

FINISHING MATERIALS FOR FACADES AND INTERIORS OF ART NOUVEAU BUILDINGS. EXAMPLES OF UKRAINE AND POLAND

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Abstract

The article is devoted to the study of building materials for Art Nouveau buildings in the cities of Ukraine and Poland and the experience of their restoration using modern materials and technologies. Considering the vastness of Art Nouveau (Secession style) heritage in Ukraine and Poland, the authors limited themselves to only one narrow aspect – finishing materials and four cities – Kyiv, Kharkiv, Cracow and Lodz. The example of Rodzianko's apartment in Kyiv shows what finishing materials were used at the beginning of the 20th century. The buildings of the northern national romanticism, in which natural raw stone was widely used, were distinguished by the specifics of the decoration. The Polish Art Nouveau version formed in the mainstream European trends and under the direct influence of the Vienna Secession. On the example of objects in Cracow and Lodz, different methods of finishing the facades of buildings with various functional purposes were shown. The scientific novelty of the article is the analysis of the chemical compositions of paints and plasters of the Secession period, and modern methods of restoration of such objects.

Keywords: Art Nouveau, Facades and interiors, Finishing materials, Kyiv, Kharkiv, Cracow, Lodz, Restoration.

Introduction

The purpose of the article is to draw the attention of specialists to the issue of finishing materials in the restoration of architectural monuments. On the example of Kyiv and Kharkiv buildings from the 19th – 20th centuries, it is demonstrated how the original decoration and colour of the building are gradually distorted, details are lost, and the reliefs are altered in the process of subsequent repairs. Today, it is impossible to establish the initial colour of the facades of houses in Kyiv, Kharkiv, and Cracow without a detailed chemical and technical examination of the colourful layers. There is an issue typical for many countries: if a building was repeatedly re-plastered and repainted during its existence, is it necessary to recreate the original finishing and colour scheme during the restoration, or to use materials as close to the original as possible? Is it possible not to be tied to the initial colour of the facades and use modern colourful materials, similar in colour to the original, but with a different chemical composition? Another problem is related to the period for which the colour of the facade should

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be repeated, and whether it should be reproduced if it was initially unsuccessful. All these items gave reason to discuss the specificity of finishing materials on the cusp of the 19th and 20th centuries, and the experience of restoration accumulated in Ukraine and Poland.

Art Nouveau buildings make up an extensive part of the historical heritage of the cities in Ukraine and Poland, so the authors sought to show the common and the differences between them, choosing only one specific aspect – finishing materials and decor.

The Art Nouveau inheritance includes buildings of various functional purposes, which resulted from a variety of sources. It was taken into account that the stylistics of historicism and local cultural traditions often layered on the Secession stylistics, which was generally typical not only for Europe but also for the settlements in China and Japan.

The problem of the revalorization of Art Nouveau architecture in the countries of Europe and Eastern Europe is currently very relevant due to the ubiquitous large stock of monuments from the turn of the 19th and 20th centuries. In order for the revalorization of the Art Nouveau heritage to be conducted properly, extensive research into the history of individual buildings, their spatial structure, functional, construction, detail and ornamentation should be carried out. Such studies are conducted, among others, in Russia where Art Nouveau architecture constitutes a very large resource. These studies concern both individual objects [1] and the style itself [2]. Similarly, in Ukraine [3], Serbia [4], France [5], Germany [6], Poland [7- 9], Italy [8], Portugal [8] and Slovakia [10], scientific research very often precedes revalorization activities of specific objects. Art Nouveau architecture is also the subject of research when analyzing the architectural activity of specific artists, such as Viktor Horta [11] in Belgium; Charles Carr in Latvia [12] or Teodor Talowski in Poland [13].

The relevance of the research is based on the fact that the principal attention of the scientists dealing with the theme of the Art Nouveau heritage in Ukraine and Poland was drawn to the historical and theoretical aspects. In particular, in many sources, the compositional, planning, morphological features of buildings serving various functional purposes have been researched in detail. However, the specificity of the use of building and finishing materials has practically not been studied in terms of its influence on the creation of the image of the Art Nouveau development, and, as far as contemporary tasks are concerned, the use of appropriate restoration materials and technologies that are as close as possible to the original materials. Today, in Ukraine this issue is especially aggravated against by many private companies and their non-compliance with the recognized requirements for the restoration of historical buildings, when non-professional repairs violate the authentic appearance of objects, facades are painted in randomly chosen colours, and the like. The dilemma lies in different approaches to the restoration of the old paint and plaster of the Art Nouveau era: whether to preserve the finishing as much as possible during the restoration, to bring the modern finishing closer to the authentic one in technology and chemical composition, or to use new effective materials and technologies that are visually similar to the genuine ones.

One more question of studying the Art Nouveau objects in Ukraine is related to the fact that the absolute majority of the most fundamental publications – articles and monographs – are absent from scientometric databases. They are printed in Ukrainian or Russian in local collections, and therefore, practically inaccessible to the scientists all over the world. It led to another task of the authors – to familiarize the public with the Art Nouveau heritage in Ukraine and the experience of restoration of such objects.

The authors put forward the assumption about the peculiar role of finishing materials for creating the image of an Art Nouveau house, and a significant part in it was assigned to colouring and plaster. Since this aspect is related to other characteristics of the Art Nouveau style, the authors have developed a suitable source base to identify common, controversial and uninvestigated issues. The studied scientific sources concerning the architectural characteristics of the Art Nouveau objects were grouped in the following way:

1) urban planning aspects associated with the preservation and restoration of the territories of historical cities and historical industrial development of the times of historicism and Art Nouveau (this aspect is related to the topic of the article since the decoration of the facades determines the frontage of the streets);

2) the influence of the environment and changes in building materials on the variation in the perception of style;

3) the history of the Art Nouveau architecture and the work of prominent Art Nouveau architects;

4) problems associated with the protection and restoration of public, residential and industrial facilities of the late 19th and early 20th centuries.

Many scientists propose to start the research of the development of the Art Nouveau era in Ukraine with identifying the specifics of the urban planning aspect of the development [14, 15]. Moreover, they emphasize the importance of preserving the authentic finishing of the monument objects from the proposed list of modernization, from the viewpoint of converting them into art spaces [16]. At the same time, similar experiences of Poland and other countries have been analysed, where industrial buildings in individual cities make up an extensive part of the protected historical heritage [17].

The variety of new building materials during the period of several waves of construction activity in large industrial cities of Ukraine contributed to the diversification of methods of building decoration, including industrial buildings.

In the cities of Ukraine and Poland, the use of various types of building materials and finishing methods created fundamentally different images of houses of the Art Nouveau era. In particular, the use of red facing bricks on the facades of industrial buildings in Łódź created the building appearance that was different from the image of Kyiv industrial buildings made of yellow bricks or with the use of plaster and painting on the traditional yellow Kyiv brick [18]. Due to the historical specifics, the issue of restoring old paintwork and plaster in Łódź is not as relevant as in the cities of Ukraine, where most of the Art Nouveau objects are plastered and painted. The study of the traditional types of plastering in the historical houses in Poland and the description of methods of restoration of such objects are presented in the analytical tables [19-21].

The regional traditions of using certain building materials and finishing methods, coupled with natural and climatic conditions, led to the fact that even objects representing one style became dissimilar and underwent stylistic transformations influenced by local cultural traditions [22, 23].

The Art Nouveau decoration of buildings depended on local traditions and the individual style of the architect; therefore, the sources devoted to the historical and architectural aspects and personalities of the outstanding architects of Art Nouveau were studied [24-27]. There is also a direct connection between the type of decor and the method of its manufacturing [28].

