ПРОБЛЕМИ ДОСЛІДЖЕННЯ РЕЧОВИХ ДОКАЗІВ
THE ISSUES OF PHYSICAL EVIDENCE RESEARCH

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THE EXPERT ASSESSMENT OF SEMI-PRECIOUS STONES (ON THE EXAMPLE OF THE PEGMATITES OF THE DEPOSITS OF THE YELISEYEVSKY ORE FIELD)

The purpose of the article is to characterize the problematic issues of regulatory and legal support for the circulation of semi-precious stones with regard to improving the assessment of their quality and value, to propose directions for their solution using the example of written pegmatites of the Eliseiv field. ***Methodology***. The methodological basis of the research is general scientific and special methods of scientific knowledge. The method of system-structural analysis made it possible to investigate the norms of domestic legislation regulating the extraction, production and use of precious and semi-precious stones, control over operations with them and the rules of their attestation, to express a number of critical remarks about the lack of regulations, technical instructions and price lists regarding pegmatite as a semi-precious stone stones of the second order. The use of statistical, mathematical, physical and other special research methods made it possible to investigate written pegmatite within the framework of forensic gemological examination in view of its physical, technological and aesthetic properties, as well as to distinguish groups based on established quality criteria. ***Scientific novelty***. The regulatory and legal problems are identifieded in the legislation of Ukraine in determining the status, cost, confinement to a specific deposit of semiprecious stones. On the example of pegmatites of the Eliseiv ore field, the solutions in the expert evaluation of semiprecious stones are proposed, including the identification of quality criteria, the creation of reference collections, the formation of price lists taking into account the consumer properties of products. ***Conclusions***. The legal framework in the field of regulation of extraction, production and use of precious and semi-precious stones, control over operations with them and their certification was analyzed. The problems of regulatory and legal provision of expert evaluation of semi-precious stones, in particular, written pegmatite as a semi-precious stone of the second order, are outlined. The cause-and-effect relationships of regulatory and legal support for the circulation of semi-precious stones in the context of improving the assessment of the quality and value of semi-precious stones (on the example of Eliseiv pegmatites) have been proven. Directions for solving the problems of regulatory and legal provision of expert evaluation of semi-precious stones are proposed using the example of written pegmatites of Eliseiv field. At the same time, it was established that written pegmatites are occur in different genetic types, but granite pegmatites are of greatest commercial interest due to their high decorative characteristics. The quality criteria of written pegmatites (color, size and shape of ichthyoglypts, smoothness, pattern) were defined, on the basis of which decorative varieties of pegmatites were selected: light pink, light brown, dot

purple, parquet pink, purple tiger, pink leopard, light gray, brown-pink looped). It was established that the absence of state standards (price lists, technical conditions, quality criteria) for pegmatite creates certain difficulties in observing the main principles of forensic examination – the completeness and objectivity of research. It has been proven that currently the most priority task is the development of methodological recommendations for the forensic gemological examination of semi-precious stones.

Keywords: legislation; forensic hemological examination; expert assessment; semi-precious stones; semi-precious stones of the second order; written pegmatite; quality criteria; reference collection; price lists.

Introduction

According to the legislation of Ukraine on state regulation of mining, production, use, storage of precious metals and precious stones and control over operations with them (*Verkhovna Rada Ukrainy,* 1997, Lystopad 18, Pro derzhavne rehuliuvannia vydobutku, st. 1) the written pegmatites are belong to semi-precious stones second order. At the same time, the any normative documents (technical conditions, price lists) that regulate the conduct of business activities in relation to it are missing.

In the world market, written pegmatite is not considered a semi-precious stone (*CIBJO*, 2020, Colored stone commission. 2020-12-1, The Gemstone Book, p. 26). But it has proven itself well as an interior and souvenir stone, which is widely used in decorative and artistic products. The written pegmatite is a branded stone with a bright commercial name for many companies. So, in the collection of the Madagascar company «Madagascar minerals» it can be found under the name «zebrodorite» (*Madagascar Minerals*®, n. d., Zebradorite Tumbled Stones), and the Italian company «Antolini» offers elite, highly artistic interior products from this stone high value (*Antolini*® ITALY, n. d., Antolini Collection / Natural Stone Collection).

At the Ukraine, pegmatites are in more than two thousand ore occurrences and in seven deposits (Hurskyi, Yesypchuk, Kalinin, Kulish, Nechaiev, Tretiakov, & Shumlianskyi, 2006). The geological and economic assessment of these deposits was carried out during the Soviet era and was aimed at the industrialization of the country, while stone-colored raw materials were almost not taken into account and were not a priority.

Therefore, these deposits are rated as ceramic, rare metal and rare earth minerals, although in fact they are complex, since they almost always contain decorative writing pegmatites as an accompanying stone-colored raw material.

Therefore, today written pegmatite as a term has a legal status, but it is impossible to determine its belonging to semi-precious stones, since there are no criteria for confirming this. That is, written pegmatite is currently allegedly outlawed.

