

Original article

ROLE OF REGIONAL MUSEUM INSTITUTIONS IN CREATION OF MODERN DESIGN PRODUCT (AS AN EXAMPLE OF STATE MEMORIAL ARCHITECTURAL COMPLEX «MEMORIAL ESTATE OF P. I. TCHAIKOVSKY»)

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Abstract. Museum is a high-demand place for organizing and carrying out events with cultural, educational and recreational purposes. For forming communicative process with visitors museum needs modern products which can reflect emotional character of territory. The role of regional museum-estate of P. I. Tchaikovsky (The Udmurt Republic, Votkinsk) for improving life expectancy of population and development destination as a whole is considered in this article. We describe components of impressions which are already used in project management of the museum. Types of products of the museum are systemized and cultural heritage of Tchaikovsky's family are learnt in the form of associative row which can be used in design accompaniment of museum product. On the base of criteria mentioned above design products and collections of images of souvenir products are realized in Udmurt State University as part of modern product of museum estate of P. I. Tchaikovsky. This direction of research is included in the program «Priority — 2030» of Udmurt State University which was supported by Ministry of Science and higher education of the Russian Federation.

Keywords: design, cultural heritage, typology, semiotic, scripting, project management

For citation: Melnikova A. S., Ivshin K. S., Golubeva O. A. Role of regional museum institutions in the creation of a modern design product (as an example of State Memorial and Architectural Complex «Memorial Estate of P. I. Tchaikovsky»). *Design. Materials. Technology.* 2024;(1(73)):9–14. (In Russ.). DOI: 10.46418/1990-8997_2024_1(73)_9_14.

Original article

HOW TO WRITE THE HISTORY OF ST. PETERSBURG: CONCEPTUAL PRINCIPLES OF THE EXHIBITION

«ST. PETERSBURG — HISTORY OF DEVELOPMENT»

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Abstract: The article is devoted to the development of a new methodology for creating histories of cities. It is based on the concept of a city as a closed system which communicates the surrounding world by means of transport and information streams.

Keywords: applied historical research, history of St. Petersburg, concept development, museum and exhibition complex «Russia — my history»

For citation: Alekseev D. Y., Kozhemyakin A. O., Chernyaga O. A. How to write the history of St. Petersburg: conceptual principles of the exhibition «St. Petersburg — History of Development». In: Design. Materials. Technology. 2024. No 1 (73):15–20. (In Russ.). DOI: 10.46 418/1990-8997_2024_1(73)_15_20.

Original article

BASIC PREREQUISITES FOR THE FORMATION INDUSTRIAL DESIGN IN JAPAN

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Abstract. The article is devoted to the history of the formation of industrial design in Japan. The main preconditions that influenced the development of design as a design and artistic activity in the country are identified, among which: economic, socio-political, socio-cultural, artistic and

aesthetic, and are discussed with examples. The features of the development of design in Japan at the initial stage of its formation are emphasized.

Keywords: japanese design, history of design, features of the development of design in Japan, prerequisites for shaping, design nation

For citation: Mikhailova A. S., Safin R. S., Ibragimova F. A. Basic prerequisites for the formation industrial design in Japan. *Design. Materials. Technology.* 2024;(1(73)):21–26. (In Russ.). DOI: 10.46418/1990-8997_2024_1(73)_21_26.

Original article

THE ALEXANDRE III BRIDGE — MONUMENTAL ART OBJECT OF THE 1900 PARIS EXPOSITION UNIVERSELLE

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Abstract. The article considers the history of the construction of the Alexandre III Bridge in Paris, the completion of which was timed to coincide with the opening of the 1900 Universal Exhibition. The art and functional characteristics of this innovative structure, the main features of which are large scale, unity of content, harmony with the architectural and spatial surrounding of the city, are studied. The authors analyze the construction features, techniques of new technologies and artistic decoration of the bridge.

