	6	bikonična	cijela	svijetlo ljubičasta	16	11	9 – 10	1,5	ulica Nyzhniy Val 41
18.	perla	5 – 6	prizmatična	fragment	*	*	*	*	*	ulica Khoryva 37
19.	perla	5 – 6	prizmatična	fragment	svijetlo ljubičasta	*	*	*	*	raskrižje ulica Nyzhniy Val i Pochainynska

* nema podataka

Table 1. *Fluorite beads from the Middle Dnipro region*

No 1.	Object	Number of Facets	Shape	Condition	Colour	Dimensions (mm)				Site
						h	d max	d min	d hole	
2.	Bead	*	*	Shard	Light purple	*	7	*	2	35 Spaska Str.
3.	Bead	6	Biconical	Whole	Purple	15	13	12	2-3	35 Spaska Str.
4.	Bead	6	Biconical	Whole	Purple	10	7	5	2	35 Spaska Str.
5.	Bead	6	Biconical	Whole	Light purple	8	6,5	5	2	35 Spaska Str.
6.	Bead	6	Biconical	Whole	Light purple	12	10	7-8	3	35 Spaska Str.
7.	Bead	6	Biconical	Shard	Light purple	14,8	12	*	2	35 Spaska Str.
8.	Bead	6	Biconical	In 3 fragments	Purple	21	16	*	4	35 Spaska Str.
9.	Bead	6	Biconical	Whole	Purple	16	14	*	2,5-3	35 Spaska Str.
10.	Bead	6	Biconical	Whole	Purple	9	9	7	1,5-2	35 Spaska Str.
11.	Bead	6	Biconical	Whole	Purple	14	10	6	2	35 Spaska Str.
12.	Bead	6	Biconical	Whole	Purple	15,5	12,3	10	2,7	35 Spaska Str.
13.	Bead	6	Biconical	Whole	Purple	13	13	8	2	35 Spaska Str.
14.	Bead	6	Biconical	Whole	Greyish green and light purple	12	10	9	3	35 Spaska Str.
15.	Bead	6	Biconical	Whole	Purple	21	14	12	2-3	35 Spaska Str.
16.	Bead	6	Biconical	Whole	Light purple	11	9	7	2	35 Spaska Str.
17.	Bead	6	Biconical	Whole	Light purple	16	11	9-10	1,5	41 Nyzhniy Val Str.
18.	Bead	5-6	Prismatic	Shard	*	*	*	*	*	37 Khoryva Str.
19.	Bead	5-6	Prismatic	Shard	Light purple	*	*	*	*	On the corner of Nyzhniy Val and Pochainynska streets

* no data

Iskopavanje u ulici Spaska 35, prilikom kojeg je prikupljen materijal za istraživanje, obavljeno je unutar gradskog bloka među ulicama Pochainynska, Naberezhno-Luhova, Khoryva i Spaska, nedaleko od korita rijeke Dnjepra. Ovo je jedno od rijetkih nalazišta u gradskoj četvrti Podol, a arheološka istraživanja provodila su se tijekom triju sezona, 2007., 2008. i 2011. godine. Zahvaljujući mogućnosti obavljanja istraživanja dulje nego što je uobičajeno, bilo je moguće potpuno primijeniti metodologiju stacionarnih arheoloških istraživanja. Radovi su se odvijali ručno, bez korištenja strojeva, što je omogućilo detaljno proučavanje slojeva i objekata te uspostavljanje kontinuirane i precizno datirane stratigrafije nalazišta od prijelaza iz 10. u 11. stoljeće do danas.[40]

Perle potječu iz stambenih horizonata 6a, 6b, 8, 9, 9a i 10, koji su se sukcesivno mijenjali tijekom vremena. Jedan predmet pronađen je u horizontima 6a i 6b, tri predmeta u horizontima 9 i 9a, a najveći broj primjeraka, čak četiri, zabilježen je u horizontu 10. Horizonti su bili odvojeni sterilnim aluvijalnim slojevima pijeska, koje su nanijele poplave rijeke Dnjepra, te su zbog toga bili lako prepoznatljivi.

Artefakti su uglavnom datirani analizom materijalne kulture, na temelju keramike i srodnih nalaza, a smještaju se u posljednju trećinu 11. i prvu polovicu 12. stoljeća. U tim horizontima također je uočen značajan porast udjela uvezene robe uključujući obojeno, pozlaćeno i emajlirano staklo.