However, being in an uncertain legal field (Smorodynskyi, 2020; Vasyliev, 2021; Mytoshop, 2022), it is difficult, if not impossible, for an expert to carry out an objective expert assessment of written pegmatite, to determine its true value. To solve these problems, research was conducted to identify the main quality criteria of written pegmatite as a semi-precious stone.

The purpose and objectives of the study

The purpose of the article is to characterize the problematic issues of regulatory and legal support for the circulation of semi-precious stones in terms of improving the assessment of their quality and value, to suggest directions for their solution using the example of the written pegmatites of the Eliseiv field.

To achieve this goal, it is necessary to perform the following tasks:

to outline the problems of regulatory and legal provision of expert evaluation of semi-precious stones;

to propose directions for solving the problems of regulatory and legal provision of expert evaluation of semi-precious stones using the example of written pegmatites of the Eliseiv field, for which, to establish the genetic types of written pegmatites and to determine the criteria for the selection of decorative written pegmatites of the Eliseiv ore field, also to initiate quality criteria for decorative varieties of pegmatites and consider the possibility of compiling reference collection of decorative varieties of written pegmatites, etc.;

to provide appropriate proposals for the forensic gemological examination of semi-precious stones.

Presentation of the main material

The problems of regulatory and legal provision of expert evaluation of semi-precious stones, in particular written pegmatite. According to the amendments to the order of the Ministry of Justice of Ukraine dated October 8, 1998 No 53/5, introduced by the order of the Ministry of Justice of Ukraine dated January 10, 2019 No 83/5 (*Ministerstvo yustytsii Ukrainy*, 2019, Sichen 10, Pro vnesennia zmin), Scientific-methodical recommendations on the preparation and appointment of forensic examinations and expert studies are supplemented by section XI (Gemological examination), which stipulates that «objects of gemological examination are precious stones, diamonds, precious stones of organogenic origin, semi-precious stones, decorative stones and articles of it, jewelry with stone inserts and raw materials (diamond, amber etc.)» (*Ministerstvo yustytsii Ukrainy*, 1998, Zhovten 08, Naukovo-metodychni rekomendatsii, rozd. XI, p. 11.1).

In addition, an approximate list of resolved issues of forensic gemological examination is provided (*Ministerstvo yustytsii Ukrainy*, 1998, Zhovten

08, Naukovo-metodychni rekomendatsii, rozd. XI, p. 11.3), which for objective reasons (there is a lack of information on written pegmatites as semi-precious stones), the expert cannot give an answer (Table 1), which makes it impossible to conduct a complete and objective forensic gemological examination.

Table 1

Possibilities of forensic hemological examination
(order of the Ministry of Justice of Ukraine of January 10, 2019 No 83/5)

No	List of resolved issues, which are applied during the forensic hemological examination	How can an expert who conducts a forensic hemological examination answer?
1	Are the stones sampled for examination precious, decorative, natural, synthetic, or imitation? If so, which one exactly?	It is impossible to determine the status of the stones due to the lack of criteria for the quality of written pegmatite as a semi-precious stone
2	What are the quality characteristics of the stone samples provided for the study?	It is impossible to give an answer about the qualitative characteristics of the studied pegmatites due to their absence
3	What is the origin of the stone samples provided for the study?	It is impossible to determine the origin of the studied stone samples, since at this time there is no information about the genetic types of deposits of decorative pegmatites
4	From which deposit was the decorative stone provided for research mined?	It is impossible to give an answer due to the lack of information about the dating of decorative pegmatites to specific deposits
5	What is the value of stones provided for research?	It is impossible to determine the value of written pegmatite due to the lack of price lists for it
6	Do the marking data correspond to the actual product characteristics of the stones?	It is impossible to determine the conformity of the marking data with the current product characteristics of written pegmatite due to the lack of such for it as a semi-precious stone
7	Does the quality of the stone product meet the requirements of standards, technical conditions according to organoleptic indicators?	It is impossible to determine with the help of organoleptic indicators the conformity of the quality of pegmatite products with the requirements of standards and technical conditions due to the lack of such for written pegmatite

Therefore, it is timely to develop normative documents, that will allow to evaluate written pegmatite (this problem is relevant for all semi-precious stones) in accordance with the Law of Ukraine «On state regulation of mining, production and use of precious metals and precious stones and control over operations with them» as semi-precious stones second order.

Genetic types of written pegmatites. Pegmatite as a natural stone is formed under certain geological conditions and belongs to two genetic groups – fluid-magmatogenic and fluid-metamorphogenic (Shavlo, Kirikilitca, & Kniazev, 1984, s. 32; Lv, Zhang, Tang, & Guan, 2012; Lv, Zhang, & Tang, 2020; Plunder, Pourhiet, Räss, Gloaguen, Pichavant, & Gumiaux, 2022).

Magmatic pegmatites are late-magmatic formations that are close in composition to the original intrusion. Intrusions with high acidity or alkalinity, complete differentiation and multiphase introduction are characterized by the greatest pegmatite bearing. Among them, four mineralogical-geochemical types are distinguished: granitic, hybrid (calcified), alkaline and ultrabasic.