Keywords: Paris, Alexandre III Bridge, Universal Exposition, art nouveau, metal, construction, decoration

For citation: Vankovich A. V., Anichkova M. M. The Alexandre III Bridge — monumental art object of the 1900 Paris Exposition Universelle. *Design. Materials. Technology.* 2024;(1(73)):27–36. (In Russ.). DOI: 10.46418/1990-8997_2024_1(73)_27_36.

Original article

DEVELOPMENT OF BASIC DESIGN COMPETENCIES FOR STUDENTS IN THE DESIGN DIRECTION (UNDERGRADUATE)

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Abstract. The article discusses the formation of holistic project thinking among students in the Design direction (undergraduate level) in the first year in the disciplines Design, Propaedeutics and Fundamentals of Industrial Excellence. The formation of a single artistic concept of the design object and its transformation in graphic and mock-up compositions. When creating a design object, the stage of searching for an artistic image and its ideological and semantic expression by graphic means is important. The application of the layout method as a stage in the development and creation of the concept of a subject design object is considered; hand-made and digital modeling of the design object in the Product Lifecycle Management.

Keywords: design-education, design, formal composition, layout, digital modeling, design graphics, design competencies

For citation: Ivshin K. S., Antipina E. V., Yarkova E. V. Development of basic design competencies for students in the Design direction (undergraduate). *Design. Materials. Technology.* 2024;(1(73)):37–43. (In Russ.). DOI: 10.46418/1990-8997_2024_1(73)_37_43.

Original article

THEORETICAL ASPECTS OF DESIGN RESEARCH IN THE ARTISTIC AND TECHNICAL SPHERE ON THE EXAMPLE OF THE FIRST INTERDISCIPLINARY EDUCATIONAL INSTITUTIONS

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Abstract. This article is devoted to the study of design as an interdisciplinary science, which in turn is based on a retrospective analysis of the emergence of design on the basis of the first interdisciplinary educational institutions (Staatliches Bauhaus, Higher art and technical workshops).

Keywords: design, interdisciplinarity, traditions and innovations, interdisciplinary basis of design

For citation: Semenova T. V., Zhukova L. T. Theoretical aspects of design research in the artistic and technical sphere on the example of the first interdisciplinary educational institutions. Design. Materials. Technology. 2024;(1(73)):44–48. (In Russ.). DOI: 10.46 418/1990-8997_2024_1(73)_44_48.

Original article

ANALYSIS OF THE EFFECTIVENESS OF UNDERGRADUATE TRAINING

IN THE FIELD OF «TECHNOLOGY OF ARTISTIC PROCESSING OF MATERIALS»
WITHIN THE FRAMEWORK OF TRAINING SPECIALISTS OF CREATIVE INDUSTRIES

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Abstract. An analysis of the effectiveness of undergraduate training in the field of «Technology of artistic processing of materials» was carried out as part of the training of specialists in the creative industries at the Siberian Federal University on the example of a specific graduation qualification work. It has been shown that in the framework of a comprehensive approach combining the modern scientific and technical level in the field of material processing (including the use of modern 3D modeling programs, laser cutting) in combination with traditional methods of processing and design on the one hand, and an artistic and analytical approach to the aesthetic content of developed products on the other hand, it is possible to prepare high-class personnel of creative industries.

Keywords: creative industries, technology of artistic processing of materials, graduation qualification work

For citation: Noskov F. M., Lyubenkova A. A., Lytkina S. I., Berezyuk V. G., Kaposhko I. A. Voevodina E. S. Analysis of the effectiveness of undergraduate training in the field of «Technology of artistic processing of materials» within the framework of training specialists of creative industries. Design. Materials. Technology. 2024;(1(73)):49–54. (In Russ.). DOI: 10.46 418/1990-8997_2024_1(73)_49_54.

Original article

DESIGN AND ANALYSIS OF STYLISTIC SOLUTIONS OF KITCHEN AREAS OVER THE LAST CENTURY (1920–2020)

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Abstract. The concept of the main trends of some time frames is highlighted. The working principles of creating kitchens for people with different incomes are considered. The article describes interesting techniques and stylistic solutions. An analysis of kitchen ergonomics was carried out and a comparison was made with foreign projects.

