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THE MAIN PRINCIPLES OF BUILDING GEMOLOGICAL CLASSIFICATION OF RAW AMBER

Purpose. To conduct a comprehensive analysis of the amber market and identify the key principles of the gemological classification of raw amber. This will provide complete information on the quality of amber and its consumer properties, which, in turn, will create the basis for solving both practical and theoretical tasks: determining the cost of raw materials and finished products; identifying patterns of development of the amber market.

Methodology. The methodological basis of the study is based on general scientific analytical approaches. Within the framework of the methodology, a classification algorithm has been developed that allows building a relational database with the ability to automate, systematise, analyse and visualise information on the basis of specialised software.

Findings. On the basis of the developed classification principles, three categories of properties have been identified: dimensional and weight, technological and decorative, and decorative ones. They are key in determining the quality of amber, drawing up geological, economic, technological and design projects. This approach made it possible to develop a gemological classification that has been tested on specific sites, which, in turn, contributed to the creation of a software algorithm that simplifies the work of geologists, miners, and processors.

Originality. For the first time, the basic principles of the gemological classification have been developed, taking into account the fundamental principles of gemological science, design, processing and evaluation of amber.

Practical value. The amber quality criteria included in the gemological classification are important for the geological and economic assessment of amber deposits, the preparation of price lists taking into account consumer properties, the development of technological projects, and the analysis of the raw amber market.

Keywords: *amber, raw materials, products, consumer properties, gemological classification, amber market*

Introduction. Amber occupies an important place in the global gemstone market due to its decorative qualities and technological properties. It is widely used in decorative and applied arts [1, 2], as well as in the production of varnishes and cosmetics [3]. In addition, amber has a scientific value: inclusions of insects, vegetation, liquids, and gases serve as unique evidence of the organic and inorganic environment that existed millions of years ago. This makes amber an indispensable material for paleontological, geographical and geological reconstructions.

Amber is a unique natural material that is the only gem of organogenic origin in Ukraine [4]. Despite the recognition of amber as a precious stone, subsequent regulations do not contain clear criteria for its quality. This inconsistency leads to uncertainty in the legal regulation of its extraction, processing and circulation. As a result, amber is unprotected both in the domestic and global markets, which makes it possible to use it in illegal trafficking, smuggling and other illegal activities [5]. This underscores the need to develop and implement comprehensive information on the quality of amber aimed at the sustainable use of this valuable natural resource.

In addition, the problem of illegal amber mining, which brings high profits bypassing the state budget, remains relevant for some regions of our country today [6].

Scientists draw attention to numerous ways of committing offences in various sectors of the public sector (Chaplynskyi, K., Pyrih, I., Yefimov, M., & Bidniak V., 2023), but the specifics of the amber market require a separate study. The catastrophic environmental situation in the Polissia region of Ukraine, which is associated with illegal amber mining, is also reflected in the artistic images of amber works of authorship [7].

Thus, today amber occupies a key position in the mineral resource base of Ukraine as a valuable stone-coloured raw material. The growing demand for amber, especially in the field of art and jewellery, emphasises the need for an in-depth study of its quality based on consumer properties.

The results of international exhibitions and market research on prices in specialised boutiques have shown a sharp discrepancy in many pricing issues in the existing market, which has always been subject to price fluctuations depending on the quality of raw materials.

The current amber market in Ukraine is characterised by economic instability and price imbalance, which is associated with a number of systemic problems [8].

1. Amber is officially recognised as a gemstone of organogenic origin [4], which requires clear evaluation criteria.

2. In practice, the market is overloaded with amber of illegal origin, the volume of which significantly exceeds legal supplies [9].

3. The current price lists [10] do not allow for a reliable assessment of the quality and value of raw amber. These documents do not take into account the geographical origin, morphological features and interests of the industry.

In addition, there is a lack of uniform terminology and diagnostic approaches.

All of this hinders the formation of a transparent and sustainable amber market, reduces its legitimacy and promotes the development of shadow schemes.