The researchers emphasized the difference between the methods of ornamental finishing in decorative "wooden mansions" and rationalistic Art Nouveau and National Romantic Style. It is clearly demonstrated on the example of Art Nouveau in Chernihiv, where several varieties of Art Nouveau are presented – each with a corresponding design, on the basis of which we can say that the combination of several types of decorative finishes and textured surface treatment played a much greater role in Art Nouveau – even the provincial one – than in earlier styles in Ukraine [29]. In Ukraine, a peculiar type of Art Nouveau emerged – the so-called "regional" or "provincial" Art Nouveau with local stylistic traditions overlapping on the recognized style of Art Nouveau. This kind of Art Nouveau was a simplified version and, in most cases, had an eclectic character; therefore, it did not occupy a dominant place in the development of the small and medium-sized cities, "dissolving" in the prevailing development of historicism-eclecticism, and having borrowed from it both the methods of decoration and individual elements, which is clearly demonstrated on the examples of Chernihiv and Poltava. "In the case of Poltava, it is

quite difficult to apply the term ‘the Secession style’, as Secession is expressed here in interpretations of regional variations, and instead, it developed an expressive type of Ukrainian national romanticism, the so-called Ukrainian Art Nouveau, based on the modernization of folk-style forms and compositional techniques. Along with regional variations of the Secession style Poltava presents options of so-called eclecticism with Art Nouveau features, even featuring Gothic and Moorish motifs“ [30].

The presence of style variety, characteristic of many cities, became the significant factor that had an impact on the type of facade decoration of buildings of the Art Nouveau era. In small and medium-sized cities, the major focus was not on the combination of several different types of decoration on the facades, which was characteristic of modernity with its tendency to create decorativeness through various processing and use of modern materials, but on imitation of the quite limited list of "cognitive" forms of Art Nouveau and national romanticism ("national romantic Art Nouveau") in provincial cities: “The hip roofs, tile roofs, turrets, porches, pseudo-Baroque gables, trapezoidal openings of windows and doors, triangular windows, ‘opasannia’ (structural addition-in the form of galleries on columns), folk style decor in majolica, wood and brick are used. Buildings in the style of Ukrainian national romanticism are marked by active dynamic silhouettes in symmetrical and asymmetric houses, with the presence of an accent or dominant element” [30].

Researching the finishing materials of Art Nouveau facilities in Poland required two groups of sources. First, it was necessary to analyze the stylistic features of Polish Art Nouveau buildings to recognize the finishing materials (and their characteristic features) of houses that appeared in Cracow during the heyday of Art Nouveau. For this purpose, the following sources were used: the collective research on this issue, with the definition of the essential features of the Art Nouveau buildings in Poland (with different functions), while focusing on the treatment and colours of the facade. The next stage of the research was the analysis of the Art Nouveau buildings in Cracow, which required studying the specific character of the "individual style" of the famous creators of the Krakow version of Art Nouveau, like Teodor Marian Talowski or Zygmunt Hendel. Reviewing these sources made it possible to evaluate the building materials used in the corresponding period, especially those used for finishing the facade, and the rich ornamentation of the facades.

The aforementioned studies provided the basis for the research on colours and facade decoration methods of the selected, specified objects of Art Nouveau of Cracow. The research was also carried out basing on the available literature, in which it was discussed the restoration of the Cracow landmarks in the Art Nouveau style, as well as publications on the technology of conducting the field surveys of decorative plaster in the architecture of the first half of the twentieth century, on the technical and aesthetic aspects of the Art Nouveau style, the issue of ornamentation of buildings in the Art Nouveau style.

Directly related to the theme of the decoration types from the Art Nouveau era, is the aspect of the restoration of such objects in Ukraine and Poland [31-33].

Yet, a review of the processed sources showed a lack of professional publications devoted to finishing materials of the Art Nouveau era in different countries, with an emphasis on the specifics of the restoration of such objects. Most often, architectural sources only casually mention the types of finishes; in particular, their chemical properties are not characterized, and the experience of restoration with a description of all technological stages and the chemical composition of substances is covered mainly in the design and restoration documentation closed to the general public. And highlighting these aspects was the objective of the presented material.

Materials and Methods

The evidence for the study carried out by the authors was the Art Nouveau buildings in the cities of Ukraine and Poland. The presented brief overview of the history of the production development of building materials, including paints, starting from the second half of the 19th century, indicates the influence of the development in the construction industry on the expansion of figurative means of architecture – including a variety of finishing methods and improvement in the types of paints and plaster. Diversity in the types of produced paints, and the improvement of their characteristics, continued with the development of concrete, reinforced concrete, steel and reinforced concrete structures. The economic advancement of the Russian Empire led to a rapid exposure to world inventions in the field of paint production, and the development of Russian chemistry. The types of facades and interiors finishes with appropriate chemical characteristics were determined; the influence of regional traditions on the distribution of the particular types of finishes was emphasised; the application of various types of finishes was compared to prove the direct influence of materials on changing the perception of the image of an Art Nouveau building.

The methods of historical and comparative analyses, as well as a graph-analytical method were used as the main ones.

Results and discussion

The influence of the development of chemical industry for producing of building materials at the end of 19th– the beginning of 20th centuries

If we want to understand the peculiarities of the construction of the period, it should be emphasized that Art Nouveau relied on the achievements of the earlier period, namely the rationalism of the 20th century. The discovery of cement (in 1820) and reinforced concrete played a phenomenal role. After the World Exhibition in Paris in 1900, architects had reinforced concrete, actually introduced in France in 1849, in their arsenal but it was widely used only in the first decades of the twentieth century, after the development of calculations for reinforced concrete structures. A striking example of the innovative use of reinforced concrete and cement in Art Nouveau buildings is the House with Chimaeras, the house of architect Władysław Horodecki at 10 Bankova Street in Kyiv. The choice of materials was not accidental: Władysław Horodecki, being a co-owner of a cement plant in Kyiv, at the same time advertised the ample opportunities of new materials. In Kharkiv, A.M. Ginzburg was also one of the first to use the reinforced concrete structures in the construction of houses, the support brackets of the cornice of which he masked with cement sculptures of fish. He called his construction company "Reinforced Concrete", which was also an advertising tool.

At the same time, the widespread use of innovative design schemes and materials required an expansion of the methods of finishing facades and interiors. During the Art Nouveau period, a variety of ceramics and majolica cladding in the form of decorative friezes, belts, and thematic panels became widespread. Finishing materials also acquire sophistication, consonant with the general style of Art Nouveau.

One of the hallmarks of Art Nouveau is its varied colour scheme, which differs radically from the poorer colourism of the Baroque period (in Ukraine – white, or less often blue walls with white details) and Classicism-Empire era (when all the facades were yellow, and the details were white, and it was strictly regulated by the construction legislation). Art Nouveau brought orange, blue, green, blue, violet and purple colours to the palette of facades and interiors, which became its distinctive feature. Such a variety of the Art Nouveau colours is directly related to the successes of the chemical industry at the end of the 19th century when factory paints began to be sold in large quantities.

The analysis of historical events in the late 19th – early 20th centuries allow us to establish a relationship in the chain "development of chemical synthesis → production of

industrial synthetic dyes → expansion of the colour range of the facades of the Art Nouveau period", which directly influenced the colours of the facades of the Art Nouveau buildings in the whole Russian Empire, a part of which was then Ukraine. If we compare the significant stages in the development of synthetic dyes and the periodization of Art Nouveau in Ukraine, we can see how the increase in the number of the new dyes coincided chronologically with the increasing variety of facade colours, which began during the period of historicism in the second half of the 19th century and reached its height during the Art Nouveau period.