Keywords: interior, decorative materials, kitchen, room, dining area, spacious environment

For citation: Isupova E. V., Balashov M. E. Design and analysis of stylistic solutions of kitchen areas over the last century (1920–2020). Design. Materials. Technology. 2024;(1(73)):55–60. (In Russ.). DOI: 10.46 418/1990-8997_2024_1(73)_55_60.

Original article

DEVELOPMENT OF A METHOD FOR MARKING SPORTS EQUIPMENT FOR MAS-WRESTLING

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Abstract. The article discusses the main size characteristics of mas-wrestlers as the basis for determining typical body figures, best characterizing the body shape in static and in motion. A new size typology for mas-wrestlers is proposed obtained as a result of anthropometric research using 3D scanning. The analysis of typical movements of mas-wrestlers was carried out and the results were systematized differentiated by the main poses. The author researched the dynamic effects of body figures in three main poses. The digital model of size characteristics changes in dynamics depending on amplitude angles changes of the lower limbs segments were obtained. The research has shown that the developed typology will serve as the basis for the design of ergonomic equipment according the terms of use.

Keywords: anthropometric characteristics, leading size characteristics, typical body figures, size typology

For citation: Baisheva D. A., Zhukova L. T. Development of a method for marking sports equipment for mas-wrestling. *Design. Materials. Technology.* 2024;(1(73)):61–67. (In Russ.). DOI: 10.46 418/1990-8997_2024_1(73)_61_67.

Original article

DIGITAL TECHNOLOGIES IN JEWELRY DESIGN: FROM IDEA TO IMPLEMENTATION

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Abstract. The article highlights the importance of three-dimensional modeling in the field of jewelry production. The capabilities of 3D design programs are considered: Rhinoceros, 3DS Max, Compass-3D and their comparative analysis is carried out. Based on the Compass-3D program, a headset model and technological documentation were developed. The authors reflect the promise of three-dimensional modeling of jewelry using digital technologies from the idea to the implementation of the design concept.

Keywords: digital technologies, design, 3D modeling, computer modeling, jewelry, Compass-3D program

For citation: Kaukina O. V., Naumov V. P. Digital technologies in jewelry design: from idea to implementation. *Design. Materials. Technology.* 2024;(1(73)):68–74. (In Russ.). DOI: 10.46 418/1990-8997_2024_1(73)_68_74.

Original article

THE ROLE OF ERGONOMICS IN THE CORRECTION OF SENSOR DEPRIVATION IN COSMONAUTS UNDER WEIGHTLESS CONDITIONS

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Abstract. The article discusses the conditions of sensory deprivation and its possible destructive consequences. The features of the effect of sensory deficiency on astronauts in the confined area of the space station are analyzed. The information was grouped on the basis of the human sensory system, socio-psychological problems of professional activity in extreme space conditions were included.

Keywords: ergonomics, sensory deprivation, isolation, astronautics, weightlessness

For citation: Kuklina A. V., Kukhta M. S. The role of ergonomics in the correction of sensor deprivation in cosmonauts under weightless conditions. *Design. Materials. Technology.* 2024;(1(73)):75–83. (In Russ.). DOI: 10.46418/1990-8997_2024_1(73)_75_83.