It is worth noting that in international practice, prices for raw amber are usually set by subsoil users – licensees who carry out commercial development of deposits. These business entities form the basic pricing guidelines and regulate production and economic processes at all stages of the commodity chain: extraction, primary processing, sorting, production and sales. Such a mechanism provides an institutionalised model for regulating the industry, which allows market participants – including consumers, experts and appraisers – to be promptly informed of current raw material prices. This helps to maintain the principles of legal equivalence of products, market transparency and the objectivity of expert assessment.

In the process of amber valuation in Ukraine, the expert service is guided by two main documents that play a key role in determining the qualitative and quantitative characteristics of this gem. The first of them is the national standard of Ukraine "Raw Amber. General Technical Conditions" [11]. This standard sets out the basic requirements for amber, including its physical and chemical properties, as well as the criteria by which it is assessed.

The second important document is the price lists for amber, which are formed and published in the bulletin 'Price Guide for Precious and Decorative Stones' [12].

The problem with the legitimacy of these documents is that they contain contradictory information, which complicates the valuation process and can lead to a distortion of the market value of amber. In a dynamic gemstone market, it is necessary to critically analyse and interpret the information contained in these sources.

It should also be noted that these documents do not take into account the consumer properties of amber, such as colour, transparency, presence or absence of inclusions, i.e. properties that are essential in determining the value of raw materials.

Now there is a need to develop a gemological classification, which will become the basis for determining the quality of amber and identifying new and original technological solutions in the field of its sorting, processing and manufacturing of products. This will undoubtedly have a positive impact on the rational use of mineral resources and create conditions for the development of a modern amber market with objective (price-quality) and transparent prices in Ukraine.

Literature review. To the present day, no single classification of amber has been developed, as a wide variety of types of the stone has led to the creation of a significant number of their disparate varieties. The existing classifications of amber [13, 14] are based on several criteria:

- external characteristics (including colour, transparency, shape and size) [15];
- place of extraction (Baltic, Burmese, Dominican, etc.) [16];
- composition, structure and properties [17, 18];
- processing method (natural, refined, calcined, pressed) [19].

In addition, there are specialised classifications [20], which include various systems that take into account the unique properties and characteristics of amber and adapt to the market conditions caused by the fashion for amber and the level of technology for its processing. Most often, these are trade classifications, where amber is divided into certain types by weight, size, structure and transparency, which affects its price and use.

It is also necessary to mention the so-called commercial classifications of amber and local standards that are currently in force, which allow taking into account the specifics of local extraction, trade and quality assessment of amber on the market [21]. Such classifications are based on the weight, size, structure and transparency of amber, its quality and purpose. They allow amber to be effectively evaluated and used in various industries, including jewellery and souvenirs.

In the international market, amber classification is based on several standards and principles that may vary depending on the country, type of amber, gemological standards (size, shape and colour) and local standards that take into account the conditions of amber extraction and trade. The 4C principle (colour, clarity, cut, carat weight) remains the international criteria for amber evaluation [22].

In the scientific and commercial literature, the most acceptable and understandable classifications of amber are by colour shades: yellow, brown, grey, black, as well as rarer ones – green, blue, red, and others. The Baltic region has its own colour varieties of amber: succinite – lemon, cognac; glessite – brown, opaque; bockerite – dark, elastic, opaque; hedanite – waxy yellow; stannite – black, fragile.

Mining organisations have their own price lists with characteristics that are available for identification at the extraction stage. Here, the main criterion is the weight of the fraction, as well as characteristics with incomplete and sometimes ambiguous concepts of transparency and shape of amber. In addition, such price lists often do not contain such characteristics as colour, inclusions,

cracks, which are the main criteria for determining the quality of raw amber and its value.

On the territory of Ukraine, the only official document that all state and commercial entities should follow when determining the value of amber is the price lists [12] of the State Gemological Centre of Ukraine (SGCU) under the Ministry of Finance of Ukraine. However, this document does not specify the properties of amber that reflect its qualities as a gem, let alone a precious stone.