A total line of discoveries in organic chemistry had become significant, among which the following should be noted:

- 1840–1842 – Carl Julius Fritzsche determined the structural formula, and N. Zinin for the first time synthesizes aniline which became the basis for synthetic dyes;

- 1856 – William Henry Perkin discovered a synthetic bright purple aniline dye, mauveine, also known as aniline purple and Perkin's mauve, and created the synthetic colours such as British Violet and Perkin Green;

- 1869 – Carl Graebe and Carl Liebermann determined the structure and synthesized natural red Alizarin;

- 1870–1873 – K. Caro, W. Perkin and H. Koch, independently of each other, developed an industrial method for the synthesis of alizarin;

- 1869 – Johann Baeyer succeeded in deciphering the structural formula of indigo and obtaining it from the simpler isatin;

- 1898 – Stanisław Kostanecki, by the condensation reaction of an aromatic aldehyde with mixed aromatic-aliphatic ketones, synthesized yellow benzalacetophenone (1.3-diphenyl-2-propen-1-one), called it chalcone, and also set the curcumin formula.

These achievements were of decisive importance in the history of chemistry, both from a scientific and practical point of view, including the development of industrial production of synthetic dyes. A stream of ready-mix paints poured into the market; the palette has expanded enormously; new names of paints and new colours appeared.

For example, synthetic alizarin completely replaced the natural dye on the market for several years, since it turned out to be not only cheaper but also cleaner. According to Ludwig Martens [34], in 1890 there were 12 factories producing alizarin: 8 in Germany, 1 in Switzerland, 2 in England and one in Russia. Consequently, the cost of 1.0kg of synthetic alizarin decreased from 140 German marks in 1873 to 5.5 in 1900. Alizarin became the first of the anthraquinone dyes class, characterized by high dyeing power, light resistance, brightness and purity of colour, which was necessary for the Art Nouveau stylistics. Alizarin became the first of the anthraquinone dyes class, characterized by high brightness colouring power, light fastness, and colour purity which was necessary for the Art Nouveau stylistics. A significant reduction in the synthetic alizarin cost determined its widespread use in various industries, including architecture.

Given the fact that the year 1890 is considered the official beginning of the development of Art Nouveau in the world architecture, and its greatest demand is observed precisely at the end of the 19th – beginning of the 20th centuries, there is every reason to assert that the achievements of organic chemistry and the development of industrial synthesis became the determining factor in the emergence of a large number of polychrome facades on buildings from that period.

Thus, the leap in the development of the chemical industry influenced all industrial processes, and it reflected in the best way on the activities of architects.

The colour scheme for the facades of Art Nouveau buildings followed particular patterns and included the colouring of the wall planes, structural and decorative elements of the facades, as well as the use of an expanded palette of colours in ceramic panels and stained-glass fillings.

Opening of E.E. Bergenheim's ceramic plant in 1876, and I.R. Lindenberg's plant of paintwork materials in 1896, greatly simplified the practical implementation of Art Nouveau trends in the architecture of Kharkiv.

It is well known that the colour of dyes, the method of dyeing, their field of application and properties depend on the nature, position and number of substituents. Many authors presented a detailed review of the composition, structure and practical application, including anthraquinone natural colouring pigments [35-37].

It allowed the authors of this work to compare the colour gamut of dyes of different composition and structure with the colour palette of buildings of the Art Nouveau era in Kharkiv and present their results in the analytical tables in the next section. It should be noted that most of the works on the study of organic dyes presented in the scientific and technical literature are aimed at improving the composition of the existing and new polymer dyes. C. Dollendorf et al. synthesized a series of new polymer substances of red, blue and green colors by nucleophilic aromatic substitution reactions of anthraquinone derivatives with several amino alcohols [38]. The synthesized substances have high durability and gloss color. Dongjun Lu, Jin Cui reported obtaining polymer dyes by grafting brominated anthraquinone derivatives onto Ocarboxymethyl chitosan through Ullmann condensation [39]. The dyes obtained are characterized by longer adsorption wavelengths and deeper color.

These examples prove there was a significant transformation in the composition, structure and the technology of dyes over the last hundred years. It is obvious that the composition of modern dyes is fundamentally different from the compositions of paints of the Art Nouveau era. Besides, the past twenty years have seen intensive renovation and construction work aimed at preserving buildings. However, restoration work without taking into account the colouristic traditions of the architectural periods lead to the loss of the original appearance and historical value of buildings.

Recently, there is a positive trend towards the restoration of the primary colour palette of the buildings from the Art Nouveau era. The most prominent example of the restoration of the authenticity of the appearance and colour of the facade is the reconstruction of Kharkiv House of Real Estate at 4 Pavlovskaya Square, as a result of which the original colour of the facade – chalcane – was restored (Figs. 1-4).



Fig. 1. Kharkiv Real Estate House at 4 Pavlovskaya Square: the original view in 1912.

Photo from the archive of Vladimir Novgorodov, scientific director of the facade restoration project



Fig. 2. The building state in the 1940s. Photo from the archive of Vladimir Novgorodov, scientific director of the facade restoration project



Fig. 3. Before the start of reconstruction in 2016. Photo from the archive



Fig. 4. After the reconstruction in 2020. Photo from the archive of Vladimir Novgorodov, scientific director of the facade restoration project

A significant point in the successful implementation of reconstruction and restoration work is the preliminary study of the facade plastering and painting; its results are the basis for choosing the restoration materials. The research by E. Doleżynska-Sewerniak [40] confirms the difficulty in identifying the colour range of facades due to the stripping of the original layers of plaster and paint during renovation. The identification of authentic plaster and paint colours will allow not only to reproduce the historical appearance of buildings, but also to explore the dominant tendencies of the Art Nouveau era. The successful solution of such problems is possible with the integrated use of modern physicochemical research methods [40]. The methods of Optical Microscope (OM), Polarized Microscope (PM), Scanning Electron Microscope (SEM), equipped with (EDS), and X-Ray Diffraction (XRD) have been successfully used in restorations of the Qarh's monuments at Al-Ulla in northwest Saudi Arabia [41] and on tomb walls in Egypt [42]. Also, phase liquid chromatography and mass spectrometry with electrospray have proven themselves in the analysis of paint layers and identification of the components of complex natural products used in art [43, 44].

Unfortunately, there are practically no publications about such studies of buildings of the Art Nouveau era in the scientific and technical literature. The identification of the colouring components during restoration work requires separate studies.

The experience in the restoration of Kyiv buildings in the Art Nouveau style

One of the first examples of the complex restoration of an Art Nouveau object in Kyiv, carried out by the specialists of the "Ukrrestavratsiya" Corporation, is the building at 14-B Yaroslaviv Val Street. The restoration work in the object was preceded by a technological survey in 2001. The development of the design was carried out by the "Ukrainian Research Institute Project Restoration" (authors of the project – E. Rubtsov and V. Otchenashko). The design for the restoration of the main facade of house No. 14-B with the adaptation of the former apartment of L. Rodzianko for a chamber theatre consisted of eight volumes, where each one was devoted to complex scientific research describing the conducted field investigations (architectural measurements, fixation by probing, photographic fixation, chemical technology research, engineering survey, wall painting survey).

In March 2001, a full-scale technological survey was conducted to investigate the technical condition, composition and type of interior decoration materials and the original kind of painting of finishing elements, as well as the technical condition of wooden floor structures. The survey was carried out using a natural method with sampling for a laboratory stratigraphic study of the composition and quality of finishing materials.

Since the article deals only with the aspects concerning decoration and decor, we will mention some sections – "Technical condition of the elements of the ornamental finishing"; "Results of laboratory analyses of original building materials samples"; "Results of determining the initial type of interior decoration" and "Conclusions based on the results of the technological survey" (supplemented by the table with the results of the stratigraphic study).

For the restoration task, the premises of Rodzianko's former apartment, the staircase and the entrance hall of the first floor were reviewed. The technical condition of the interior decoration materials was approximately the same in all rooms; the hall was decorated with luxurious stucco and architectural ornaments; the walls of several rooms were covered with paintings; a significant number of decorative elements were gilded. The decoration imitated wood on the staircase, in the lobby of the first floor and one of the halls.