Original article

NATIONAL COMPONENT IN ART OF GRAFFITI AND SUPERGRAPHICS

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Abstract. The manifestation of the national component in the formation and development of graffiti and supergraphics in city design is considered as a special form of artistic synthesis of graphic design and architecture in the process of organizing the subject-spatial environment of the city at

various levels. The conditions for the emergence of graffiti as a form of self-expression of artists, as well as as a prerequisite for the birth of supergraphics, are highlighted. Examples of the use of the national component in murals and other examples of modern street art are identified and the most frequently used forms are identified: direct quotation of national motifs, stylization and actualization of elements of the national component from the point of view of the modern visual component,

Keywords: architectural supergraphics, city design, artistic synthesis, subject-spatial environment, graffiti, national component in design

For citation: Mikhailova A. S., Safin R. S., Hafizov R. R. Khusnutdinova L. R. National component in art of graffiti and supergraphics. Design. Materials. Technology. 2024;(1(73)):84–93. (In Russ.). DOI: 10.46418/1990-8997_2024_1(73)_84_93.

Original article

FOLK LANDSCAPES OF GERMAN FAIRY TALES IN ARTISTIC IMAGES OF DESIGN OBJECTS OF INTERIOR SOLUTIONS WITH THE FUNCTION OF A CHILDREN'S ZONE IN THE ROMANTICISM OF THE WORKS

OF THE BROTHERS JACOB AND WILHELM GRIMM

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Abstract. In this work, a study was carried out of artistic images of design objects of the subject-spatial environment that organize the living space of a person, represented by the dominant modules of the composition of the children's interior zone «Roads of German Fairy Tales», in residential suburban construction. The project was carried out in a retrospective of the second nature of cultural folk landscapes with a cognitive approach to the history of the theory of fine arts and design in the narrative of the fairy-tale romanticism of the works of the brothers Jacob and Wilhelm Grimm.

Keywords: interior, children's area, ontological and semiotic reality, semantic network, subject-spatial environment of design objects, furniture, decorative elements

For citation: Zhukov V. L., Smirnova A. M., Dunaeva A. D. Folk landscapes of german fairy tales in artistic images of design objects of interior solutions with the function of a children's zone in the romanticism of the works of the brothers Jacob and Wilhelm Grimm. Design. Materials. Technology. 2024;(1(73)):94–102. (In Russ.). DOI: 10.46418/1990-8997_2024_1(73)_94_102.

Original article

ONTOLOGY OF URBAN ENVIRONMENT DESIGN OBJECTS

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Abstract. The article examines the ontological essence of design from the perspective of the involvement of value-symbolic images in life processes. This aspect of understanding Design as a given, which nature has endowed a person from birth, distinguishes him with a capital letter among many other design definitions. Concrete examples describe the connection of objects of monumental art and design, as a special formative activity, with Plato's metaphysics, in which things exist only «when introduced to ideas». Western art is identified with the artistic representation of the phenomena of reality, which contradicts the spirituality of the native Russian culture (P. Florensky, S. A. Frank). Semiotic, technological and compositional aspects of design objects are selected for analysis. Emergent evolution considers the existence of a thing in the system of space-time points of the world basis, which is consonant with the cultural self-development of modern man. The design of design objects is interpreted from the position of restoring a stable trace of engrams in memory (Greek. *έν* — «being in any state or action» + Greek. *γράμμα* — «everything written», «»). The examples of student developments presented in the article demonstrate a synergetic effect associated with the semiotic field of the archetypal essence of design.

Keyword: design, ontological entity, emergent evolution, cultural self-development, archetype

For citation: Piirainen V. Yu., Kiriyenko I. P., Makhova T. O., Sharapova D. M. Ontology of urban environment design objects. Design. Materials. Technology. 2024;(1(73)):103–109. (In Russ.). DOI: 10.46418/1990-8997_2024_1(73)_103_109.

Original article

TRANSHUMANISTIC APPROACHES IN THE COSMICITY

OF NATURAL REALITIES, REPRESENTED BY ARTISTIC IMAGES OF DESIGN OBJECTS
OF JEWELRY ART IN THE RELEVANCE

OF MODERN CULTURE OF SCIENTIFIC FICTION WORKS BY I. A. EFREMOV WITH
ANTIQUÉ AND MYTHOLOGEMES OF ASTRONOMICAL PRATOTHEMISM

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Abstract. The scientific approach is one of the traditional methods for a comprehensive study of both the properties of artistic images of design objects and design technologies for creative processes and the desire to create on their basis an optimal theory of fine art and design, with the help of which to solve all sorts of goals and problems determined in this work ideas of transhumanism in the development of scientific forecasts in cosmology through futurological aspects reflected in the genre of science fiction literature by I. A. Efremov.