That is why it is necessary to develop a gemological classification for amber, the only precious stone mined in Ukraine, which could serve as a basis for creating more objective price lists that would respect the main ratio of price and quality.

Purpose. A marketing analysis of the amber market in Ukraine has shown its disorder and instability, primarily because the issue of amber pricing remains unresolved [23]. Therefore, today, identifying the main pricing criteria for raw amber and amber products is an urgent problem that needs to be addressed by specialists in various fields (gemological, geological, economic, legal, etc.).

In our opinion, this problem can be best solved by the gemological classification of raw amber. This will provide complete information on the quality of amber and its consumer properties, which, in turn, will create the basis for solving both practical and theoretical problems: determining the value of raw materials and finished products, as well as identifying patterns of development of the amber market.

Thus, the purpose of the article is to conduct a comprehensive analysis of the amber market and identify the key principles of the gemological classification of raw amber, which will significantly increase the level of valuation of this gem.

The objectives of this work are:

1. To analyse the amber market in Ukraine.
2. To study the consumer properties of raw amber and consider the possibility of using them to develop a gemological classification.
3. To develop the basic principles of the multidimensional gemological classification of amber, which takes into account its consumer properties and reflects the continuity of amber characteristics from raw materials to finished products, covers all possible combinations of amber properties, takes into consideration gemological, technological, aesthetic and economic links between raw materials and products.

Methods. The research conducted includes both well-known analytical approaches and gemmological classification of amber, which is developed based on the combination of available knowledge, skills, and components of the methodological apparatus. Gemological classification is a comprehensive system for studying amber, which includes:

- diagnosis of technological, technological-decorative and decorative parameters of amber samples, with differentiation into quantitative and qualitative characteristics due to their different effects on the properties of the raw material;
- analysis of data taking into account dimensional, weight and morphological (size, mass, shape) and optical (transparency, colour) properties, as well as the presence of cracks and inclusions, which can act as defects that reduce the grade of amber, or as factors that increase its aesthetic value and cost.

To increase the objectivity of the final results, a gemological classification algorithm was developed, which served as the basis for the creation of specialised software. This software includes a relational database with automated systematisation, analysis and visualisation of information in tabular and graphical formats, which significantly increases the objectivity, reproducibility and practical significance of the results.

The main array of experimental data obtained over the last five years is focused on applied aspects (utilitarian results).

Results of the study. The results of marketing research show that it is the market that influences changes in the value of amber, since it is here that economic factors are regulated, quality indicators for products are selected, and technological issues of production are resolved [23]. Therefore, the most important evaluator of both raw materials and amber products is the consumer, because it is the consumer who chooses the product and sets the appropriate price.

Let us consider how specific products form requirements for the quality of raw materials through their consumer properties: colour, transparency, shape, etc. (Table 1).

Table 1 was constructed according to the following algorithm: type of product (commodity) → consumer properties → requirements for the quality of raw materials. Aesthetic effects should also be added here, as they are the hallmark of a particular type of product for the consumer.

The analysis of Table 1 shows that certain products require raw amber with certain properties.

For example, to make the 'Bullets' necklace from honey amber, isometric samples or blanks obtained from large pieces of amber of the corresponding (honey) colour are required.

The isometric shape of the amber is also important for the "Diamond Facet" necklace, but the preferred colours are lemon or cognac, as they create the effect of a 'diamond' sparkle.

For Cameos and Intaglios, flat samples or blanks are required. However, the preferred colours for each type differ: for Cameos, landscape or honey amber is preferred, which emphasises the expressiveness of the artistic image and the carver's skill; for intaglio, only transparent amber (without cracks or inclusions) is required to create a clean and clear carving relief.

These examples demonstrate once again that each type of product requires raw materials with specific properties. Such properties as the size and shape of the amber, then the presence of cracks, inclusions, transparency and colour play a decisive role in this. It is these properties that determine the value of amber and should form the basis of its gemological classification, which is focused on solving primarily practical problems – determining the field of application and the type of products.