At the time of the survey, the walls of the premises were plastered with lime-gypsum-sand mortar, and then the surfaces were smoothed with a gypsum coating. Additionally, the wall surfaces were levelled with emulsion putty and painted. The technical condition of the wall plaster was satisfactory: the cracks in plaster were up to 3mm wide, and the 'cobweb cracks' were small.

During the entire period of functioning of the former Rodzianko apartment, about ten colour coatings were applied onto the original painting, which led to a distortion of the initial colour, the appearance of inequalities, the separation of the plaster layer from the brickwork, the appearance of plaster chips, lagging and sprinkling of paint layers. The technical condition of the stairwell plaster was better than in the rooms. All things considered, the technical condition of the wall plaster on the premises at the time of the survey was found to be subject to conservation and restoration.

The original colour scheme of the entrance hall was brown. The stucco decoration against the background of the walls was of darker intense colour.

A separate aspect of the research was related to the review of columns and vases, which were in satisfactory technical condition. It was found that the vases were made by semi-dry filling a cement-sand mortar with a plasticizing additive in the moulds and painted with bronze paint. The sculptural compositions in the form of two women with amphorae were gilded. At the time of examination, the fust of the gypsum column was covered with a layer of putty, a layer of dark brown oil paint, two layers of putty and another layer of dark brown oil paint. The gypsum capital of the column was covered with a layer of drying oil, a layer of dark brown oil paint, a layer of brown paint with a green tint, and two coats of bronze paint.

The brickwork of the walls was covered with a lime-gypsum-sand mortar, a gypsum coating, and on top of it, there was low-strength brown emulsion paint with a green pigment. The decorative plaster elements were covered with layers of drying oil, putty, brown emulsion paint, white primer and two coats of bronze paint. The plaster rods were covered with a layer of linseed oil imitating wood with a brown glaze layer, putty and four coats of light green colour.

The pilasters of the staircase were made of a lime-sand mortar with a slight admixture of gypsum, on top of which a layer of a levelling plaster coating and a layer of black varnish imitating black natural stone were applied. The capitals of the pilasters were cast from plaster and painted with bronze paint; significant damage and gaps were recorded on the capitals; the pilasters themselves were covered with wide cracks, and there was a "swelling" of the paint layer on the capitals.

Three halls and the staircase of Rodzianko's apartment were decorated with fireplaces made of compound lime-cement-sand mortar, finished with plaster moulding and painted. The paint layers of subsequent repairs changed the original appearance of the decor elements on the fireplaces; the repair colour layers became dirty and darkened over time, chips and cracks were observed in the face layer.

In the "English studio" on the second floor of Rodzianko's apartment, layers of lime-gypsum-sand mortar, lime-gypsum-sand finishing coating, textured link rust, putty and several layers of paint were applied over the brickwork. During examinations the remains of authentic striped, green English silk wallpaper pasted on old theatre posters were found under the lincrusta paper. The stucco decoration of the ceiling was made of plaster, on top of which there was a layer of drying oil, emulsion putty, several layers of bronze paint and a layer of varnish (Fig. 5). The wooden frieze on the wall was covered with two layers of grey putty and a layer of varnish on top of it. The moulded curl of the frieze was gypsum; on top were layers of drying oil, emulsion putty, two layers of bronze paint, a layer of varnish, and a coat of paint. Ceiling mouldings and fireplace decor were made of plaster with subsequent covering (Fig. 6). Bronze paint was widely used in the decoration of the "English studio" – for the stucco curls of the wall frieze, the stucco decorations of the ceiling, ceiling mouldings, fireplace decoration and imitation of wood – on the friezes of the walls, covings, and ceiling mouldings.

The problem was that the original colour of the walls of the so-called "room with angels on the ceiling" was not preserved. The covings and ceiling mouldings of this room had "woodgrain" finish; the fireplace was yellow; the sculptural image of the fireplace was painted first with bronze, then with brown paint.

The most luxurious was the light green decoration of the banquet hall. Part of the stucco details and individual elements of the fireplace decor were covered with gilding. The fireplace itself was painted light brown. The stucco elements – patterned cornice, floral ornaments, and mouldings in the frame of the picture, ornament near the chandelier, pilasters, ceiling moulding, fireplace figures and fireplace decor were made of plaster, and some of the mouldings and panels were made of lime-gypsum-sand mortar. The plane of the door leaf of the banquet hall was covered with oil putty and four layers of light green paint; the figured "mirror" of the doors – with oil putty, oil light ocher paint and seven layers of ocher and light brown paint. The overlay pattern of the doors was made of putty wood, followed by a layer of gilded lacquer, primer, bronze paint and four additional paint coats.



Fig. 5. The interior of the "English studio" after restoration. Photo from a private archive of Y. Ivashko

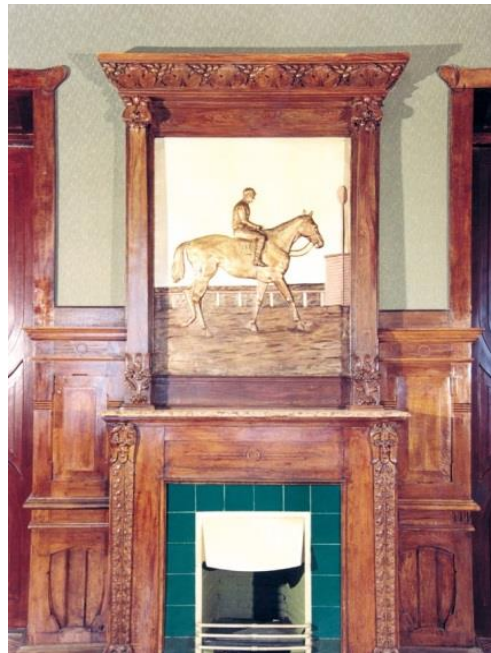


Fig. 6. Fireplace in the "English studio". Photo from a private archive of Y. Ivashko

The walls of the stage box in the banquet hall were originally pink, and the architectural and stucco decor was light green and light brown, with the stucco elements decorated with gilding.

The ceiling of the banquet hall was plastered with plaster mortar with a small admixture of lime on the shingles, with stucco decoration. The technical condition of the plaster layers of the hall ceiling was considered unsatisfactory, as the entire surface of the plaster layer was covered with cracks, and large areas of stucco decoration sagged.

The condition of the plaster stucco decoration was assessed as satisfactory. Small volume losses and chips, surface corrosion of gypsum stone was recorded. Initially, the surfaces of the gypsum stucco moulding were lined and covered with later numerous emulsion and oil paint layers, which smoothed out the clarity of the lines and the relief of the decor, making rounded corners. Thick layers of paint have broken off from the substrate in places, mainly along the line of through cracks.

Three test samples were taken from the covings above the windows to assess the technical condition of the wooden floor structures, the degree of preservation of the shingles and the moisture of the gypsum plaster on the ceiling. In these places, an increased relative humidity of the plaster layer was recorded, which arose due to improper use of the premises.

The entrance doors on the ground floor in the entrance hall are made of wood and covered with a layer of brown lacquer that has darkened with time. The wooden moulding of the cornice on the second-floor landing was covered with a thick layer of white putty, a layer of varnish, gold leaf from white metal and bronze paint.

The volume "Working Design" included a description of the architectural part of the project – the principal design solutions, floor and ceiling structures, joinery, the design part of the project, interior painting passports, and recommendations for the technologist of repair and restoration work. A separate project was developed for the restoration of interior painting. The restorers tried to recreate the original appearance of the premises of Rodzianko's apartment as much as possible. The plaster layer was fragmentarily restored and the damaged areas of lime-sand plaster were replaced with modern plaster of the same composition. Gypsum parts – mouldings, stucco decoration, column details – were restored according to the original chemical composition. The original colours of the interior were determined according to the modern European colour classification.