Metamorphogenic pegmatites were formed at various stages of metamorphic transformation, mainly of ancient Precambrian rocks, in regressive stages of high facies of regional metamorphism and are not associated with magmatic complexes. They develop within granitogneiss blocks of ancient platforms and are controlled by fault structures. They are represented by ceramic recrystallized pegmatites and rare-earth types of granite pegmatites, formed in the conditions of the andalusite-sillimanite facies, and form tantalum-niobium and rare-earth deposits. This type of pegmat serves as a source of Li, Cs, Be, Ta, Sn, as well as aquamarine, heliodor, topaz, etc.

The majority of pegmatites are associated with magmatic intrusions of granitoids and are composed mostly of orthoclase, microcline, quartz, albite, oligoclase, and biotite. The following are present as additional minerals (mainly useful or ore mineralization): muscovite, tourmaline, garnet, topaz, beryl, lepidolite

(Li), spodumene (Li), fluorite, apatite, minerals of rare metals, radioactive elements and rare earths (TR).

These pegmatites are divided into two groups:

simple undifferentiated – composed mainly of microcline and quartz;

complex differentiated are characterized by a zonal structure and the presence of several zones and areas of mineral accumulations (from the periphery to the center): an outer fine-grained muscovite-quartz-feldspar border several centimeters thick; quartz-feldspar aggregate with a graphic and granite-like (indistinct) structure; blocks of coarse-grained microcline; quartz core; anomalous accumulations of quartz, albite, spodumene, manganese minerals and rare metals.

Granite pegmatites include ceramic, mica, rare and rare earth mineral varieties.

Magmatogenic and metamorphogenic simple and recrystallized pegmatites composed of K-Na-feldspars and quartz are considered ceramic. The ratio of quartz and feldspars in industrial grades of raw materials is 1:3. The structure is written, granitoid and giant-grained. It is developed as a feldspar raw material for the ceramic and glass industry.

Mica pegmatites are formed at great depths (more than 6 km) and consist of plagioclase, microcline, quartz, muscovite, biotite, black tourmaline, apatite, and beryl. Compared to other pegmatites, they are poor in mineral species and serve as a source of sheet muscovite, ceramic materials – microcline and quartz, which form significant deposits with graphic structures.

Rare-metal and rare-earth pegmatites are formed at medium depths (from 4 to 6 km), contain microcline, quartz, albite, sometimes spodumene, muscovite, lepidolite, and beryl, as well as colored tourmalines, columbite, tantalite, cassiterite, plucite, and plucite-replacement (albitization, greisenization). Rare metal pegmatites are represented by magmatogenic and metamorphogenic metasomatically replaced pegmatites. Magmatic deposits form tantalum and niobium deposits, small deposits of tin, tungsten, uranium, thorium, and rare earths.

Crystal-bearing pegmatites formed at relatively shallow depths (from 3 to 4 km) contain microcline, quartz, as well as albite, muscovite, biotite; serve as a source of obtaining rock crystal (piezo-optical raw material) and optical fluorite, sometimes topaz, beryl, amethyst, which are located on the walls of cavities in quartz zones of veins.

Of the genetic types listed above, granite pegmatites are of greatest interest, in which graphic textures of large volumes are widely and vividly displayed.

Criteria for the selection of decorative writing pegmatites of the Eliseiv ore field. In order to distinguish decorative varieties of written pegmatites among numerous pegmatite manifestations, the pegmatites of the Eliseiv ore field of the Western Azov region of the Ukrainian shield were studied, among which the «Balka Velikiy Tabor» deposit is the most studied and developed as a feldspar raw material. It was established that veins with pegmatite of a graphic structure are widely developed in the deposit. A detailed analysis of the works of the past years (Dehtiar, 2006) proved that the selected written pegmatites were evaluated as stone-colored raw materials according to OST 41-01-143-79 «Mineraly i gornye porody dlia kollektcii» (*Ministerstvo geologii SSSR*, 1979, OST 41-01-143-79), ТУ 41-07-051-89 «Plitka dekorativnaia iz prirodnykh tcvetnykh kamnei» (*Ministerstvo geologii SSSR*, 1989, TU 41-07-051-84), ТУ 41-07-052-90 «Kamni tcvetnye prirodnye v syre» (*Ministerstvo geologii SSSR,* 1990, TU 41-07-052-90).

Research of the state-owned enterprise Yuzhukrgeology on the study of written pegmatites with the aim of using them in the stone-working industry and the jewelry industry has shown that the yield of conditioned raw materials (size from 50 x 50 x 5 mm to 200 x 300 x 40 mm) is on average 55–56 % of the deposit's reserves. That is, today a full assessment of the decorativeness of written pegmatites is economically expedient and relevant, as it makes it possible to transfer a significant part of ceramic raw materials to the rank of stone-colored by complex development of pegmatite deposits without investing huge funds.