Arheološko datiranje nalaza

Skupni nalaz sadrži posuđe poput čaša, zdjela i boca za parfeme te nakit kao što su perle, narukvice i umetci za prstenje. Također uključuje fragmente takozvanog trgovačkog stakla, koje je prepoznatljivo po svojoj prozirnosti, visokoj kvaliteti i živopisnim bojama poput tirkizne, ljubičaste i žute,[41] te glaziranu keramiku i amfore.[42] Među posudama se mogu prepoznati i one korištene za parfeme. Neki od pronađenih predmeta izrađeni su od kobaltnog stakla (poznatog po svojoj intenzivnoj plavoj boji) i ukrašeni bijelim neprozirnim staklenim trakama u obliku spirala ili ptičjeg perja. Pojedini primjerci, također izrađeni od plavog stakla, dolaze u obliku malih konveksnih čaša ili zdjelica s tankim stjenkama. Na površini ovih predmeta nalaze se prikazi

The excavation at 35 Spaska Str., from which the material for the research was taken, was in the city-block between Pochainynska, Naberezhno-Luhova, Khoryva and Spaska streets, not far from the Dnipro riverbed. This is one of the rare sites in Podil where archaeological research was carried out during the three seasons of 2007, 2008 and 2011. The longer-than-usual time allotted to the work made it possible to fully apply the methodology of stationary archaeological research. From the very beginning, the work was carried out manually, without the use of machinery, which allowed a detailed study of the layers and objects and a continuous, well-dated stratigraphy of the site from the turn of the 10th and 11th centuries to the present.[40]

The beads originate from living horizons 6a, 6b, 8, 9, 9a and 10, which successively replaced each other in time. One item was recovered from horizons 6a and 6b, three items from horizons 9 and 9a, and the greatest number of finds, four items, from horizon 10. The horizons were separated by sterile alluvial sand layers left by the floods of the Dnipro River. This allowed them to be clearly distinguished from each other.

In general, the artifacts were dated using material culture analysis based on ceramics and related finds. In total, the period ranges from the last third of the 11th to the first half of the 12th century. These horizons also demonstrated a marked increase in the share of imported goods, including colored, gilded, and enameled glass.

Archaeological dating of finds

The assemblage comprises tableware, including cups, bowls, fragrance bottles, and jewellery, such as beads, bracelets, and ring inserts. It also includes fragments of what is known as trade glass, which is characterised by its transparency, high quality, and colourful composition, including turquoise, violet, and yellow,[41] glazed ceramics, amphorae.[42] Among the vessels, one can distinguish those that were used for perfumes. Some of the finds are composed of cobalt glass (characterised by a bright blue hue) and adorned with white opaque glass bands in the shape of spirals or bird feathers. Some specimens are represented by small, thin-walled, convex cups

40 Sahaidak, Khamaiko, Komar 2015.
41 Khamaiko 2011, str. 32.
42 Sahaidak, Khamaiko, Komar 2015, str. 26, sl. na str. 27.

40 Sahaidak, Khamaiko, Komar 2015.
41 Khamaiko 2011, p. 32.
42 Sahaidak, Khamaiko, Komar 2015, p. 26, fig. on p. 27.

droplji izvedeni u zlatnoj boji unutar emajliranih medaljona, a pronađeni su i mali ulomci posuda oslikani bijelim i žutim emajlima. Jedini očuvani primjerak predstavlja potpuno sačuvana bočica. Tehnika korištena za izradu ovih posuda identična je onoj koju su antički obrtnici primjenjivali pri stvaranju staklenih predmeta koji su oponašali izgled kamena (za dodatne pojedinosti pogledajte gornji odjeljak). Osim širokih narukvica i ravnih konveksnih umetaka od plavog stakla oslikanih obojenim emajlima, ovi se nalazi mogu smatrati proizvodima provincijskih staklarskih radionica iz Bizantskog Carstva. Ova vrsta stakla poznata je još od 10. stoljeća i povezuje se s djelovanjem takvih radionica iz Bizanta, s Bliskog istoka, iz Bugarske i srednje Azije.[43]

Iz istog razdoblja, odnosno iz druge polovice 11. i početka 12. stoljeća, potječe nekoliko enkolpiona i pektoralnih križeva. Posebno je zanimljiv pozlaćeni srebrni križ s reljefnom slikom Bogorodice s Djetetom u prirodnoj veličini, za koji se pretpostavlja da je bio uvezen.[44] U horizontu 9 pronađeno je nekoliko novčića i olovni viseći pečat s natpisom „Gospode, pomozi svojoj sluškinji Mari[ni]". Pretpostavlja se da je taj artefakt pripadao velikoj kneginji, drugoj supruzi velikog kijevskog kneza Vsevoloda Yaroslavycha i maćehi Volodymyra Monomakha. Pečat se datira u posljednju četvrtinu 11. stoljeća.[45]

Perle su pronađene na nalazištu u ulici Spaska 35, točnije na Posjedu I i uz ogradu Posjeda II. Ova dva posjeda samo su djelomično istražena, a istražena površina obuhvaćala je stražnji dio dvorišta uključujući pomoćne građevine, skladišne prostore, razne kanale i ograđene prostore za stoku. Artefakti pronađeni na ovom području obično su potrošni predmeti koji su najčešće bili odbačeni.