From the point of view of practical gemology [25], all properties of amber are divided into three groups:

- technological properties (hardness, refractive index, specific gravity, viscosity), which affect only the way amber is processed;

Table 1

Amber products and consumer properties

Products	Consumer properties	Requirements to amber	Aesthetic effects
Necklace "Balls" honey	Honey colour, ideal shape of beads	The shape of the sample is isometric, honey colour of the raw material	Warm, lower colour, the thread is not visible
Necklace "Diamond Facet"	Brightness of lemon and cognac colour with strong glass lustre	Raw amber of lemon and cognac colours of isometric shape	Strong glass (to diamond) lustre
Intaglio	Lemon or cognac colour with a pattern inside	Lemon or cognac amber of a flat shape	The effect of a convex pattern inside the amber
Cameos	Honey or landscape colour (a combination of white and honey amber)	Honey or landscape amber of flat shape	The effect of a convex pattern on the surface of the amber

- technological and decorative properties (shape, size, cracks, inclusions), which determine both the processing technology and the decorative properties of the stone and are taken into account when developing the design of the product;

- decorative properties (colour, transparency) determine the decorative and aesthetic component and do not affect the processing technology.

The three groups of properties identified are crucial for constructing a hierarchical gemmological classification of amber. In fact, this classification is a standardised algorithm for determining the quality of raw materials, which is used by technologists, designers and artistic processing masters.

Levels of gemmological classification.

First level: Morphology of samples (Table 2).

The morphology of amber samples is characterised by considerable variability and often does not have strictly defined contours [26]. However, in the vast majority of cases, their shape can be classified according to the following geometric categories:

- isometric – aspect ratio L:W:H≈1:1:1;
- flat – L:W:H≈0.3:1:1;
- elongated – L:W:H≈1:1:0.3;
- amoeboid – a shape that does not have distinct contours and does not correspond to the above types (Fig. 1).

The morphological classification of amber is a key factor in determining its grade and practical application, as well as in selecting specific types of finished products. For example, isometric samples are ideal for making balls, figurines and souvenir (collectible) items.

An important technological indicator in determining the type of product is the yield coefficient of usable material, which is calculated as the ratio of the mass of finished products to the mass of raw materials, expressed as a percentage.

Second level: Cracking (Table 2).

Fracturing is a significant parameter that determines both the technological features of amber processing and its aesthetic properties [26]. Cracks are traditionally considered defects that reduce the grade of raw materials. Depending on the intended use of the finished product, their presence may be categorically unacceptable or limitedly permissible.

Fig. 1. The shape of natural amber specimens
A – isometric; B – flat; C – elongated; D – amoeboid

It should be noted, however, that some types of cracks, in particular stress cracks (so-called 'umbrellas'), can create unique optical effects, such as internal sparkles and iridescence, which, on the contrary, increase the aesthetic and collectible value of the sample.

The classification of amber samples according to the degree of fracturing is presented below. Four main varieties of amber are distinguished according to the nature and severity of the cracks (Fig. 2):

1. Samples without cracks: complete samples without any defects.
2. Single cracks: interlayer cracks and tensile cracks ('umbrella cracks').
3. Cracks up to 50 %: 'Umbrella' cracks and internal cracks that create localised areas of softening.
4. Cracking over 50 %: cases where cracks can compromise the integrity of the sample and create softening areas throughout the entire volume.

Thus, there are four types of fissures in each form of amber. Taking into account the shape and fissure, a total of 16 classification taxa can be obtained, which emphasises the complex approach to the classification of amber and its properties.

The third level of amber classification is inclusions (Table 2). Inclusions in amber are a unique and invaluable scientific material that can provide important information about events that took place on the Earth millions of years ago. These inclusions may contain the remains of vegetation, insects, animals, and provide data on the climate and atmospheric composition of that time [27].