In order to determine the main criteria for the selection of decorative varieties of pegmatites from the «Balka Velikiy Tabor» deposit, their decorative properties were evaluated. It should be emphasized that the method of studying written pegmatite involved field, chamber and laboratory work. That is, the decorativeness of pegmatites was first assessed directly at the deposit during field observations, and then laboratory studies are conducted to adjust the category of decorativeness as new information about the stones is obtained.

During the gemological evaluation of written pegmatite, the physical and technological (hardness, cracking, cleavage, smoothness, geometric parameters – size and shape) and aesthetic properties of natural stones (color, texture pattern, various surface effects) are determined, which determine its true value.

Our research has shown that, due to the high hardness of the rock-forming minerals (quartz – 7, microcline – 6, on the Mohs scale), the written pegmatites of the studied deposit are well amenable to processing with a diamond tool (cutting, grinding and polishing). Even minor defects in stone (cracks and fissures, which complicate the technological process of processing) determine the method of its processing. For example, some difficulties during the processing of written pegmatites are caused by the perfect cleavage of feldspars (stones can chip along the cleavage

planes in the process of processing, causing the formation of a rough surface), which requires the selection of diamond powder according to the size of the fraction and hardness. That is, the polishability (the ability to take mirror-smooth polishing) of this stone and the absence of cracks determine the suitability of written pegmatite for use in the stone-cutting and jewelry industry. The polished surface enhances its textural pattern, formed by intergrowths of clear and smoky quartz in feldspars. The quality of polishing is expressed by the percentage of the area of the mirror surface and makes it possible to distinguish three varieties of written pegmatite as one of the criteria for its decorativeness (Fig. 1).

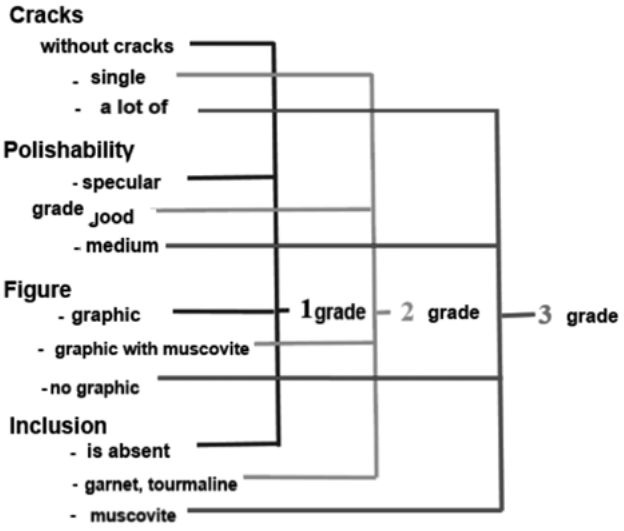


Fig. 1
Scheme for determining the quality (grade) of pegmatites

Thus, the 100 % polished surface and the absence of cracks prove that pegmatite belongs to the first grade, which enables its use in the jewelry industry in the form of jewelry inserts.

The second grade of pegmatites are varieties with a minimum number of cracks, their polished surface is 70–90 %.

The third grade is characterized by pegmatite with a polished surface of 30–60 % and cracking that does not violate the integrity of the stones.

Therefore, the set of physical and technological properties (hardness, cracking, fissure, geometric parameters – size and shape, smoothness), which made it possible to classify written pegmatites by grade, is one of the most important quality criteria of written pegmatites of the Eliseiv ore field.

At the same time, the shape and size of fragments or samples of written pegmatites also significantly affect their qualitative characteristics. This criterion makes it possible to assess the possibility of using written pegmatites as a material for decorative and artistic products, distinguishing the following size groups: 1–2 cm, 2–5 cm, 5–30 cm. Fragments of written pegmatites are presented in various forms: isometric, lamellar, elongated and irregular. That is, the shape and size of the stone-colored raw materials actually determine the shape and size of the finished product.

In addition, when clarifying the scope of application, the size of texture-creating elements (quartz ichthyoglypts) is taken into account. According to the size of the quartz inclusions in the feldspars of the written pegmatites of the Eliseiv field are distinguished: giant (from 10 to 30 mm); large (5–10 mm); medium (2–5 mm); small (up to 2 mm); elongated (length 5–10 mm or more, width 1 mm).

The aesthetic properties (pattern, color) of pegmatite carry beauty and artistry, and directly affect the cost of stones and products made from it.

The studied written pegmatites of the deposit are distinguished by a variety of patterns and shade variations of pink-red and light beige colors, which is due to the presence of microcline, often with a pearly tint, characteristic of cleavage planes of feldspars. The color of microcline depends on the presence of impurities of chromophore elements in the mineral structure (Platonov, Platonova, & Geleta, 2000, p. 5): the pink-red color of microcline is given by trivalent iron oxides, and yellowness and reddish-brown the shade corresponds to its hydroxides – goethite. A decrease in the concentration of pigmenting phases leads to discoloration. The appearance of a lilac shade is caused by an admixture of titanium.