Otkriće perli u četirima odvojenim, ali kronološki povezanim horizontima, razdvojenim aluvijalnim slojevima, otvara pitanje o vremenu njihova uvoza u Kijev. Neki su primjerci pronađeni kao fragmenti, što može ukazivati na postupno povlačenje iz upotrebe. Međutim, s obzirom na to da je većina perli neoštećena, pretpostavlja se da njihova pojava na posjedu trgovca ukazuje na dugogodišnje trgovanje s regijom proizvodnje ili distribucijskim središtem u razdoblju od posljednje trećine 11. do sredine 12. stoljeća.

[43] Valiulina 2005, str. 108; Shchapova 2010, str. 91.
[44] Khamaiko, Onoprienko 2012.
[45] Khamaiko 2015; Lesak, Khamaiko, Černenko 2020.

or bowls, also made of blue glass. The surface of these items displays a picture of a bustard in gold within enamel medallions, or small fragments of vessels painted with white and yellow enamels. The only surviving specimen is a small vial, which has been entirely preserved. The technique employed in the production of these vessels is identical to that utilised by ancient artisans in the creation of glass items that imitated the appearance of stone (for further details, please refer to the above section). In addition to wide bracelets and flat-convex blue glass inserts painted with coloured enamels, these findings can be considered products of provincial glass workshops in the Byzantine Empire. Glass of this type has been known since the 10th century and is associated with the activities of such workshops (Byzantine, Middle Eastern, Bulgarian, and Central Asian).[43]

The same period of the second half of the eleventh and early twelfth centuries saw the discovery of several crosses-encolpions and pectoral crosses. A gilded silver cross with a relief, life-size image of the Virgin and Child is of particular interest, and is thought to have been imported.[44] In Horizon 9, several coins and a lead hanging seal bearing the inscription "Lord, help your servant Mari[na]" were discovered. This artefact is attributed to the Grand Duchess, the second wife of the Grand Duke of Kyiv Vsevolod Yaroslavych, stepmother of Volodymyr Monomakh. The dating of the seal places it in the last quarter of the 11th century.[45]

The beads were discovered on the 35 Spaska Str. excavation site, specifically on the Estate I and near the Estate II fence. These two Estates were only partially investigated. The area subjected to excavation comprised the rear section of the courtyard, encompassing ancillary structures and storage facilities, utility trenches, and livestock enclosures. This zone typically yielded artefacts of a residual nature, that were usually discarded were usually found.

The discovery of beads in four distinct horizons, though chronologically consecutive, separated by alluvial deposits, prompts the question of the time of arrival of these products in Kyiv. Some of the beads are fragments, which could be interpreted as evidence of a gradual withdrawal from use. However, given that most of the beads are undamaged, it

[43] Valiulina 2005, p. 108; Shchapova 2010, p. 91.
[44] Khamaiko and Onoprienko, 2012.
[45] Khamaiko 2015; Lesak, Khamaiko, Chernenko 2020.

Na srednjovjekovnim nalazištima na području Rusi povremeno su otkrivene i perle i umetci od ametista. Ametist je, primjerice, pronalažen i u Skandinaviji među zaobljenim perlama iz perioda od druge polovice 6. do početka 17. stoljeća. Slični nalazi kasnije su pronađeni i u Kaupangu, Helgöu, Eketorpu i Birki. Pretpostavlja se da perle od ametista nisu bile samo uvezene kao gotovi proizvodi, već da su postojale lokalna trgovina i obrada dragog kamenja, čiji je razvoj bio pod utjecajem istočnjačkih draguljara.[46]