The "Alfrey marble" of the main staircase was restored according to the original technique – an imitation of real marble was made with oil paints. Easel painting was recreated; the type of wallpaper of the "English studio" was selected according to historical samples (Fig. 5). The wood panels and parts were cleaned of the later residue of varnishes, stains and paints.

The experience of research of the Kharkiv buildings in the Art Nouveau style

The degree of development of the chemical industry at the turn of the 19th and 20th centuries provided a great variety of colours for finishing materials. It influenced the architectural look both of individual buildings and the city as a whole. Mass production of analogues of natural dyes was established, which were added in large quantities to glass and facade paints. There is a tradition to paint the walls of buildings outside and inside in pastel colours – lilac, greenish, pearl grey, etc. Trends in the development and architecture of Kharkiv corresponded to the pan-European ones. It was during this period that a contradiction between the internal and external content matured, that is between the prevailing conservatism of the traditional forms and new building materials – reinforced concrete, metal, cement, glass, colouring pigments, which were cramped in the established traditions of construction.

Gradually, new materials and structures changed the general architectural solution of new buildings, while the elements of the order system, as a means of organizing an artistic form, were becoming a thing of the past. It allows us to assert that, thanks to the development of

scientific and technical progress at the turn of the 20th century, a new style appears in architecture which used the achievements of many industries.

The most characteristic of the Art Nouveau architecture with its desire to reveal the work of structures is the option of increasing the height of the basement floor and highlighting it with textured processing (smooth or rough-faced rustication). The most common variation is to raise the basement, but the option to increase the basement by combining the lower floors and highlighting them with texture is also widespread. A variant of the conditionally deformed finishing under the load of the basement floor, highlighted by a rough surface became widespread in Kyiv, Lviv and Kharkiv (Fig. 7). The tradition of using different textures and various stone cladding was borrowed from the northern national romanticism (Northern Art Nouveau). The influence of the Northern Art Nouveau on the architecture of Kharkiv consisted in the restraint of the colours and the emphasized importance of the texture of the materials of the facades, which provides decorativeness. The cladding of facades with natural stone and terrazite plaster on top of the brick masonry with open joints (marble chips with mica and cement spray) became widespread.

The Art Nouveau style in architecture, which was born at the turn of the 20th century, perfectly absorbed all the achievements of the chemical industry of that time. It can be seen on the example of Kharkiv where the colour of the facades of buildings begins to change, and grey-green and other shades become widely used.



Fig. 7. Facade texture at 57 Pushkinska Street, Kharkiv. Photo from a private archive of A. Korovkina

The architecture of Art Nouveau Kharkiv is closer in its colouristic solution to the Northern Art Nouveau of St. Petersburg than the Art Nouveau architecture in Lviv and Kyiv; grey colour and yellowish other prevail in Kharkiv Art Nouveau, a significant role is assigned to the texture of facade materials which are responsible for the decorative function.

Designed by Nikolai Vasilievich Vasiliev and Alexandr Ivanovich Rzhepishevskii, the building of the city Commercial Bank and the Astoria Hotel on Pavlovskaya Square (10, Rozy Luxemburg Square) in Kharkiv, were executed in St. Petersburg in the style of Northern Art Nouveau (Fig. 8).

The complicated plastic compositions of this architect are related to the Finnish northern national romanticism and to individual objects of the German national romanticism of the early 20th century. Its "calling card" was the use of rough-faced rustication, massive sculpture,

accentuation of the centre and corner in corner buildings, projections of different heights, bay windows, gables, attics, and superstructures.



Fig. 8. A fragment of the facade of the former building of the Kharkiv City Commercial (Merchant) Bank and the Astoria Hotel.

The work of N.V. Vasiliev's co-author A.I. Rzhepishevsky was characterized by the replication of architectural motifs, a fascination with versatility (not only northern modernity but also the classicized Art Nouveau, decorative Art Nouveau in the style of German Jugendstil, modernized Renaissance, the rationalism of the 20th century); the use of specific colours of facades – grey stone and "yellowish sandstone", the embodiment of the Art Nouveau style both on the facades and in the interiors, the use in the interiors of wooden front stairs with fountains on the landing.

The devotion to northern Art Nouveau of another Kharkiv architect, Mikhail Fedorovich Piskunov, was expressed in the emphasized multi-textured facades (terrazite facade plaster with pigment on brickwork).

The building at 19 Pushkinska Street, by architect A.M. Ginzburg (1905), has a light grey-green, nuanced colour. All the decoration of the facade of this object is highlighted in a darker shade (the floral ornaments and mouldings are grey, brown on an almost white background). The building at 1 Gogol Street is also characterized by a floral theme, but here decorative daisies have a light-yellow tint against the background of a red-brown facade. Increasingly, architects use colour in their works, which completely changes the appearance of buildings. So, soon after the open inorganic combination of chalcone and the yellow pigment obtained from it, they erected buildings on the facades of which yellow dominates. These are buildings at 26, 49, 53 and 65 Sumska Street, 47 Alchevskykh Street, 14 Kulikovskiy Spusk, 8 Kulikovska Street, 3a and 5a Klochkovska Street. The availability of pigments and their significantly reduced cost allowed for diversifying the design of the facade of Art Nouveau objects in Kharkiv. There are a large number

of examples of buildings of this era where recently discovered pigments of synthetic dyes were used in the colour scheme of the facades (Figs. 9 and 10).

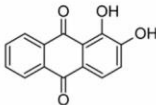


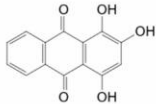


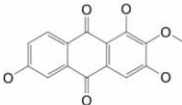


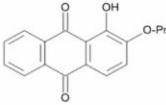


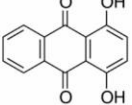


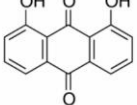


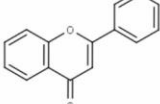


Dye name	Chemical structure	Color	Object
<i>Alizarin</i> 1,2-dihydroxy-antraquinone		 Yellow to red (acid); red to violet (alkaline)	 23 Rymarska Street
<i>Purple</i> 1,2,4-trihydroxy-antraquinone		 Yellow to red (acid); red to violet (alkaline)	 25 Lermontovska Street
<i>Flavopurpurin</i> (alizarin Y) 1,2,6-trihydroxy-antraquinone		 Yellow	 53 Pushkinska Street
<i>Ruberithric acid</i> (alizarin primeveroside) 2-O-primeverose-1-hydroxy-antraquinone		 Yellow	 52 Moskovskyi Avenue
<i>Quinizarin</i> 1,4-dihydroxy-antraquinone		 Orange to red-brown	 41 Moskovskyi Avenue
<i>Danthron</i> (danthron or chrysazin) 1,8-dihydroxy-antraquinone		 Reddish to orange	 72 Moskovskyi Avenue
<i>Flavone</i>		 Yellow	 10 Myronosytska Street

Fig. 9. Chemical structures and colors of natural pigments [19 – 24]
in Kharkiv houses of the beginning of 20th century.
Part 1. Photo from a private archive of A. Korovkina

Ukrainian experience in the restoration of textured plasters

Since textured plasters are a widespread method of finishing in Art Nouveau objects, the experience of the "Ukrrestavratsiia" Corporation can be used for their research and restoration. Plastering on masonry is carried out with various plaster solutions, except lime-gypsum. Restoration work on plaster begins with the tapping of the plaster and the installation of probes. As already mentioned at the beginning, the issue of finishing materials during the restoration of a monument is debatable: to what extent it is permissible to replace the original finishing with a more modern one, how much the new finishing should correspond to the original one in composition, technology, colour, etc.