The colors of written pegmatites are light pink, pink, light red, deep pink with a brown tint, deep pink with a purple tint, and light beige colors. The color of the pegmatite is closely related to the color of the quartz ichthyoglypts, since the lighter the pattern, the more contrasting the ichthyoglypts. Accordingly, the main advantage of written pegmatite comes to the fore – graphic drawing.

Reference collection of written pegmatites. Using the textural and color feature as a criterion for evaluating the quality of written pegmatites, we distinguished the following decorative varieties of pegmatites: pale pink; light brown; point violet; parquet-like pink; purple tiger; pink leopard; light gray; brown-pink looped (Fig. 2).

The textural pattern of stones, determined by a number of characteristics of quartz ichthyoglypts (size, shape, orientation in feldspar, clarity of contours and similarity of the pattern with ancient Hebrew and Arabic writing), is also a criterion for evaluating the quality of written pegmatite and makes it possible to distinguish four types of decorative varieties (Table 2), which determine the scope of their application in industry.

In addition, the criteria for the quality of written pegmatites are physical and mechanical resistance (abrasion resistance, frost resistance, strength, hardness, brittleness), chemical resistance of pegmatite

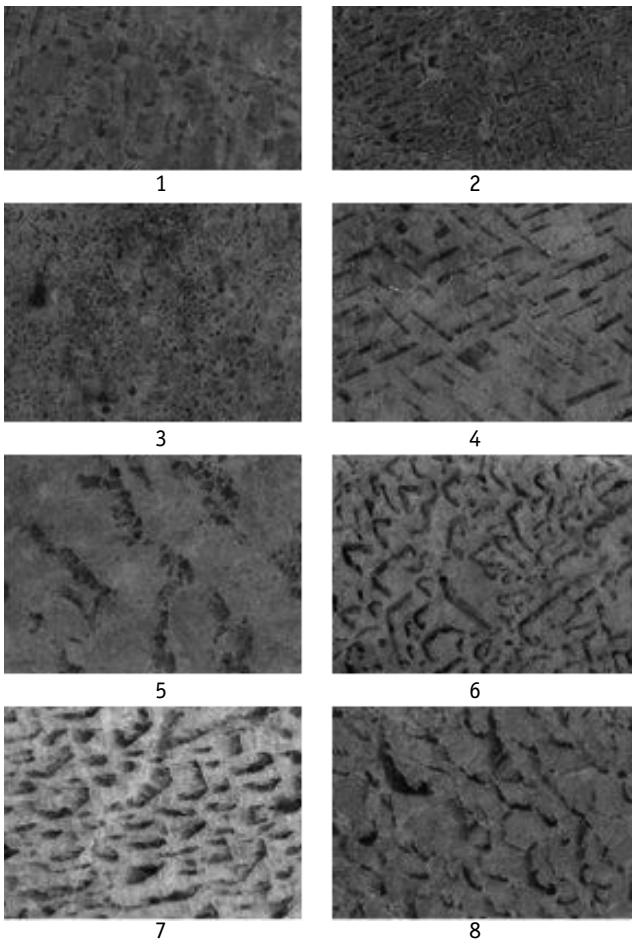


Fig. 2
Decorative varieties of pegmatites of the «Balka Velikiy Tabor» deposit: 1 – pale pink; 2 – light brown; 3 – spot purple; 4 – parquet-like pink; 5 – purple tiger; 6 – pink leopard; 7 – light gray; 8 – brown-pink looped

(resistance of stones to chemically active substances – acids, alkalis, to the action of the atmosphere) and its suitability for use after making jewelry and decorative art products. An example can be the radiation activity of written pegmatites of the «Balka Velikiy Tabor» deposit – from 280,4 to 294,3 Bq/kg, which is less than the permissible (370 Bq/kg) value. So, these stones can be used for finishing works.

Separated groups of pegmatite varieties are, in fact, a reference collection, according to which extraction from a deposit of already marketable pegmatite will be carried out.

However, according to the authors, it is most rational in the process of field and laboratory research, as well as during expert evaluation of semi-precious stones, to use a catalog or atlas of written pegmatites, which includes all decorative varieties of these natural stones. The creation of such an atlas, which is current today, is a possible solution, taking into account the proposed criteria for evaluating the quality of decorative varieties of written pegmatites of the studied pegmatite field.

Directions for improving the regulatory and legal provision of the procedure of expert evaluation of written pegmatite as a semi-precious stone of the second order. Decorative writing pegmatites of the Eliseiv ore field, which are an integral component of ceramic pegmatites, are currently mined as cheap ceramic (feldspar) raw materials, which causes irrational use of the mineral and raw material base of Ukraine. After all, there is a lack of economic evaluation of written pegmatite as a semi-precious stone, besides, the scope of its application, technological features of extraction and processing are not defined (Nesterovskii, 2003; Heleta, & Serhiienko, 2005; Ryshchenko, Fedorenko, Firsov, Chyrkina, & Mikheienko, 2010; Fuchsloch, Nex, & Kinnaird, 2018; Duuring, 2020; Bhandari, Qin, Zhou, & Evans, 2022).