Rasprava

Perle od kvarca najzastupljenije su na arheološkim nalazištima u srednjoj Aziji, gdje postoje prirodna nalazišta ovog minerala. Nakit od ametista u obliku perli, uložaka i privjesaka poznat je iz gradova Volške Bugarske i Zlatne Horde, međutim, daleko je manje uobičajen od drugog dragog kamenja, kao što je to slučaj i u Rusiji. Mnoge perle od ametista pronađene na ranoruskim nalazištima potječu iz 12. stoljeća.[47] Dokumentirana su tri slučaja ametistnih perli iz Mokhova (razoreni humak 18, gdje je u grobnom inventaru zabilježeno nekoliko staklenih perli uključujući zlatno-staklenu perlu i ulomak jantarne prizmatične perle), Suzdalja (sloj iz 11. stoljeća) te iz Yaropolcha Zaleskog.[48] Perle od ametista također su pronađene među materijalom arheološkog kompleksa Mininskiy (dva primjerka) te u Beloozeru (tri primjerka), gdje je oblik perle elipsoidan s nekoliko lica.[49]

U Beloozeru je otkriven jedan umetak za prsten ovalnog oblika, koji je djelomično obrađen i ima površinske nepravilnosti, a Zakharov za njega tvrdi da je izrađen od tamnocrvenog ametista. [50] Na arheološkim lokalitetima naselja Tsarevskoya pronađen je još jedan umetak od ametista, ravno-konveksnog i ovalnog oblik.[51] U istočnoj Europi umetci u obliku kabošona otkriveni su u slojevima koji datiraju iz 11. stoljeća.[52]

Ametist se u Rusi smatrao vrijednim dragim kamenom, što dokazuje otkriće predmeta izrađenih od ametista u kraljevskim riznicama. O tome svjedoči i

[46] Resi 2011, str. 156.
[47] Poluboyarinova 1991, str. 36, 39.
[48] Ivanova-Pralya 2022, str. 120; Guliaeva 2008, str. 119; Rodina 2010, str. 100–101.
[49] Zakharov, Kuzina 2008, str. 184; Zakharov 2004, tabla 327.
[50] Zakharov 2004, str. 212.
[51] Poluboyarinova 1991, str. 86.
[52] Poluboyarinova 1988, str. 197–198.

can be assumed that their appearance on the trader's estate reflects long-standing trade contacts with the region of production or a distribution centre in the latter third of the 11th to mid-12th century.

It is occasionally the case that amethyst beads and inlays are discovered in medieval sites on the territory of Rus'. In Scandinavia, amethyst was found among rounded beads from the second half of the 6th to the beginning of the 17th century. It was also found in later periods at Kaupang, Helgö, Eketorp, and Birka. It has been proposed that amethyst beads were not solely imported as finished products, but that there may have been a local trade in gemstone processing, the development of which was facilitated by oriental jewellers.[46]

Discussion

Quartz beads are most prevalent at the archaeological sites of Central Asia, where deposits of this mineral are located. Amethyst jewellery is represented by beads, inlays and pendants in Volga Bulgaria and Golden Horde cities. However, it is much less common than other precious stones, as in Rus'. Many amethyst beads found on Early Rus' sites date from the 12th century.[47] Three cases of amethyst beads have been documented from Mokhov (destroyed mound 18, where several glass beads (including a gold-glass bead) and a fragment of an amber prismatic bead were recorded in the burial inventory), Suzdal (11th century layer), and Yaropolch Zaleskiy.[48] Amethyst beads were identified in the materials of the Mininskiy archaeological complex (two specimens) and in Beloozero (three specimens). The shape of the beads is multifaceted ellipsoidal.[49]

A single ring insert was discovered in Beloozero. It is oval in shape, partially worked, and exhibits surface irregularities. Zakharov proposes that the inlay is composed of dark red amethyst.[50] Another amethyst inlay was recovered from excavations at the Tsarevskoye settlement. It is flat-convex and oval in shape.[51] In medieval Eastern Europe, cabo-

[46] Resi 2011, p. 156.
[47] Poluboyarinova 1991, pp. 36, 39.
[48] Ivanova-Pralya 2022, p. 120; Guliaeva 2008, p. 119; Rodina 2010, pp. 100-101.
[49] Zakharov, Kuzina 2008, p. 184; Zakharov 2004, table 327.
[50] Zakharov 2004, p. 212.
[51] Poluboyarinova 1991, p. 86.

spomenuto blago s područja zlatnovršnog manastira sv. Mihovila u Kijevu. H. Korzukhina to bogato blago uvrstio je u skupinu blaga zakopanih između zadnje trećine 12. i prve polovice 13. stoljeća, a sadržavalo je prsten s ovalnom krunom i umetkom od ametista, koji je pronađen 1885. godine. Na Yesykorskijevu posjedu Troitskyi Lane također je otkriven prsten s ovalnom krunom i umetkom od ametista.[53] Nadalje, u ostavi iz Ryazana iz 1822. godine pronađeni su predmeti od ametista s umetcima od dragog kamenja.[54]