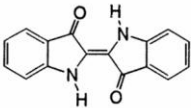


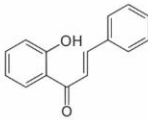


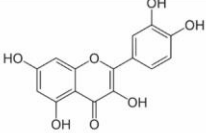


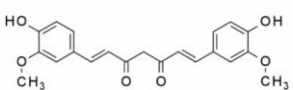


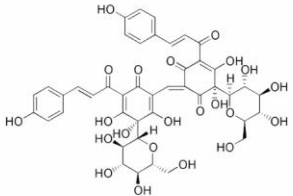


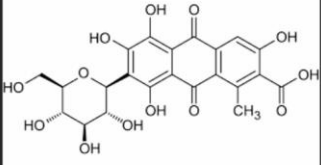


Dye name	Chemical structure	Color	Object
<i>Indigo</i> $C_{16}H_{10}N_2O_2$		 Blue	 2 Moskalivska Street
<i>Chalcon</i>		 From yellow to red	 32 Alchevskykh Street
<i>Quercetin</i>		 Shades of yellow	 26 Sumska Street
<i>Curcumin</i> 1,7-Bis (4-hydroxy-3-methoxyphenyl)-1,6-heptadiene-3,5-dione		 Shades of yellow	 2 Pershotravneva Square
<i>Cartamine</i> $C_{40}H_{52}O_{22}$		 Intense red colour	 11 Maksimilianivska Street
<i>Carminic acid (cochineal)</i> 7-D-glucopyranosyl-3,5,6,8-tetrahydroxy-1-methyl-9,10-dioxoanthracene-2-carboxylic acid		 Magenta-red	 53 Pushkinska Street

Fig.10. Chemical structures and colors of natural pigments [19 – 24] in Kharkiv houses of the beginning of the 20th century. Part 2. Photo from a private archive of A. Korovkina

When carrying out restoration work on old plasters, the specialists of the "Ukrrestavratsiia" Corporation use the compositions of the plaster solution according to the technology developed by technologists and chemists. Since the buildings of the turn of the 20th century were decorated with a variety of stucco ornaments fixed on top of the plaster, it is preliminarily dismantled and installed in its original place after the new primer has been laid to replace the removed one. If the task is to preserve the old plaster, it is fixed by injection with complex lime mixtures with further pressing against the wall with special devices until the mortar sets, or by introducing special polymer or stainless-steel plaster dowels with very wide caps into the wall.

The re-plastering consists of spraying a 5 mm thick layer for brick, stone and concrete surfaces, on top of it, after setting by the method of throwing (lower soil layer) and spreading (subsequent layers), a thicker solution is applied in several layers – the ground coat. Cement mortar assumes a smaller the ground coat thickness, lime-gypsum – twice as large, up to 20mm, the thickness of the ground coat layers is even greater for slopes. Before applying the top layer

– finishing coat, the last layer of soil is levelled, and the finishing coat layer is applied with a thickness of 1 – 2mm on the adhered undried soil, followed by levelling the surface. As M. Orlenko wrote, these layers differ in their purpose: the spray provides strong adhesion to the surface and the strength of the subsequent ground coat and spray, the ground coat solution is thicker than the spray consistency, and it is the thickest layer in the plaster, the covering layer provides decorative qualities plaster and mortar for it is less durable than for the ground coat, on fine sand [23].

The specialists of the "Ukrrestavratsiya" Corporation have developed appropriate recommendations on the technology of restoration and conservation work of plastering facades, which were made locally by layer-by-layer application of plaster mortar on embedded metal mouldings. The order of such events is carried out in the following sequence: first, by the method of plastering additions, solid rustications are restored with the removal of exfoliated fragments, cleaning from old colour layers, with antiseptic and anti-salt treatment, removal of corroded reinforcement and anti-corrosion treatment of retained reinforcement, then plastering additions are made with a thickness of 5 – 10cm, using stainless steel reinforcement. If the size of the complemented fragment is less than 30x30cm, the plaster is applied on stainless-steel netting with the diameter of 1.5mm, stretched over stainless-steel anchors. If the size of the complemented fragment is 30x30 cm or more, the plaster is applied along a plaster grid with a cell of 20x20mm and a wire thickness of 1.5 – 2mm made of stainless steel, fixed on anchors. The anchors are installed in a staggered manner with a pitch of 15 – 25cm; the outer end of the anchor is hidden under a 1.5 – 2cm plaster layer.

In the monograph by *M. Orlenko, Y. Ivashko and S. Li* [23], the subsequent technology is described in detail. The cleared surfaces of the rustication stones are moistened with water and kept moist for two hours. The surface of the rustication stone in the places of the additions is covered with an adhesive ground coat from KEIM, rubbed in with a brush. The first plaster layer is applied with a thickness of not more than 1.5cm per application on the adhesive layer using the "wet on wet" method. The surface of the setting layer of the mortar is cut to ensure the adhesion of the lower layer with the upper one, and by layer-by-layer application of plaster, they gradually approach the texture of the "rough" stone of the old rustication. Each layer is kept moist until the next layer is applied. The texture "rough-faced rustication" is carried out in a setting solution.

To supplement the rock-face stones, a dry plaster mixture is used, consisting of alumina non-shrinking cement, sand and superplasticizer; the mortar is kneaded with an aqueous solution "Acryl-60"; the fastening of solid rustic materials that have moved away from the brick surface is carried out according to the designer's solution; the restoration of cracks in the rustic materials is performed using the KEIM system of materials.

Then, the cracks are restored, and only then – hollow rusts, the addition of which is made with a plaster solution from a dry plaster mixture, using stainless steel pins, a plaster mesh of stainless steel and wooden formwork, which is installed on the backside of the rock-face stones, while the emergency corroded reinforcement is cut out and they are replaced with a new one, after which the cracks in the rustication are restored and the homogeneity of the old and the new coating is ensured by applying a 2mm layer of cement putty over the entire area of the rustication materials and textured a new layer similar to the finish of the old rustication materials.

In the decoration of Art Nouveau buildings, decorative and artistic plasters have become widespread – textured unpainted with wavy cuts, coloured due to colour fillers and coloured cement or coloured cement painted with pigments. Decorative plasters used on the facades and interiors are as follows: lime-sand coloured plaster (based on the lime dough with or without the addition of cement, quartz sand or sand from coloured rocks and pigment, with processing in a plastic state with giving them by spraying, stamps, rollers or by scratching in cycles of smooth grooves or any other texture); terrazzo plaster (based on hydrated lime slaked into a fine powder with or without the addition of cement, marble powder, marble chips, mica and pigment, with

the addition of cement and processing in a semi-hardened state by scraping, chopping down solution for obtaining the texture of chipped stone and in rare cases forging with bush hammers); stone plaster (based on cement with the addition of up to 5% lime dough for plasticity, marble or other stone chips and processing due to the greater rigidity in the hardened state by forging with chisels, bush hammers, gears or by acid etching) and sgraffito.

M. Orlenko indicates such a composition of lime-sand plasters: lime dough, up to 10% of Portland cement, natural quartz or marble sand as filler, pigment, in some cases stone flour or powder, and notes that in the case of a smooth texture, more fine sand (grain size 0.3 – 0.5mm), when making textured spray plaster, sand is used, where 50% of the grains are of 0.6 – 2mm [23].

The use of light quartz sand in the solution provides a light plaster colour, the use of white marble or limestone obtained by crushing gives a white plaster color and the use of sand from such coloured rocks as dolomite or tuff-weakly coloured plaster.

If we characterize terrazzo plasters, then the terrazzo mixture itself consists of hydrated lime, aggregates (glass, mica, stone chips), to which crushed mica or crushed glass of a certain size is sometimes added to add shine, and pigments, and the type of mixture is determined by the type of binder (lime, lime-cement, cement-lime, cement mixtures using white cement and aggregates of various sizes – fine-grained, medium-grained and coarse-grained).