A concise analysis of the economic assessment of the «Balka Velikiy Tabor» deposit proved that among the total reserves of written pegmatites (5152 m^3), decorative varieties of pegmatite with a graphic texture make up 1717,3 m^3, which corresponds to 4,292,500 kg. It was established that the cost of ceramic raw materials ($429 337,5) is almost ten times lower than the cost of decorative pegmatites. And considering the range of possible finished products from decorative pegmatite, the value of the pegmatite deposit «Balka Velikiy Tabor» will amount to $429 250 000, exceeding by hundreds of times the initial indicators of the geological and economic assessment (Slyvna, & Baranov, 2015, p. 77). These rough calculations to demonstrate the importance of the direction of transfer of writing pegmatite from ceramic to stone-colored raw materials.

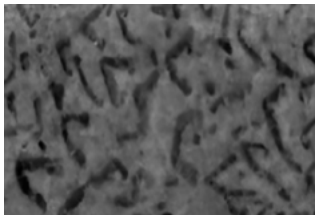
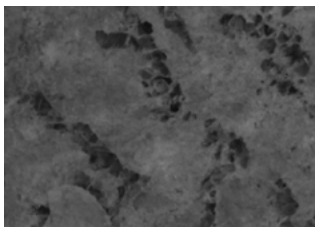
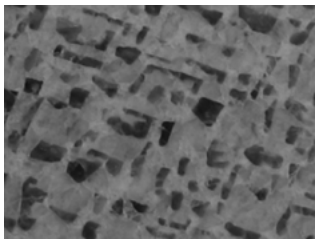
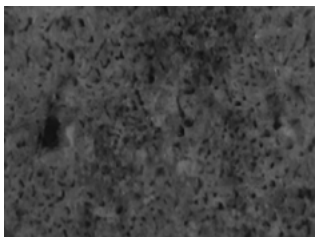
Therefore, solving the problem of the development of the mineral and raw material base of Ukraine as a material basis for the growth of the national economy (*Verkhovna Rada Ukrainy,* 2011, Kviten 21, Zahalnoderzhavna prohrama rozvytku), based on a balanced systemic approach to its expansion, in particular thanks to the balanced use of new types of minerals , it is necessary to urgently re-evaluate known and evaluate new pegmatite deposits, recognizing written pegmatites as stone-colored raw materials. At the same time, it is necessary to develop regulatory documents (price lists, atlases) for this type of raw material (decorative varieties of written pegmatite), in our opinion, with the help of software, taking into account the cost of already finished products.

In order to improve the evaluation of the quality and value of written pegmatite as a semi-precious stone, it is necessary to develop a model of rational use of decorative pegmatites of the Eliseiv ore field. To do this, it seems worth applying the sequence of geological and industrial quality assessment of decorative varieties of written pegmatites on the example of the «Balka Velikiy Tabor» deposit.

It is known that the «Balka Velikiy Tabor» deposit has been assessed as a ceramic raw material, and

Table 2

Decorative varieties of written pegmatites of the Eliseiv Field

Varieties	General appearance	Short characteristics of pegmatite
1		Perfectly clear ichthyoglypts up to 10 mm in size, have a shape reminiscent of ancient Hebrew and Arabic writing. The color of feldspar is pale pink
2		Clear ichthyoglypts up to 7 mm in size, have a lamellar shape. The color of feldspar is pink-red with pale orange shades
3		Indistinct ichthyoglypts with blurred borders measuring up to 40 mm or more. The color of feldspar is pink-gray with a purple tint
4		Needle ichthyoglypts up to 2 mm in size. Brown-red color of feldspar with a purple tint, with a faint graphic pattern

a certain extraction technology has been approved. Accordingly, the method of selection of decorative pegmatite at the deposit should be based on current technologies (Baranov, Tcotcko, & Shevchenko, 2012). Therefore, only selective selection of decorative varieties of pegmatite is possible, which does not violate technologies and does not affect the extraction of a useful component, and the cost of extraction, which is reduced to the selection of stones and its sorting, is 1–2 % of the cost of commercial pegmatite.

To effectively sort stones, you need to know the market range of products from this type of raw material and the requirements for them. Therefore, at this stage, which, in fact, depends on the quality of the final product (products), it is necessary to involve a specialist who knows the technology of processing written pegmatite. Such recommendations are also valid for the rest of the semi-precious stones.

The next stage should be the direct study of the selected samples in laboratory conditions. For this purpose, the authors propose to use the method of hemological assessment of the quality of written pegmatite, presented in the form of a scheme for determining their grade (Fig. 1).

Therefore, the initiated quality criteria of decorative types of pegmatites make it possible to rationally use written pegmatite not only as a raw material for the ceramic and glass industry, but also as a semi-precious stone. For this, in the near future, the development of value prices for decorative pegmatites should be started in the context of improving the current system of regulatory and legal support for the circulation of semi-precious stones.