Fluorit se spominje u blagu iz Černihiva iz 1848. godine, otkrivenom u blizini manastira Yelytskyi. Blago koje datira iz 11. stoljeća sadrži dva prstena s umetcima od zlata, zrnaca, fluorita i gagata u glatkim kalupima.[55]

Fluorit je prilično čest mineral u Skandinaviji i mogao je služiti kao zamjena za ametist. Uz perle, arheološka građa iz naselja Kaupanga uključivala je kamenčiće u obliku valjka (šljunka), što sugerira da je sirovina eksploatirana iz riječnog šljunka.[56] Prisutnost fluoritnih perli dokumentirana je tijekom istraživanja naselja Ivolge, danas jedinog poznatog grada Hunskog Carstva.[57] Pregledom kamenih perli koje potječu s arheoloških nalazišta u Homielu i iz Homielske regije otkriveno je nekoliko perli od fluorita, a jedan primjerak potječe iz groba 28 na groblju Kurganye.[58] Perle su sličnog oblika kao i one pronađene u Kijevu, višestrane s blago zaobljenim rubovima. Ipak, fluoritne perle češće se pronalaze među srednjovjekovnim arheološkim materijalom u srednjoj Europi, gdje su otkrivene na lokalitetima koji datiraju iz razdoblja od 10. do 12. stoljeća. Također su pronađene u kompleksima iz istog razdoblja u susjednoj Poljskoj, Češkoj, Moravskoj i Mađarskoj,[59] gdje su bile uobičajeni element uz drugo drago kamenje (kvarc i karneol) ili stakleni nakit.[60]

Značajan broj nalaza potječe iz grobova datiranih u sredinu 12. stoljeća, na primjer, u okolici Wroclawa. Broj perli u tim grobovima kreće se od jed-

chon-shaped inlays were found in layers from the 11th century.[52]

The amethyst was regarded as a valuable gemstone in Rus', as evidenced by the discovery of amethyst items in royal treasures. This is exemplified by the aforementioned treasure from the territory of the St. Michael's Golden-Domed Monastery. A rich treasure on the territory of Kyiv (G. Korzukhina included it in the group of treasures buried between the last third of the 12th and the first half of the 13th century) includes a ring with an oval-shaped socket with an amethyst insert (found in 1885 in Additionally, the Troitskyi Lane estate of Yesykorsky).[53] Furthermore, the 1822 Ryazan hoard included amethyst colts with gemstone inserts.[54]

Fluorite is suggested in the Chernihiv treasure of 1848, situated in close proximity to the Yelytskyi Monastery. The treasure, dated to the 11th century, comprises two rings with inlays in smooth casts, comprising gold, grain, dark and light gemstones.[55]

Fluorite is a relatively common mineral in Scandinavia and may have served as a substitute for amethyst. In addition to beads, the archaeological material from the Kaupang settlement included rolled stones (pebbles), which may indicate the exploitation of this raw material, which could be found in river gravel.[56] The presence of fluorite beads was documented during the investigation of the Ivolga settlement, which is currently the only known city of the Hun Empire.[57] A review of the stone beads from the archaeological sites of Homiel and the Homiel region revealed the presence of several fluorite beads, with one specimen originating from burial 28 of the Kurganye cemetery.[58] The beads are of a similar shape to those found in Kyiv, namely multifaceted with slightly rounded edges. Nevertheless, fluorite beads are more frequently encountered among medieval archaeological materials in Central Europe, where they are present on archaeological sites dating from the 10th and 12th centuries. Fluorite beads have been identified in synchronous complexes in neighbouring Poland, Bo-

53 Kondakov 1896, tablica V, 3; Korzukhina 1954, str. 117–118; Pekarska 2019, str. 103.
54 Kondakov 1896, str. 83–95; Korzukhina 1954, str. 143–144.
55 Korzukhina 1954, str. 92, br. 35.
56 Resi 2011, str. 154.
57 Kradin *et al*. 2020, str. 47.
58 Ivanova-Pralya 2022, str. 120.
59 Lisowska 2013, sl. 104; Ritoók 2020, sl. 1.
60 Trzciński 2016, str. 154–155.