Modern technologies for producing decorative dry building mixtures base on the use of inorganic pigments, among which it is worth highlighting the following: blue – ultramarine $\text{Na}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot n\text{SiO}_2 \cdot \text{Na}_2\text{SO}_3$, green – chromium (III) oxide Cr_2O_3 , white – titanium (IV) dioxide TiO_2 , as well as a whole class of iron-oxide pigments, a wide colour range of which is provided by the different chemical composition of iron oxides. So, yellow pigments are hydrates of ferric oxide $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$; red ones are ferric oxides Fe_2O_3 ; black ones are ferrites of iron Fe_3O_4 ($\text{FeO} \cdot \text{Fe}_2\text{O}_3$); brown ones are a mixture of yellow and red pigments. Iron oxide pigments are characterized by high colouring power, hiding power, oil absorption, dispersibility, lightfastness, and are also resistant to the action of salts, acids, alkalis and salts, which determines their widespread use for the production of coloured cement, concrete, decorative dry building mixtures, etc.

The experience of the "Ukrrestavratsiia" Corporation made it possible to establish the most frequently used inorganic pigments for colouring terrazite mixtures, among which M. Orlenko singled out:

- white, light grey and grey (mortar pigment – ground slate);
- blue, turquoise and blue (pigment for a solution – ultramarine);
- light green and green (an example for the solution is chromium oxide);
- light yellow and cream (pigment for the solution – golden ocher and light ocher);
- rich yellow (pigment for the solution – golden ocher);
- pink (pigment for the solution – light mummy and red lead);
- terracotta (pigment for a solution – red lead iron and golden ocher);
- red;
- red-brown;
- brown;
- fawn / straw-coloured (pigment for the solution – golden ocher and mummy);
- black (pigment for a solution – manganese black and soot).

Moreover, it is allowed to use several colours by thoroughly mixing pigments to obtain a more complex colour scheme of the terrazzo mixture.

The area of application of terrazzo mixtures is determined by the degree of grinding: fine and medium-grained lime-cement mixtures of hydrated lime, cement and pigments are used for finishing external brick walls, for plastering socles, columns, pilasters and fences with increased moisture load and exposure to adverse atmospheric factors, fine-, medium- and coarse-grained cement-lime terrazzo mixtures are used; for plastering of plinths, balconies and fences made of concrete or heavily fired bricks, fine-, medium- and coarse-grained crushed cement mixtures are

used; for cornices and mouldings use terrazzo plaster with fine-sized plaster walls and slopes – with a medium-sized aggregate; for plastering of basements and lower floors of facades – with a large-sized aggregate; for socles and creating the effect of finishing the lower floors "under rough-faced stone" – with an especially large aggregate.

There are varieties of decorative plasters that imitate natural stone finishes. Plaster with "sandstone" imitation is provided by a mixture of three compositions:

- 1) coloured cement, quartz coarse sand and marble sand;
- 2) coloured cement with marble chips and coarse quartz sand;
- 3) coloured cement with yellow marble chips and coarse quartz sand;

Plaster with imitation "red granite" is provided by four compositions:

- 1) coloured cement, red and grey granite chips and labradorite chips;
- 2) coloured cement, red granite chips and labradorite chips;
- 3) coloured cement, chippings of red granite of fine-crystalline structure with a purple tint;
- 4) coloured cement, red granite chips, labradorite, grey granite.

Plaster "grey granite" give four compositions:

- 1) coloured cement, grey granite chips, labradorite;
- 2) coloured cement, grey and black granite chips;
- 3) coloured cement, lime paste and grey granite chips;
- 4) white Portland cement with additions of 30% marble powder, lime paste and fine-grained chippings of grey granite and labradorite.

Specialists of the "Ukrrestavrtsiia" Corporation developed a procedure for making decorative plaster on architectural monuments, and a significant role in the work is played by the strength of the solution when processing the applied decorative coating layer. The first stage consists in applying a preparatory layer of spray and ground coat on the screeds (solutions of the preparatory layer can be lime, lime-gypsum, cement, cement-lime) and to better adhere to the subsequent layer, the surface of the surface layer is scratched and kept well. The second stage consists in applying a one-, two- or three-layer finishing coat from a decorative solution – first, spraying of the decorative solution, then a layer of ground coat and, if necessary, an upper finishing coat layer from the same solution.

The consistency of the plaster mortar should ensure its workability i.e. its mobility – spreading under the influence of tools in a thin dense layer, adhering tightly to the base and ensuring that irregularities on the surface are filled.

The experience of research of buildings in the Art Nouveau style in Poland

Even though Cracow, as mentioned earlier, is primarily the main centre of medieval architecture, quite a lot of objects of a new style were built in it including such public buildings as: the Union Printing House; the State Industrial School; the manor house of the Society of Supporters of Fine Arts; the manor house of the Cracow Technical Society; the Old Theatre and residential houses – stone house "Under the Owl"; "Under the Spider"; "Under the Dagger", richly decorated with friezes in the technique of plane stucco decoration with geometric and phytomorphic (plant) ornaments (Figs. 11 and 12). The rapid spread of the new style in Cracow was facilitated by the influx of wealthy customers – landowners from Galicia, who built decorated buildings and invited famous Polish architects to design them [28].

The decoration of buildings in this period in Cracow depended on their function. It was a sculptural stucco decoration, bas-relief, painting or mosaic, in which, in addition to the previously mentioned phytomorphic and zoomorphic motifs, the anthropomorphic decor was used in the form of symbolic or geometrized male and female images.

Decorations on the facades were made primarily with the use of cement mortars or concrete, and the natural stone was sporadically fitted mainly in bas-reliefs. In some buildings, the facades had an asymmetric composition with a combination of window openings of different sizes and shapes.




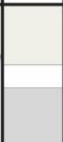








Building/ address	Architect	Facade finishing material	Color	Photograph of a fragment of the facade - existing state	Object photography - the existing state
The building of the Union Printing House / 13 Mikołajska St	R.Meus	colored plaster / brick			
The manor of the Society of Friends of Fine Arts/ 4 Szczepanski Sq	F. Maczynski	colored plaster / mosaics stone (plinth)			
The building of Krakow Technical Society/ 28 Straszewskiego St	S. Odrzywolski	rusti- cation on the ground floor / white glazed brick			
Old Theatre/ 1 Szczepanski Sq	Rebuilding T. Stryjenski, F. Maczynski	colored plaster			

Fig. 11. Public buildings of Cracow in the Art Nouveau style [12, 13]

Regardless of the function of the buildings from the Art Nouveau period, the facades were finished with various types of plasters – lime-cement, based on ready-made lime-cement mixtures. The composition of such mixtures included: cement, lime, sand and fine aggregate [19, 21]. Face brick was also used for decoration. It should be noted that in several cases brick, stone and ceramic mass were used simultaneously on the facades (Figs. 11 and 12).

The analysis of the objects mentioned made it possible to analyze the type of facade decoration: in the Building of the Union Printing House, in the Old Theater, in the stones of Festina Lente and David Gronner – mass-painted plaster; in the house of the Society of Supporters of Fine Arts – mass-painted plaster combined with mosaics; in the Cracow Technical Society building – unplastered main facade with a combination of rusticated lower floors and white glazed bricks of the upper floors (Figs. 11 and 12).

Analysis of the coloristics of the facades of buildings in Cracow makes it possible to establish that the colors were diverse, some facades were painted with pastel colors of paints and plasters, others had facades of unplastered bricks- white or glazed, which was especially fashionable in Cracow [25] (Figs. 11 and 12).