From the point of view of mineralogy and jewellery, inclusions are considered to be defects that can negatively affect the quality of amber. The number and nature of inclusions affect the colour and transparency of amber (Fig. 3), which makes them interrelated parameters.

For example, the smallest gas-liquid inclusions can give amber a milky white colour. Small clusters of such inclusions inside the amber can create the effect of nebulae or clouds. At the same time, larger inclusions of organic matter can colour amber in a dark grey colour, sometimes with a brownish tint.

It is important to note that the content of inclusions directly affects the transparency of amber. The more in-

Table 2

Gemological classification of raw amber

Shape	Cracks, inclusions	Clarity	Colour	Sort
Isometric shape	without cracks and inclusions	clear	transparent-coloured	1
		translucent 1–2 mm	honey	
		opaque	milky-white	
			black	
	single cracks and inclusions	clear	coloured	2
		translucent		
		translucent up to 10 mm		
		Translucent 1–2 mm	honey	
		opaque	milky-white	
			black	
	cracks and inclusions < 50 %	translucent	coloured	3
		translucent up to 10 mm		
		Translucent 1–2 mm	honey	
		opaque	milky-white	
			black	
	cracks and inclusions > 50 %	translucent	coloured	4
		translucent up to 10 mm		
		translucent 1–2 mm	honey	
		opaque	milky-white	
			black	
Flat shape	without cracks and inclusions	clear	coloured	1
		translucent 1–2 mm	honey	
		opaque	milky-white	
			black	
	single cracks and inclusions	clear	coloured	2
		translucent		
		translucent up to 10 mm		
		translucent 1–2 mm	honey	
		opaque	milky-white	
	cracks and inclusions < 50 %	translucent	coloured	3
		translucent up to 10 mm		
		translucent 1–2 mm	honey	
		opaque	milky-white	
			black	
	cracks and inclusions > 50 %	translucent	coloured	4
		translucent up to 10 mm		
		translucent 1–2 mm	honey	
		opaque	milky-white	
			black	
Elongate form	without cracks and inclusions	clear	coloured	1
		translucent 1–2 mm	honey	
		opaque	milky-white	
			black	
	single cracks and inclusions	clear	coloured	2
		translucent		
		translucent up to 10 mm		
		translucent 1–2 mm	honey	
		clear	coloured	
	cracks and inclusions < 50 %	translucent	coloured	3
		translucent up to 10 mm		
		translucent 1–2 mm	honey	
		opaque	milky-white	
			black	
	cracks and inclusions > 50 %	translucent	coloured	4
		translucent up to 10 mm		
		translucent 1–2 mm	honey	
		opaque	milky-white	
			black	
Amoebic shape (irregularly shaped)	without cracks and inclusions	clear	coloured	1
		translucent 1–2 mm	honey	
		opaque	milky-white	
			black	
	single cracks and inclusions	clear	coloured	2
		translucent		
		translucent up to 10 mm		
		translucent 1–2 mm	honey	
		clear	coloured	
	cracks and inclusions < 50 %	translucent	coloured	3
		translucent up to 10 mm		
		translucent 1–2 mm	honey	
		opaque	milky-white	
			black	
	cracks and inclusions > 50 %	translucent	coloured	4
		translucent up to 10 mm		
		translucent 1–2 mm	honey	
		opaque	milky-white	
			black	

End of Table 2

clusions, the lower the level of transparency, which can also affect the aesthetic and commercial characteristics of this material.