52 Poluboyarinova 1988, pp. 197-198
53 Kondakov 1896, table V, 3; Korzukhina 1954, pp. 117-118; Pekarska 2019, p. 103.
54 Kondakov 1896, pp. 83–95; Korzukhina 1954, pp. 143-144
55 Korzukhina 1954, p. 92, no. 35.
56 Resi 2011, p. 154.
57 Kradin et al. 2020, p. 47.
58 Ivanova-Pralya 2022, p. 120.

ne-dvije do trinaest-četrnaest, a na lokalitetima su bile prisutne sve do prijelaza iz 12. u 13. stoljeće. U Poljskoj se općenito prihvaća da je razdoblje upotrebe perli od fluorita bilo od kraja 9. do 12. stoljeća. U Mađarskoj dokazi upućuju na to da su one bile u upotrebi od kraja 10. do sredine 12. stoljeća, uz znatan porast njihove upotrebe u posljednjoj trećini 11. stoljeća.[61] Može se primijetiti da broj tih perli korelira s brojem perli pronađenih u iskopavanju na lokalitetu Spassky, gdje je otkriveno 15 primjeraka.

Glavni izvori dragog kamenja za zemlje rane Rusi bili su Indija i Cejlon, koji su imali bogata nalazišta raznih dragulja, ali i radionice za njihovu obradu.[62] Široka rasprostranjenost kvarca otežava precizno određivanje podrijetla nakita. Primjerice, kvarc je prisutan i u srednjoj i južnoj Europi, o čemu svjedoče nalazi Voudourisa i njegovih suradnika.[63] U srednjem vijeku Jemen je izvozio razno neobrađeno kamenje, poput ahata, karneola, kalcedona, oniksa, gorskog kristala i ametista,[64] a kasnije je postao važno središte za obradu kamena. Rudarska nalazišta u srednjoj Europi i srednjoj Aziji bila su među najpoznatijima u tom razdoblju.[65] Predmeti su se najčešće izrađivali i obrađivali na licu mjesta, a zatim su se gotovi proizvodi trgovačkim putovima dopremali na područje rane Rusi. Osim toga, Bizant je imao ključnu ulogu kao posrednik u opskrbi teritorija rane Rusi dragocjenim kamenjem. Bizantski izvori pobliže otkrivaju načine korištenja ukrasnog kamenja, osobito u pogledu istaknutosti umetnutih kamenja u bizantskoj primijenjenoj umjetnosti. U srednjoj bizantskoj epohi (11. – 12. stoljeća) umetci od jaspisa i kalcedona, poput oniksa i ahata, služili su za dekoraciju korica knjiga i drugih umjetničkih predmeta. Prema J. Aksentonu, to bi mogao biti razlog širenja dragog kamenja u obliku umetaka, posebno na području Dnjepra, koje je imalo snažne veze s Bizantom.[66]

Podrijetlo sirovine i putovi opskrbe fluoritom predmet su značajnih rasprava. Pretpostavlja se da je fluorit stigao u Europu (Poljsku, Njemačku i skandinavske zemlje) putem trgovačkih ruta koje su prolazile preko područja rane Rusi, uz posredovanje Arapa. S. Dušek smatra da je glavna trgovačka

[61] Lisowska 2013, str. 143–150; Ritoók 2020, str. 159.
[62] Axenton et al 1974, str. 9.
[63] Voudouris et al 2019, str. 13, 15.
[64] Lemmlein 2011, str. 420.
[65] Poluboyarinova 1991, str. 12, 34–36, 39.
[66] Aksenton 1974, str. 10; Eniosova, Puškina 2012, str. 67.

hemia, Moravia, and Hungary,[59] where they were a common feature among other precious stones (rock crystal and carnelian) or glass jewellery.[60]

A substantial number of finds originate from burials dating back to the mid-12th century (for instance, in the environs of Wroclaw), where the quantity of beads ranges from one-two to thirteen-fourteen (while on the sites they are found until the turn of the 12th and 13th centuries). In Poland, the period of use of fluorite beads is generally accepted to be the late 9th to the 12th centuries. In Hungary, the evidence suggests that they were in use from the late 10th century to the mid-12th century, with a particularly marked increase in the last third of the 11th century.[61] It can be observed that the number of beads correlates with the number recovered from the Spassky excavation, which amounted to 15 units.