Keywords: artistic images of design objects, cognitive technologies, methodological approaches to design, science fiction literature, interdisciplinarity, cosmology, jewelry art

For citation: Zhukov V. L., Smirnova A. M., Grave V. D. Transhumanistic approaches in the cosmicity of natural realities, represented by artistic images of design objects of jewelry art in the relevance of modern culture of scientific fiction works by I. A. Efremov with antique and mythologemes of astronomical prathemism. *Design. Materials. Technology.* 2024;(1(73)):110–119. (In Russ.). DOI: 10.46418/1990-8997_2024_1(73)_110_119.

Original article

THE SYMBOLIC MEANING OF TRADITIONAL ORNAMENTS IN YAKUT ARTS AND
CRAFTS

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Abstract. The article examines the symbolization of the language of ornament in the decorative and applied arts of the Yakuts. Pattern is the most important component of artistic language and the meaningful grain of compositions.

Keywords: art, artistic image, Yakut culture, canon, meaning of ornaments

For citation: Baisheva D. A. The symbolic meaning of traditional ornaments in Yakut arts and crafts. Design. Materials. Technology. 2024;(1(73)):120–125. (In Russ.). DOI: 10.46418/1990-8997_2024_1(73)_120_125.

Original article

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USING CALLIGRAPHY ORNAMENT TO DECORATE ARABIAN WOMEN CLOTHES AND ITS EFFECT ON MODERN ARABIC MODE

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Abstract. Clothes ornament plays a major role in sales, at the same time fashion shows enormous role that recently emerged Arab style on the world stage and the appearance of many Arab designers in the international fashion shows in Paris and other world fashion houses. Arabian clothes ornaments have identified concepts of the Islamic religion and decorated clothes according to these limits. These ornaments have been used by many Arab designers as motifs such as animal images, geometric motifs and calligraphy, which have played the major role in the ornaments in the present time. It is known that the Arabian societies have a moral system derived from the Arabian culture and the Islamic religion which control the type of the clothes whether it's decent or not, or is it acceptable according to the traditional costumes under the influence of the global trends and fashion houses. In this research, these ornaments, whether they are «written words» or «pictures», will not be studied whether they are socially acceptable or not, or if they are traditionally offensive or not.

Keywords: ornament, Arabian calligraphy, construction, typography, style, questionnaire

For citation: Najim A. A. Using calligraphy ornament to decorate Arabian women clothes and its effect on modern Arabic mode. Design. Materials. Technology. 2024;(1(73)):126–132. (In Russ.). DOI: 10.46 418/1990-8997_2024_1(73)_126_132.

Original article

EFFECT OF SURFACTANTS ON THE STRUCTURE OF POLYPROPYLENE

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Abstract. In this paper the change in the supramolecular structure of isotactic polypropylene as a result of film treatment with aqueous solutions of surfactants is studied. On the basis of DSC curve analysis it was found that ionic surfactants have no plasticising effect on polypropylene, but cause reorientation of its macromolecules. This is confirmed by calculations of the intrachain melting co-operativity parameter and TGA results.

Keywords: differential scanning calorimetry, thermo-gravimetric analysis, phase transitions, melting, quaternary ammonium salt

For citation: Elokhin I. V., Mikhailovskaya A. P., Sitnikova V. E. Effect of surfactants on the structure of polypropylene. *Design. Materials. Technology.* 2024;(1(73)):133–137. (In Russ.). DOI: 10.46 418/1990-8997_2024_1(73)_133_137.