Building/ address	Architect	Facade finishing material	Color	Photograph of a fragment of the facade - existing state	Object photography - the existing state
"Under the spider" House / 35 Karmelicka St	T. Talowski	white lime- stone / brick			
"Festina Lente" House / 7 Retoryka St	T. Talowski	colored plaster / brick			
David Gronner's House / 8 Rakowicka St	E. Oraczewski	colored plaster			
Czyniel's House / 9 Mariacki Sq	R.Meus	colored plaster			

Fig. 12. Tenement houses of Cracow in the Art Nouveau style

It is appropriate here to compare the Art Nouveau buildings in Cracow and Lodz. A striking example of this style in Lodz is Leopold Kindermann's villa at 31/33 Wólchańska Street (now the City Art Gallery), designed by the architect Gustav Landau/Gutenteger (1903). The building is remarkable for its rich phytomorphic decor in the Art Nouveau style, and the entrance portico rests on columns that imitate apple tree trunks. The decoration of the facade combines sculptural decor and plaster of different textures – smooth, rusticated, grooved (Fig. 13).

The building was renovated in 2011 – 2013. As Jacek Olesiak, Product Manager of Renowacje, Dział Ochrona Budowli Remmers Polska sp. z o.o. said, the complex restoration of the mansion was carried out by the firm Cialbud-Wiesław Ciałkowski from Radzymin according to the project and under the supervision of architect Ariana Gano-Kotuli from "Arcona" Company [20].



Fig. 13. The fragment of the wall decoration of the Kindermann's villa. Photo by O. Ivashko, 2017

Repair and restoration work involved the restoration of waterproofing of foundations, renovation of basements, roof trusses, carved wooden elements of openings; a separate part of the work related to the conservation of old plasters and the reconstruction of fluted plaster from the so-called Roman cement; waterproofing, restoration and renovation works were carried out with products from the Remmers catalogue [20]. It concerns the materials of the Kiesol system and renovation plasters for waterproofing and dehumidification of building basements, plasters based on Roman cement, impregnations and paints for the glazed pattern of plasters and impregnations Adolit and Induline varnishes for interior and exterior windows and doors [20]. The high standard of restoration work was recognized by the Iconic Houses Foundation, and in 2015 the building itself was included in the Iconic Houses list of the most outstanding buildings [20].

If we talk about the features of many factory buildings in Lodz at the turn of the 20th century, then the facades were usually made of unplastered red facing bricks of local production and decorated with brick decor. This popularity of unplastered bricks in Lodz was driven by economic feasibility when decorative finishes were limited to ornamental brickwork and complemented by metal elements.

Conclusions

Traditionally, all published scientific studies on Art Nouveau in Ukraine are limited to purely architectural and art aspects, without delving into the chemical composition of building materials and solutions, and without combining the actual historical and architectural part with the analysis of the experience of practical restoration of specific Art Nouveau buildings. This

combination of different aspects is present only in the restoration documentation, which is not available to the general scientific community. That is why the scientific novelty of the article is as follows:

- for the first time:
 - materials for decoration of houses of the Secession period of different countries (Ukraine and Poland) and different cities from the point of view of their aesthetic and chemical properties, chemical components with the corresponding formulas, and also ways of performance of finishing works are analyzed;
 - on the basis of the conducted analysis it is proved which modern restoration techniques are applied to reproduction of initial finishing materials and décor;
- knowledge has been extended about:
 - information on the influence of chemical properties of finishing materials and technologies of their implementation on the creation of the image of houses of the Art Nouveau era;
 - information on the effectiveness of certain methods for the restoration of Art Nouveau buildings with a certain type of finishing;
- it received further development:
 - as a result of combining the results of research of Art Nouveau objects of scientists from different countries and different cities, it is possible to identify certain trends in the application of types of decoration of the Art Nouveau era, to identify common and different, further adding to the analysis the restoration experience of other countries.

The decoration of facades and interiors of Art Nouveau buildings in Ukraine and Poland was distinguished by its diversity. These were a variety of plasters, paints, stucco decoration, stained glass windows, ceramics and majolica. If we characterize the specificity of finishing of the main facades of buildings in Kyiv, then, as a rule, the facades were decorated with stucco decoration, some facades were plastered, and some were not. Majolica and stained-glass inserts were quite rare and were found, as a rule, in the most architecturally attractive objects.

Of all the cities-centres of Art Nouveau in Ukraine, more attention was paid to various types of textured processing of facades in the cities-centres of concentrated placement of objects of the architecture of the Art Nouveau style in the East of Ukraine. Most of the houses were plastered over brickwork, while plastered "rough cast" brickwork is known only in single objects, plaster "rough cast" and facing with stone "rough-faced" rustication is inherent mainly in the samples of northern national romanticism.

The development of organic synthesis, in particular, the industrial production of synthetic aniline dyes, is one of the main factors that influenced the formation of the colour scale of the facades of buildings of the Art Nouveau era at the turn of the 19th and 20th centuries.

The architecture of Art Nouveau of Kharkiv is closer in its colouristic solution to the Northern Art Nouveau of St. Petersburg than the architecture of Art Nouveau in Lviv and Kyiv; grey colour and yellowish ocher prevail in Art Nouveau of Kharkiv, a significant role is assigned to the texture of facade materials, which is responsible for part of the decorative function.

The decoration of the facades of the Art Nouveau buildings in Poland can be seen in the examples of buildings in Cracow and Lodz. The technique of planar stucco decoration with geometric and phytomorphic (plant) ornaments, sculptural stucco decoration, painting and mosaics was used, lime-cement plasters were used on ready-made lime-cement mixtures. A peculiar feature was the decoration with front brick, which was not typical for buildings in Kyiv.

If we compare the variety of finishing materials used for facades, then in Kyiv on one facade there could be plastering and painting on brick, stone cladding, stucco decoration, sometimes majolica or stained-glass inserts, metal decor. In the buildings of Cracow, the facades could also have simultaneously brick, stone or ceramic mass, and stucco decoration.

A significant role in the decoration of the facades of buildings in Cracow and Lodz was played by bricks – white or glazed in Cracow and red obverse in Lodz. Along with the

widespread use of facing bricks, a peculiar feature of Łódź buildings is the use of various plasters of different textures, including grooved plaster from the so-called Roman cement.

As mentioned at the beginning, the topic of the study of finishing materials at the turn of the 19th and 20th centuries is open for discussion. On the example of the restoration of many architectural monuments in Ukraine, it can be seen that the choice of colour and type of finishing materials is a very crucial aspect in the restoration since it remarkably affects the perception of the authenticity of the object. Based on the restoration experience of cult objects, which were often built and rebuilt over several periods, then the style, figurative, colour solution and decor are taken for the period of maximum prosperity of the object.

The Ukrainian and Polish experience in the restoration of historical buildings at the turn of the century made it possible to identify the basic principles of restoration. If it is possible to preserve the authentic plaster, it is strengthened with modern methods and restored; and in the event of the loss of fragments, it is supplemented, trying to bring the added fragments as close as possible to the authentic ones. To strengthen the old plaster, the specialists of the "Ukrrestavratsiia" Corporation fix it by injecting it with complex lime mixtures and further pressing against the wall with special devices until the solution sets, or by introducing special polymer or steel plaster dowels with very wide heads into the wall. If the plaster layer cannot be preserved, it is replaced with modern plastering chemical mixtures designed for application in particular places and for specific purposes, while striving to maintain an impression of authenticity, namely maximum external similarity to the original finish. As it was shown on the example of the building at 14-B Yaroslaviv Val Street, the colours for the facades and interiors were selected according to the modern palette of colours and the work was carried out with modern materials, but with the maximum approximation to the original colour scheme. An example of the reconstruction of the wall decoration in the "English studio", which was initially covered with green silk wallpaper, is typical. During the restoration process, we tried to choose new wallpaper, as close as possible to the original. The same applies to the restoration of easel painting and the return of the original profile to the stucco decor. The list of technologies used for the restoration of decorative finishing of buildings of the Art Nouveau period in Ukraine indicates that when using more efficient materials and technologies for decorative finishing of facades and interiors in comparison with historical materials and technologies, restorers, at the same time, strive for maximum preservation of the original finish and maximum similarity of the modern finishing with authentic materials.

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