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Receipt high-quality blanks of various shapes for lacquer miniature painting in laboratory production conditions

Abstract. This study analyzes the development and transformation of the process of making papier-mache blanks for lacquer miniature painting artworks. The article presents how traditional technologies for processing cellulose and fibrous materials to modern requirements, innovative approaches that were developed to improve the quality and functionality of artistic blanks for lacquer miniature painting at the Russian University of traditional art crafts. The characteristics of wood fiber materials for creating lightweight but durable structures are studied, which is especially relevant in the conditions of modern des ign of art works of lacquer miniature painting.

Keywords: papier-mache, fiberboard, scientific and design technological laboratory, patent, traditional art crafts, lacquer miniature painting.

In contemporary society, where the sustainable development of industrial sectors depends on the availability and environmental safety of materials, papier-mâché stands out as a unique raw material possessing all the necessary characteristics. However, there is a lack of research dedicated to the use of papier-mâché in modern production technologies and pedagogical practices for teaching lacquer miniature painting artists. This article presents the results of a study investigating papier-mâché both as a material within its historical context and through modern technologies that enhance understanding of its physical properties, thereby contributing to the advancement of techniques for creating works of lacquer miniature painting.

Papier-mâché is a unique composite material with diverse physicochemical properties [5, p. 6]. Its applications span numerous fields including traditional arts and crafts, theater, sculpture, architecture, and more.

The composition of papier-mâché includes fibrous materials and adhesive substances such as polyvinyl acetate or starch. The chemical composition of papier-mâché affects its resistance to moisture. While pure products may be susceptible to degradation, the addition of special fillers or protective coatings (such as acrylic or alkyd varnishes) significantly enhances water repellency. The lightness, relative strength, and ease of processing make papier-mâché a relevant material for creating artworks in traditional applied arts.

The process of creating artistic works across different cultures has been adapted by improving methods of working with papier-mâché. Two approaches have emerged for making items from papier-mâché:

- *manual* – creation of the mass involves soaking or boiling paper followed by mixing it with an adhesive substance;

- *mechanical* – achieved by gluing long strips of cellulose together under pressure using a specialized organic compound.

These technological approaches enable the creation of a wide range of products – from simple toys to complex structures like boxes, caskets, powder cases, etc.

The widespread use of this raw material for creating artistic objects is due to its accessibility and cost-effectiveness. Over time, papier-mâché has become emblematic of the application of innovative technologies in art and everyday life.

At the same time, papier-mâché technology in both artistic and industrial production has undergone significant changes over the past decades of its application and refinement in the creation of artistic blanks for lacquer miniature paintings. For instance, the use of microcreped paper in the manufacture of small blanks can substantially increase the durability and lifespan of finished products, particularly elements prone to greater wear and tear, such as pins, hinge areas and corners of the body, thus rendering them more resistant to mechanical damage [6]. Therefore, these new approaches to creating blanks for artistic works allow for the development of more proportionate and resilient products against external influences.

Another example of utilizing modern technologies in the creation of artistic blanks from papier-mâché is the integration of computer numerical control machines into the manufacturing process, which build the product additively. This method combines classical approaches with cutting-edge technologies, enabling the design of more intricate and adaptable constructions. This approach demonstrates how modern technologies can harmonize with traditions, expanding the horizons of possibilities in product creation [7].

Technologies for producing papier-mâché-based raw materials represent an area where traditional methods intersect with modern approaches to manufacturing. Combining tradition with innovation opens a new chapter in the evolution of papier-mâché fabrication techniques, demonstrating its value for both artistic and functional applications.

This raw material serves as a unique structural material for modern technological developments, consisting of cellulosic fibers and glue, making it similar to *fiberboard*. Modernization of the process for creating artistic blanks has allowed for the use of modern and high-quality adhesive compositions, increasing the strength and durability of products. This material is the most accessible and straightforward among existing modern materials for producing blanks for artistic creations, surpassing others in terms of physico-mechanical qualities.

From a technological standpoint, papier-mâché consists of porous layers, providing good physical and mechanical properties. However, evaluating the strength characteristics of medium-density fiberboard reveals that it can serve as an alternative to more complexly produced papier-mâché (Table 1).

According to Table 1, it can be concluded that medium-density fiberboard exhibits superior performance in machinability, as well as in terms of defects and cracks. It also outperforms other tested samples in dimensional stability after exposure to external physical and mechanical factors.

Traditional multilayered fibrous materials, such as papier-mâché, demonstrate better results in bending strength limits and paintability, but lead to defects and cracks during mechanical processing. Molding compounds used for detailing or volumetric sculpting of artistic pieces exhibit the lowest performance indicators and are unsuitable for mass production.

Table 1.

Comparison of Physico-Mechanical Properties of Fibrous Materials for Producing Blanks for Lacquer Miniature Painting

Physico-mechanical properties of the material	Legend: x – poor; xx – satisfactory; xxx – mediocre; xxxx – good; xxxxx – excellent		
	Medium Density Fiberboard (MDF)	Multilayered Fibrous Material (Papier-Mâché)	Molding Compound of Fibrous Material (Papier-Mâché)
Bending Strength Limit	xx	xxxxx	Xxx
Modulus of Elasticity	xx	xxx	Xxxx
Dimensional Stability	xxxx	xxx	Xx
Machinability	xxxxx	xxx	X
Defect and Cracking Occurrence	xxxx	xx	X
Suitability for Painting	xxxx	xxxxx	Xxx

Thus, based on the data presented in Table 1, it can be concluded that for creating monumental artistic pieces such as plates, panels, and screens, it is advisable to use fiberboard, whereas for smaller items like powder boxes and round caskets, traditional multilayered fibrous materials are preferable.