Original article

INTERPOLATION OF THE COEFFICIENTS FOR CALCULATING THE VISCOSITY OF GLASS USING THE OKHOTIN METHOD FOR THE INTERVAL $9 > \lg(\eta) > 5$

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Abstract. The article proposes the extension of the Okhotin method for calculating the viscosity of sheet glasses for the interval $9 > \lg(\eta) > 5$

Keywords: method, calculation, viscosity

For citation: Zhukova L. T., Kozitsyn I. P. Interpolation of the coefficients for calculating the viscosity of glass using the Okhotin method for the interval $9 > \lg(\eta) > 5$. *Design. Materials.*

Original article

ANALYSIS OF METHODS FOR INCREASING THE ADHESIVE STRENGTH OF CORROSION-RESISTANT COATINGS OF HEATING PIPELINES

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Abstract. The current state of heating network pipelines in most large cities of the Russian Federation is in an unsatisfactory condition due to corrosion damage to the continuity of the pipe metal, as a result of poor protection from the active influence of environmental humidity, the influence of the chemical and biological composition of the soil, the presence of stray currents and other factors, which leads to disruption operation of heating networks, their downtime and the costs of repairing the emergency area. The main indicator of the quality of a pipeline is its service life, which is influenced by both the chemical resistance of the coating itself and the conditions of its application, installation and operation of the pipeline. One of the main ways to solve the problem of external corrosion of pipes is the use of non-metallic coatings, and if the influence of their composition and chemical resistance has been sufficiently well studied: glass-enamel and polymer compositions used in the production of pipes are widely known, then the performance properties of coatings in various conditions of pipeline location require additional serious study. In general, from a scientific point of view, the durability of a coating is determined by its adhesive strength. The adhesive strength of coatings is associated with a large number of factors. These factors can be roughly divided into several categories: the composition and type of the coating itself, the nature of the material of the product being coated, the substrate and factors associated with the technological processes of forming the intermediate and main coatings. Increasing the adhesive strength of coatings on specific materials is solved in several ways — by changing the morphology of the surface of the coated product, which increases mechanical adhesion, its activation by intermediate layers and the choice of the optimal coating application mode — its drying, formation conditions, etc. Separately, it is worth mentioning methods for increasing adhesive strength through additional exposure to the surface of a product to be coated, for example a pipe, or to the material of the intermediate substrate with various fields (magnetic, ultrasonic and others). Purpose of the work: to analyze existing methods for increasing the adhesive strength of coatings in order to identify potential methods for increasing the operational resistance of protective corrosion-resistant coatings under extreme operating conditions associated with exposure to high humidity, pH environment and stray currents. Modern methods of statistical data processing (results of scientific research) were used. Microsoft Office tools were used during creation. Based on the processing of data presented in the reviewed articles, an analysis of modern

methods for increasing the adhesive strength of corrosion-resistant coatings was carried out, and promising areas in which scientific research should be carried out were identified.

Keywords: adhesive strength, coating, water supply pipeline, corrosion-resistant coating, modification

For citation: Pribytkova D. A., Pryakhin E. I. Analysis of methods for increasing the adhesive strength of corrosion-resistant coatings of heating pipelines. Design. Materials. Technology. 2024;(1(73)):142–147. (In Russ.). DOI: 10.46 418/1990-8997_2024_1(73)_142_147.

Original article

INVESTIGATION OF EXPERIMENTAL CHROMATICITY DATA FOR PREDICTING THE CONCENTRATION OF DYES IN OPAL GLASSES

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Abstract. Glass is an inorganic durable, brittle, impervious to natural elements, transparent or translucent material that is used in many areas of our daily life. Studies of synthesized opal glasses with different concentrations of blue dye have been carried out. Dependencies of the thermal coefficient of linear expansion and coloristic properties on the chemical composition of opal glasses were obtained.

Keywords: glass, opal glasses, dyes, concentration, silencing, crystallization, coefficient of linear expansion, chromaticity, saturation

For citation: Zhukova L. T., Rybakova M. E. Investigation of experimental chromaticity data for predicting the concentration of dyes in opal glasses. Design. Materials. Technology. 2024;(1(73)):148–153. (In Russ.). DOI: 10.46 418/1990-8997_2024_1(73)_148_153.