Recommendations for expert evaluation of written pegmatites. Pegmatite is mined in large quantities on the territory of Ukraine as a ceramic raw material. At the same time, it is not represented on the European market as a stone-colored raw material. That is, in Europe, pegmatite is not considered a semi-precious stone, and the term «semi-precious» is not used according to CIBJO standards.

Today, Ukraine has an ambiguous situation in the field of forensic gemological examination of pegmatite as a semi-precious stone of the second order, since the lack of state standards for this stone creates certain difficulties for forensic examination in determining the quality of its raw materials, pricing policy and certification.

Analyzing the above, as well as the problems of modern legislation in the field of semi-precious stones, for a full-fledged expert evaluation of written pegmatite, the issue of developing methodical recommendations for conducting its forensic gemological examination becomes especially relevant.

Scientific novelty

Regulatory and legal problems in the legislation of Ukraine in terms of determining the status of semi-precious stones, their value, belonging to a specific deposit, etc. are outlined. Directions for their solution in the expert evaluation of semi-precious stones on the example of pegmatites of the Eliseiv ore field are proposed, including the identification of quality criteria, the creation of reference collections, the formation of price lists, taking into account the consumer properties of products.

Conclusions

1. The legal framework in the field of regulation of extraction, production and use of precious and semi-precious stones, control over operations with them and their certification was analyzed. The problems of regulatory and legal provision of expert evaluation of semi-precious stones, in particular, written pegmatite as a semi-precious stone of the second order, are outlined. The cause-and-effect relationships of regulatory and legal support for the circulation of semi-precious stones in the context of improving the assessment of the quality and value of semi-precious stones (on the example of Eliseiv pegmatites) have been proven.

2. Directions for solving the problems of regulatory and legal provision of expert evaluation of semi-precious stones are proposed using the example of written pegmatites of the Eliseiv field. At the same time, it was established that written pegmatites occur in different genetic types, but granite pegmatites are of greatest commercial interest due to their high decorative characteristics. Quality criteria of written pegmatites (color, size and shape of ichthyoglypts, smoothness, pattern) were defined, on the basis of which decorative varieties of pegmatites were selected (soft pink, soft brown, dot purple, parquet pink, purple tiger, pink leopard, light gray, brown-pink looped). It was established that the absence of state standards (price lists, technical conditions, quality criteria) for pegmatite creates certain difficulties in observing the main principles of forensic examination – the completeness and objectivity of research.

3. It has been proven that currently the most priority task is the development of methodological recommendations for the forensic gemological examination of semi-precious stones.

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ЕКСПЕРТНЕ ОЦІНЮВАННЯ НАПІВДОРОГОЦІННОГО КАМІННЯ (НА ПРИКЛАДІ ПЕГМАТИТІВ РОДОВИЩ ЄЛИСЕЇВСЬКОГО РУДНОГО ПОЛЯ)

Мета статті – схарактеризувати проблемні питання нормативно-правового забезпечення обігу напівдорогоцінного каміння щодо вдосконалення оцінювання його якості та вартості, запропонувати напрями їх розв'язання на прикладі письмових пегматитів Єлисеївського поля. ***Методологія***. Методологічну основу дослідження становлять загальнонаукові та спеціальні методи наукового пізнання. Метод системно-структурного аналізу дозволив дослідити норми вітчизняного законодавства, що регулює видобуток, виробництво та використання дорогоцінного та напівдорогоцінного каміння, контроль за операціями з ним та правила його атестації, висловити низку критичних зауважень про відсутність нормативних актів, технічних вказівок та прейскурантів щодо пегматиту як напівдорогоцінного каміння другого порядку. Використання статистичних, математичних, фізичних та інших спеціальних методів дослідження дозволило дослідити письмовий пегматит у межах судової гемологічної експертизи з огляду на його фізико-технологічні та естетичні властивості, а також виокремити групи декоративних різновидів на основі встановлених критеріїв якості. ***Наукова новизна***. Окреслено нормативно-правові проблеми в законодавстві України в частині визначення статусу напівдорогоцінного каміння, його вартості, належності до конкретного родовища тощо. Запропоновано напрями їх вирішення в експертній оцінці напівдорогоцінного каміння на прикладі пегматитів Єлисеївського рудного поля, серед яких виявлення критеріїв якості, створення еталонних колекцій, формування прейскурантів, зважаючи на споживчі властивості виробів. ***Висновки***. Проаналізовано нормативно-правову базу у сфері регулювання видобутку, виробництва та використання дорогоцінного та напівдорогоцінного каміння, контролю за операціями з ним та його атестації. Окреслено проблеми нормативно-правового забезпечення експертного оцінювання напівдорогоцінного каміння, зокрема й письмового пегматиту як напівдорогоцінного каменя другого порядку. Засвідчено причинно-наслідкові зв'язки нормативно-правового забезпечення обігу напівдорогоцінного каміння в контексті вдосконалення оцінювання якості та вартості напівдорогоцінного каміння (на прикладі Єлисеївських пегматитів). Запропоновано напрями розв'язання проблем нормативно-правового забезпечення експертного оцінювання напівдорогоцінного каміння на прикладі письмових пегматитів Єлисеївського поля. При цьому встановлено, що письмові пегматити трапляються в різних генетичних типах, але найбільший комерційний інтерес становлять гранітні пегматити завдяки своїм високим декоративним характеристикам. Визначено критерії якості письмових пегматитів (колір, розмір і форма іхтіогліптів, поліровність, рисунок), на підставі яких виділені декоративні різновиди пегматитів: ніжно-рожевий, ніжно-коричневий, точковий фіолетовий, паркетоподібний рожевий, фіолетовий тигровий, рожевий леопард, світло-сірий, коричнево-рожевий петельчастий. Констатовано, що відсутність державних стандартів (прейскурантів, технічних умов, критеріїв якості) на пегматит створює певні труднощі в дотриманні основних принципів судової експертизи – повноти та об'єктивності досліджень. Засвідчено, що наразі чи не найпріоритетнішим завданням є розроблення методичних рекомендацій щодо проведення судової гемологічної експертизи напівдорогоцінного каміння.