The fourth level of amber classification is transparency (Table 2). The transparency of amber is an optical property that determines its ability to transmit light. This property is closely related to the presence or ab-

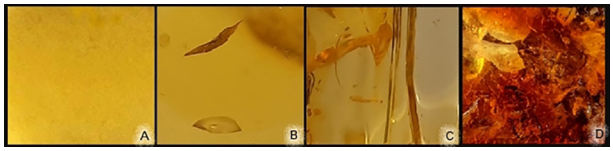

Fig. 2. Classification of specimens by cracking:
A – no cracks; B – single cracks; C – cracks up to 50 %; D – cracks over 50 %

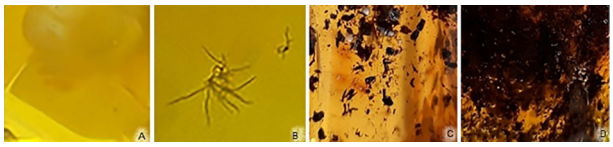

Fig. 3. Classification of inclusions in amber by their content:
A – no inclusions; B – single inclusions; C – inclusions up to 50 %; D – inclusions over 50 %

sence of inclusions in the amber structure [28]. For example, a large number of microscopic gas-liquid inclusions can give amber a white colour, while organic inclusions with a high degree of saturation can colour it grey with a brownish tint, dark grey or black. In this classification, for simplicity, we do not consider a separate level of inclusions.

According to the level of transparency, amber is divided into five main types (Fig. 4):

1. Transparent: completely transmitting light.
2. Translucent: characterised by turbidity in certain areas.
3. Transparent up to 10 mm: light passes through the material to a depth of 10 mm.
4. Translucent to a shallow depth: transmits light to a depth of 1–2 mm.
5. Opaque: does not transmit light.

Each of the distinguished varieties may contain amber with different fissures. For example, there may be transparent amber with single cracks or opaque amber with similar defects.

If we make calculations based on the following scheme: mass – shape – fissure – transparency – transparency, we can get the total number of classified taxa – 576 (Table 2).

Thus, after the analysis according to the fourth level of classification, it is already possible to speak with confidence about the quality of raw materials. For example, an amber sample weighing 4.9 grams, which has a flat shape, no cracks and high transparency, is suitable for the manufacture of highly artistic items such as intaglios and cameos.

The fifth level of amber classification is colour range (Table 2). The colour range of amber is an important aspect of its classification [29], as it significantly affects the aesthetic perception and preferences of consumers.

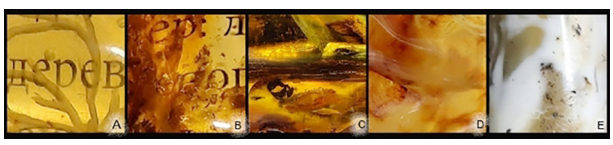

Fig. 4. Classification of amber by transparency level:
A – clear; B – translucent; C – transparent up to 10 mm; D – translucent up to 2 mm; E – opaque

Based on the above, colour can be considered as one of the key decorative properties that determines the value and attractiveness of the material.

Within the cost classification, there are four main colour segments of raw amber, ranked from the most expensive to the most affordable (Fig. 5):

1. Milky-white (Landscape) amber.
2. Honey amber.
3. Black amber.
4. Transparent-coloured amber (including lemon, cognac, brown, green and red shades) (Fig. 6).

The number of classification taxa based on such characteristics as weight, shape, fissure, transparency and colour is 536.

This underlines the diversity and complexity of amber classification, which makes it a subject of interest for both gemologists and collectors.

The sixth level of amber classification is inclusions (Table 2). These are inclusions of insects or other animals that were preserved in amber many millions of years ago [30]. Their study requires a specialised approach and extensive knowledge of palaeontology and mineralogy. Inclusions occur in three transparent types of amber, which usually contain cracks and other inclusions.

There are three categories of inclusions: common, rare and unique (Fig. 7). The value of inclusions is determined by such factors as the degree of preservation, rarity of the find and the uniqueness of individual specimens.