The primary sources of precious stones to the lands of Early Rus' were India and Ceylon, which boasted considerable deposits of a vast array of gemstones, along with established facilities for their processing.[62] The distribution of quartz deposits is extensive, rendering the determination of jewellery sources a challenging endeavour. For instance, they are also present in Central and Southern Europe, as evidenced by the findings of Voudouris.[63] In the Middle Ages, Yemen exported a number of raw stones, including those of agate, carnelian, chalcedony, onyx, rock crystal and amethyst.[64] The country later became an important centre for the cutting of stone. In the Middle Ages, Central and Central Asian mining sites were the most popular.[65] The processing and manufacturing of products was usually carried out on site, with the finished products transported to the territory of Early Rus' via trade routes. Additionally, it is noteworthy that Byzantium served as a primary intermediary for the supply of precious stones to the territory of Early Rus'. Furthermore, Byzantine sources provide insights into the methods of their use, given the prominence of set stones in Byzantine applied art. In the Middle Byzantine period (11th-12th centuries), jasper and chalcedony (onyx, agate) inserts were used to dec-

[59] Lisowska 2013, fig. 104; Ritoók 2020, fig. 1.
[60] Trzciński 2016, str. 154–155.
[61] Lisowska 2013, pp. 143-150; Ritoók 2020, p. 159.
[62] Axenton 1974, p. 9.
[63] Voudouris et al 2019, pp. 13, 15.
[64] Lemmlein, 2011, p. 420.
[65] Poluboyarinova 1991, pp. 12, 34-36, 39.

ruta s Dalekog istoka u 9. stoljeću prolazila kroz Kijev, Wroclaw, Bautzen, Leipzig i područje Tiringije.[67] Na sličan način E. Lisowska pretpostavlja da su proizvodi od karneola, ahata i fluorita s Bliskog ili Dalekog istoka došli u Donju Šlesku preko Kijevske Rusi.[68] Unatoč postojanju poznatih nalazišta fluorita u Donjoj Šleskoj, uključujući ona u Kletnom, Kowaryju, Boguszówu u planinama Walbrzychu i Karkonoszama, hipoteza o lokalnoj ekstrakciji sirovina za fluoritna zrnca nije potvrđena arheološkim ili gemološkim dokazima.[69] Što se tiče perli iz karpatske regije, vjeruje se da je sirovina koja je korištena za izradu nakita u 11. i 12. stoljeću bio fluorit koji potječe s nalazišta u brdima Velenca, u sjeverozapadnom dijelu Mađarske.[70] Međutim, preuranjeno je donositi konačne zaključke o podrijetlu nakita od fluorita te su potrebna dodatna stručna ispitivanja materijala.

Fluorit je mineral koji se relativno često pronalazi u Zemljinoj unutrašnjosti. Njegova nalazišta poznata su u Uzbekistanu, Kirgistanu, Kazahstanu, Turskoj, Italiji, Njemačkoj, Velikoj Britaniji, Norveškoj, Rusiji, Kanadi, Sjedinjenim Američkim Državama, Kini i drugdje u svijetu. U Ukrajini je tijekom 20. stoljeća u šupljim nalazištima pegmatita u regiji Žitomir otkriven fluorit koji se po kvaliteti može usporediti s onim pronađenim tijekom istraživanja u ulici Spassky u kijevskom Podilu. Međutim, sva ta nalazišta nalaze se duboko pod zemljom i mogu se eksploatirati samo rudarenjem, zbog čega se ne smatra da je sirovina iz tih nalazišta korištena u srednjovjekovnoj proizvodnji predmeta. Uz to, sva druga poznata nalazišta fluorita na području Ukrajine nisu relevantna za ovu analizu, jer fluorit u njima nema ista svojstva kao onaj s arheoloških nalazišta.

67 Dušek 1983, str. 53–54, 75.
68 Lisowska 2013, str. 225.
69 Lisowska 2013, str. 149.
70 Ritoók 2020, str. 160, 167.

orate book bindings and other objects. J. Aksenton posited that this may be the reason for the proliferation of precious stones in the form of inlays, particularly in the Dnipro region, which had close ties with Byzantium.[66]

The provenance of the raw material and the routes of fluorite supply are subjects of considerable debate. It is possible that fluorite reached Europe (Poland, Germany, and the Scandinavian countries) via the Arabs and the territory of Early Rus' as a result of trade. S. Dušek posits that the principal trade route from the Far East in the 9th century traversed Kyiv, Wroclaw, Bautzen, Leipzig, and the territory of Thuringia. [67] In a similar vein, E. Lisowska posits that this is how carnelian, agate, and fluorite products from the Near or Far East came to Lower Silesia via Kyivan Rus'.[68] Despite the existence of known fluorite deposits in Lower Silesia, including those in Kletno, Kowary, Boguszów in the Walbrzych Mountains, and Karkonosze, the hypothesis of local raw material extraction for fluorite beads has not been corroborated by archaeological or gemological evidence.[69] With regard to the beads from the Carpathian region, the raw material used to create the 11th- and 12th-century jewellery is believed to be fluorite, with deposits originating from the Velence hills (situated in the northwestern part of Hungary).[70] Nevertheless, it is premature to reach a definitive conclusion regarding the provenance of the fluorite jewellery. Further professional examination of the material is necessary.