Ключові слова: законодавство; судова гемологічна експертиза; експертне оцінювання; напівдорогоцінне каміння; напівдорогоцінне каміння другого порядку; письмовий пегматит; критерії якості; еталонна колекція; прейскуранти.

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ЭКСПЕРТНАЯ ОЦЕНКА ПОЛУДРАГОЦЕННЫХ КАМНЕЙ (НА ПРИМЕРЕ ПЕГМАТИТОВ МЕСТОРОЖДЕНИЙ ЕЛИСЕЕВСКОГО РУДНОГО ПОЛЯ)

Цель статьи – охарактеризовать проблемные вопросы нормативно-правового обеспечения обращения полудрагоценных камней в контексте усовершенствования оценки его качества и стоимости, предложить пути их решения на примере письменных пегматитов Елисеевского поля. ***Методология***. Методологическую базу исследования составляют общенаучные и специальные методы научного познания. Метод системно-структурного анализа позволил исследовать нормы отечественного законодательства, регулирующего добычу, производство и использование драгоценных и полудрагоценных камней, контроль за операциями с ними и правила их аттестации, высказать ряд критических замечаний об отсутствии нормативных актов, технических указаний и прейскурантов для пегматита как полудрагоценного камня второго порядка. Использование статистических, математических, физических и других специальных методов исследования позволило исследовать письменный пегматит в рамках судебной геммологической экспертизы с учетом его физико-технологических и эстетических свойств, а также выделить группы на основе установленных критериев качества. ***Научная новизна***. Обозначены нормативно-правовые проблемы в законодательстве Украины в части определения статуса полудрагоценных камней, стоимости, принадлежности к конкретному месторождению. Предложены направления их решения в экспертной оценке полудрагоценных камней на примере пегматитов Елисеевского рудного поля, среди которых выявление критериев качества, создание эталонных коллекций, формирование прейскурантов, учитывая потребительские свойства изделий. ***Выводы***. Проанализирована нормативно-правовая база в сфере регулирования добычи, производства и использования драгоценных и полудрагоценных камней, контроля за операциями с ними и их аттестации. Обозначены проблемы нормативно-правового обеспечения экспертной оценки полудрагоценных камней, в том числе и письменного пегматита как полудрагоценного камня второго порядка. Обоснованы причинно-следственные связи нормативно-правового обеспечения обращения полудрагоценных камней в контексте усовершенствования оценки качества и стоимости полудрагоценных камней (на примере Елисеевских пегматитов). Предложены пути решения проблем нормативно-правового обеспечения экспертного оценивания полудрагоценных камней на примере письменных пегматитов Елисеевского поля. При этом установлено, что письменные пегматиты встречаются в разных генетических типах, но наибольший коммерческий интерес представляют

гранитные пегматиты благодаря своим высоким декоративным характеристикам. Определены критерии качества письменных пегматитов (цвет, размер и форма ихтиоглиптов, полируемость, рисунок), на основании которых выделены декоративные разновидности пегматитов: нежно-розовый, нежно-коричневый, точечный фиолетовый, паркетообразный розовый, фиолетовый тигровый, розовый леопард, светло-серый, коричнево-розовый петельчатый. Констатировано, что отсутствие государственных стандартов (прейскурантов, технических условий, критериев качества) на пегматит создает определенные трудности при соблюдении основных принципов судебной экспертизы – полноты и объективности исследований. Подтверждено, что сегодня едва ли не самой приоритетной задачей является разработка методических рекомендаций по проведению судебной геммологической экспертизы полудрагоценных камней.

Ключевые слова: законодательство; судебная геммологическая экспертиза; экспертная оценка; полудрагоценные камни; полудрагоценные камни второго порядка; письменный пегматит; критерии качества; эталонная коллекция; прейскуранты.