For creating artistic works in various techniques of traditional lacquer miniature painting, a base made from papier-mâché is commonly utilized. The aesthetic requirements and the technology for producing raw materials for lacquer miniature painting, characteristic of traditional Russian folk arts practiced in villages such as Holuy, Palekh, Fedoskino and the settlement of Mstyora, have been

successfully preserved at the unique higher education institution “Russian University of traditional art crafts” and its branches.

Within the academy's walls, modern methods for producing artistic blanks from fiberboard are being explored, along with preserving the traditional papier-mâché technique for creating lacquer miniature paintings. These ongoing developments draw upon the achievements and studies conducted by artists and technologists in the field of traditional folk arts who worked in factories and artels at the beginning of the 20th century.


РОССИЙСКАЯ ФЕДЕРАЦИЯ

ПАТЕНТ

НА ИЗОБРЕТЕНИЕ

№ 2641484

Способ изготовления изделий из папье-маше

Патентообладатель: ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ БЮДЖЕТНОЕ ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ ВЫСШЕГО ОБРАЗОВАНИЯ "ВЫСШАЯ ШКОЛА НАРОДНЫХ ИСКУССТВ (ИНСТИТУТ)" (RU)

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Fig. 1. Patent No. 641484 "Method for Manufacturing Papier-Mâché Products"

In 2013, a scientific design and technology laboratory was established at the Mstyora Institute of Lacquer Miniature Painting named after F.A. Modorov—a branch of The Russian University of traditional art crafts—which holds a patent for the production of papier-mâché (Fig. 1[42]).

Based on the scientific design and technology laboratory, papier-mâché products, as well as fiberboards of various sizes and functional purposes, are created. The laboratory includes workshops for the production of icon boards and blanks for future artistic works of lacquer miniature painting and decorative painting, which are essential for the educational process of the academy’s specialized branches and main university.

Laboratory staff conduct scientific research within the framework of the project "Renovation of Optimal Technology for Creating Papier-Mâché for Lacquer Miniature Painting—as a Basis for Artistic and Design Solutions in High-Quality Works of Decorative and Applied Arts" [3, p. 59]. The primary task of the laboratory is to search for and produce new forms of products for lacquer miniature painting based on original creative projects and drawings by students of the academy and its branches, which is one of the distinctive features of the process of creating artistic blanks using state-of-the-art equipment (Fig. 2[43]).

[42] Fig. 1. Patent for invention No. 2641484 "Method for manufacturing papier-mâché products". Research work. // Mstyora Institute of Lacquer Miniature Painting named after F.A. Modorov - URL: https://www.vshni.ru/doc/nauka/patent20180117.pdf (accessed: 30.01.2025).

[43] Fig. 2, 3. Photos from the scientific archive of the Mstyora Institute of Lacquer Miniature Painting named after F.A. Modorov – a branch of the Russian University of traditional art crafts.

Fig. 2. Equipment of the Scientific Design and Technology Laboratory of the Mstyora Institute of Lacquer Miniature Painting named after F.A. Modorov – a branch of The Russian University of traditional art crafts

Currently, there are no official enterprises in the Vladimir region engaged in the production of artistic blanks made from papier-mâché and fiberboards. As a result, the Mstyora Institute of Lacquer Miniature Painting named after F.A. Modorov serves as a unique scientific and technological center for preserving traditional technologies, where experimental activities can be carried out and modern methods of raw material creation can be implemented.

Additionally, the laboratory provides a platform for the scientific and educational activities of students from the Mstyora Institute of Lacquer Miniature Painting named after F.A. Modorov. The laboratory serves as a research environment where each student can gain insight into the process of creating an artwork from the initial stages of blank preparation, delve into the production process, analyze and consider the properties of the materials when designing future works [4, p. 12].

The types and varieties of products manufactured by the academy's scientific design and technology laboratory are diverse. The laboratory produces both miniature and large-scale utilitarian, highly artistic items: caskets, boxes, powder boxes, pouches, brooches, pendants, hairpins, screens, writing sets, bookmarks, chessboards, as well as monumental plates, panels, and screens (Fig. 3).

Upon completion of the production process for artistic blanks intended for future lacquer miniature paintings, each batch is inspected in the laboratory by a technologist according to several criteria: water resistance, density, strength, surface roughness and evenness of the lacquer coating.

Integrating the study of papier-mâché and fiberboard blank-making technologies into the curriculum of lacquer miniature painting students fosters a deeper understanding of the entire artistic creation process—from model to final

product—and emphasizes principles of environmental sustainability and recycling, which are especially pertinent amid global ecological challenges [1, p. 48]. Programs that incorporate theoretical content and practical demonstrations of the papier-mâché production process directly within the academy's scientific design and technology laboratory provide a platform for discussing broader topics related to innovative technologies, manufacturing processes, ecosystems, and responsible consumption.

Fig. 3. Examples of shapes produced in the Academy's Scientific Design and Technology Laboratory

Each of these new methods and approaches in producing artistic blanks for lacquer miniature painting elevates the technology of raw material production, allowing for a combination of practical utility with students' creative self-expression [2, p. 7]. On one hand, traditional techniques are carefully preserved and passed down to the next generation of artists in the realm of traditional applied arts; on the other hand, innovations take center stage, enriching the ancient craft of papier-mâché with new technologies and opportunities

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