Thus, the gemological classification, based on the principle of hierarchy (sequence) of studying the properties of amber, is a configuration of scientific knowledge and meets the following criteria:

- it makes it possible to solve a set of tasks of different levels (technological, art historical, cultural, economic

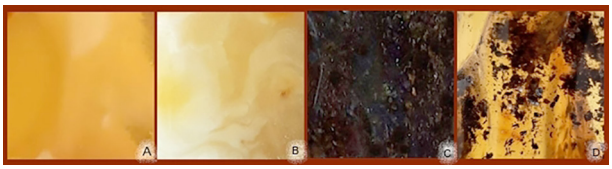

Fig. 5. Reference opaque amber specimens:
A – honey; B – milky-white (landscape); C – black; D – black-brown (Pompeii)

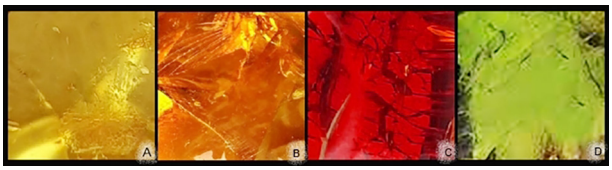

Fig. 6. Reference transparent-coloured shades of amber:
A – lemon; B – cognac; C – red; D – green

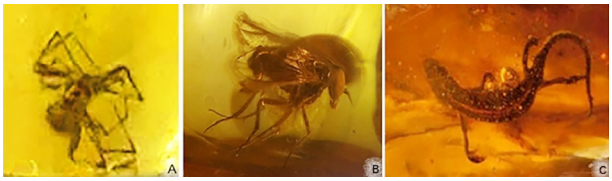

Fig. 7. Inclusions in amber:
A – ordinary; B – rare; C – unique

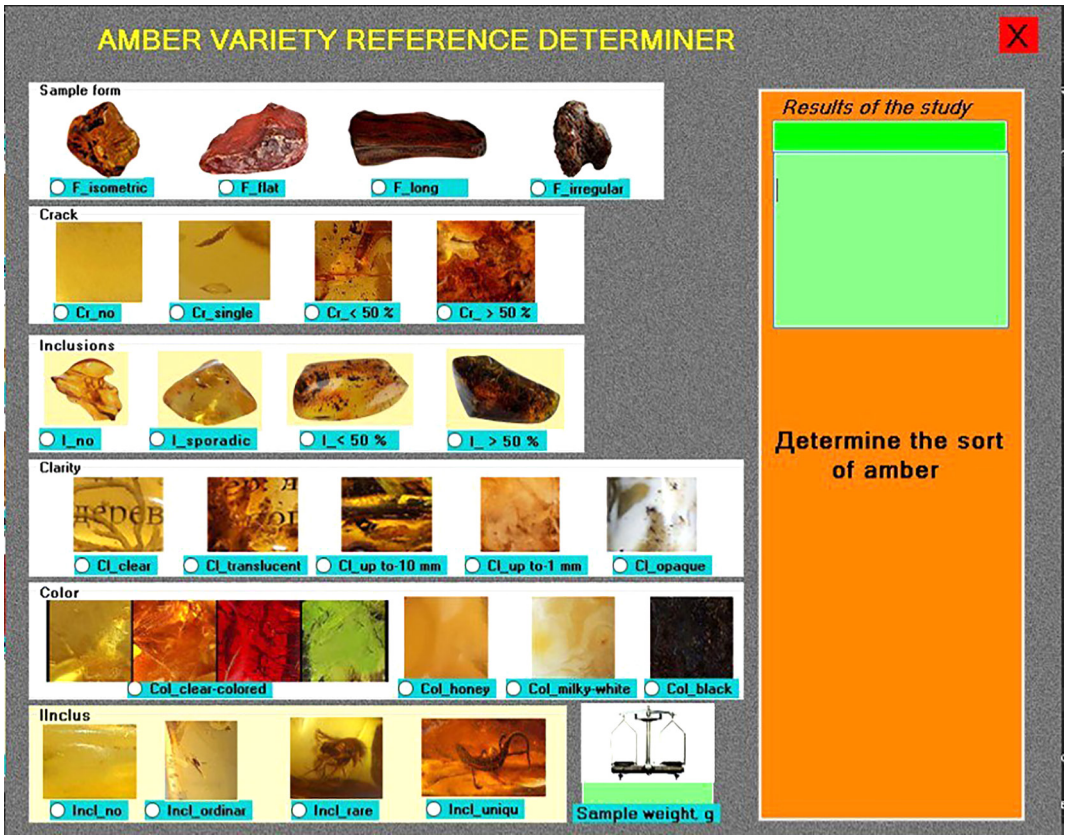

Fig. 8. Interface of the "Veriety" program

ones) for a wide range of subjects (designers, processors, technologists, economists);

- provides for the possibility of expanding the classified gemological properties and making the necessary changes to the classification algorithm;

- ensures the simplicity of maintaining the classifier, provided that it is used by competent knowledgeable experts in the established field of knowledge.