Fluorite is a relatively common mineral found within the Earth's interior. Its deposits are known in Uzbekistan, Kyrgyzstan, Kazakhstan, Turkey, Italy, Germany, the United Kingdom, Norway, Canada, the United States, China, and elsewhere. In Ukraine, fluorite of a quality comparable to that of the excavation at 35 Spaska Str. in Kyiv Podil was discovered in a chamber pegmatite deposit in the Zhytomyr region during the 20th century. However, all of these finds are located in deep horizons and can only be extracted through mining operations. Consequently, they cannot be considered as raw materials for products in the Middle Ages. Addi-

66 Aksenton 1974, p. 10; Eniosova and Pushkina 2012, p. 67.
67 Dušek 1983, pp. 53-54, 75.
68 Lisowska 2013, p. 225.
69 Lisowska 2013, p. 149.
70 Ritoók 2020, pp. 160, 167.

Zaključci

Zbog nedostatka nalazišta fluorita s takvim karakteristikama u današnjoj Ukrajini, može se zaključiti da su predmetni proizvodi od fluorita na područje srednjovjekovnog Kijeva bili uvezeni. S obzirom na brojna nalazišta ovog minerala izvan Ukrajine, određivanje točnog izvora uvoza predstavlja veliki izazov. Činjenica da većina primjeraka ima slične nijanse dodatno komplicira analizu. Za precizno utvrđivanje izvora potrebno je nizom laboratorijskih ispitivanja utvrditi karakteristične komponente nečistoća prisutne na različitim nalazištima fluorita, a potom ih usporediti s komponentama nečistoća u proizvodima koji se istražuju. U ovom trenutku možemo se osloniti samo na logičku usporedbu povijesnih činjenica i jednostavnu usporedbu raspoloživih podataka o mogućim trgovačkim putovima u srednjem vijeku. Također, možemo istražiti i druge načine na koje su ove perle mogle dospjeti u grad. Nadamo se da ćemo odgovore na ova pitanja pronaći u daljnjim istraživanjima.

Već spomenuti nakit koji je pronađen arheološkim istraživanjima u Kijevu pokazuje da je ametist bio u upotrebi u razdoblju 11. – 13. stoljeća. Ametisti su prisutni u skupocjenom zlatnom nakitu, a pronađeni su u otmjenom dijelu srednjovjekovnog Kijeva, na području zlatnovršnog manastira sv. Mihovila. Perle od fluorita, izrađene od jeftinijeg i lakše obradivog materijala, pronađene su u pučkoj četvrti Podil.

Morfološki se perle s predmetnog područja podudaraju sa sličnim istodobnim nalazima iz Poljske, Moravske i Mađarske. Ti nalazi koncentrirani su na karpatskom prostoru, pa se za početak može pretpostaviti da je i proizvodnja ovih predmeta bila povezana s tim prostorom.

tionally, all other deposits and occurrences of fluorite known on the territory of Ukraine cannot be included in this analysis, as the fluorite in them is not of a similar quality to the archaeological one.

Conclusions

It can therefore be concluded that the fluorite products in question were imported to the territory of medieval Kyiv, as there are no deposits of this mineral with such characteristics in modern Ukraine. As there are numerous deposits of this mineral outside Ukraine, determining the precise source of imports is a challenging undertaking. The fact that the majority of the specimens exhibit comparable hues further complicates the analysis. In order to ascertain the precise source, it is essential to undertake a series of laboratory-based tests, focusing on the identification of distinctive impurity components present in a range of fluorite deposits and their comparison with the impurity components observed in the fluorite products under investigation. At this juncture, we can only rely on a logical comparison of historical facts and a simple comparison of scattered data regarding the possibility of trade routes in the Middle Ages or the search for other options for getting these beads to the city. It is our hope that we will find the answer to this in our further research.

The jewellery described above, which has been found by archaeological excavations in Kyiv, shows that this jewellery was in use in the 11th-13th centuries. Amethysts are present in expensive gold jewellery and were found in a more fashionable area of medieval Kyiv, on the territory of St Michael's Golden-Domed Monastery. Fluorite beads, made of a cheaper and easier to process material, were found in the more democratic Podil district.

Morphologically, these beads are identical to similar synchronous finds from Poland, Moravia and Hungary, which are concentrated within the Carpathian region. We can initially assume that the production of these products was also associated with this area.

Zahvale

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Kratice / Abbreviations

A. F. G. – Associatoin Française de Gemmologie

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