The proposed gemological classification is quite extensive and contains 536 classification taxa, which in paper and electronic versions takes up 13 pages of printed text.

To optimise the work with this classification, the "Veriety" software was developed, which significantly speeds up and simplifies the process of determining the amber grade, providing more objective results.

The main interface of the software includes six classification levels: the shape of the samples, the presence of cracks and inclusions, the degree of transparency and colour, and the presence of inclusions (Fig. 8).

Each level is accompanied by colour illustrations of reference samples that serve as standards for each of the amber properties, including colour, shape and the presence or absence of cracks. This, in turn, increases the objectivity in determining the quality of amber and, consequently, the accuracy of the classification of raw materials.

Let us consider how the software works on a specific sample of amber with the following properties: weight 9 g, flat shape, no cracks, transparent (no cracks or inclusions), lemon colour. In the interface panel, select: "RadioButton coloured". After clicking the 'Determine grade' button, the programme displays the following information: Grade 1, flat shape, no cracks, transparent, lemon colour.

The results of the analysis are saved in Word and SQL formats, which ensures their further use and processing.

Conclusions. The gemological classification is based on the hierarchy of studying the properties of raw amber: weight, shape, cracks, transparency, and colour. It provides comprehensive information about the quality of amber and its consumer properties. This, in turn, opens up opportunities for solving technological, art historical, cultural, and economic problems for geologists, miners, and processors.

The information obtained with the help of the proposed software is characterised by unambiguity, which ensures the reliability of the results in further research.

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Основні принципи побудови гемологічної класифікації бурштину-сирцю

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Мета. Провести комплексний аналіз бурштинового ринку й виявити ключові принципи побудови гемологічної класифікації бурштину-сирцю. Це дасть змогу отримати повну інформацію щодо якості бурштину та його споживчих властивостей, що, своєю чергою, створить підґрунтя для розв'язання як практичних, так і теоретичних завдань: визначення вартості сировини й готової продукції; виявлення закономірностей розвитку ринку бурштину.

Методика. Методологічну основу дослідження складають загальнонаукові аналітичні підходи. У рамках методології розроблено алгоритм класифікації, що дозволяє побудувати реляційну базу даних із можливістю автоматизації, систематизації, аналізу й візуалізації інформації на базі спеціалізованого програмного забезпечення.

Результати. На основі розроблених принципів класифікації виділені три категорії властивостей: розмірно-вагові, технолого-декоративні й декоративні. Вони є ключовими при визначенні якості бурштину, складанні геолого-економічних, технологічних і дизайнерських проєктів. Такий підхід дав змогу розробити гемологічну класифікацію, апробовану на конкретних об'єктах, що, своєю чергою, сприяло створенню алгоритму програмного забезпечення, яке спрощує роботу геологів, гірників та обробників.

Наукова новизна. Уперше розроблені основні принципи побудови гемологічної класифікації з урахуванням фундаментальних засад гемологічної науки, дизайну, обробки й оцінки бурштину.

Практична значимість. Критерії якості бурштину, що закладені в гемологічну класифікацію, важливі для геолого-економічної оцінки родовищ бурштину, складання прейскурантів із урахуванням споживчих властивостей, розроблення технологічних проєктів, аналізу ринку бурштину-сирцю.

Ключові слова: *бурштин, сировина, вироби, споживчі властивості, гемологічна класифікація, ринок бурштину*

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