Original article

METHOD FOR SPECTRAL-TEMPORAL MODELING OF VISCOELASTICITY OF POLYMER TEXTILE MATERIALS

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Abstract. Solving the problem of spectral-temporal modeling of the viscoelasticity of polymer textile materials is important for determining the functional and performance characteristics of these materials, which, in turn, makes it possible to increase their competitiveness. The development and improvement of methods for the computational prediction of stress-strain states of polymer materials in the field of non-destructive mechanical influences is due to their expanding use in technical products, and is also inextricably linked with the tasks of comparative analysis of the properties of materials, with studies of the relationship between properties and structure, with targeted technological regulation of properties, with prediction of short-term and long-term mechanical effects.

Keywords: polymer textile materials, spectral-temporal modeling, deformation processes, forecasting, performance properties

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Original article

ENSURING THE ADHESION OF THE FLUOROPLASTIC COATING TO THE STEEL SUBSTRATE

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Abstract. The aim of this work is to increase the adhesive properties of a fluoroplastic coating on a steel substrate by pre-laser treatment of the steel surface and the use of various phosphating compounds as an intermediate layer.

Plates made of St3 steel were selected as prototypes. For preliminary surface preparation, laser treatment on the Mini Marker 2 laser complex was selected. Also, 2 phosphating compositions were selected for the study. Surface roughness measurements before sample processing, after laser treatment and after phosphating were performed on a HOMMEL TESTER T1000 profilometer. A Leica DMIL HC microscope was used to image the microstructure. Enamel FP-566 was chosen as a fluoroplastic coating. The separation adhesion measurements were performed using an Elcometer 108 Hydraulic Adhesion Tester.

The structures formed during «cold» phosphating with a characteristic type of formation of phosphate crystals on a pre-laser-treated steel surface can significantly increase the adhesive tear strength of the fluoroplastic antifriction coating. Moreover, the best results are shown by composition No. 1 (Majef (salt: manganese, iron, phosphorus) (25 g/l), Zn (NO₃)₂×6H₂O (35 g/l), NaF (7 g/l)). The obtained values of the surface roughness of the untreated sample, the sample after laser treatment and after phosphating allowed us to identify the cause of this increase in adhesive strength.

The overall increase in adhesive strength when using phosphating compounds can be attributed both to the characteristic surface relief after laser treatment and to the overall increase in surface roughness after phosphating. The resulting phosphate crystals have a developed surface, which has a beneficial effect on the growth of adhesive strength by increasing the contact area of the coating with the treated surface.

As a result of the study, it was found that the use of phosphating in conjunction with laser treatment makes it possible to increase the adhesive strength of the coating. Composition no. 1 (Majef (salt: manganese, iron, phosphorus) (25 g/l), Zn (NO₃)₂×6H₂O (35 g/l), NaF (7 g/l)) showed the greatest effectiveness. This can be attributed to the greater amount of roughness formed when using this composition.

Keywords: adhesion, fluoroplastic coating, phosphating, steel substrate, pretreatment

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Original article

MODELING OF RELAXATION OF POLYMER TEXTILE MATERIALS FOR TECHNICAL PURPOSES

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Abstract. The article describes methods for constructing mathematical models of relaxation of polymer textile materials for technical purposes. The problem of constructing the specified mathematical models that most adequately correspond to the simulated processes is also solved.

Keywords: polymer materials, relaxation processes, forecasting, mathematical modeling

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Original article

APPLICATION OF TOPOLOGICAL OPTIMIZATION FOR THE DEVELOPMENT OF JEWELRY AS THE EXAMPLE OF A BIONIC PENDANT CREATION

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Abstract. The paper illustrates the development of a bionic pendant using software for topology optimization, strength tests and post-processing of the surface of the resulting model. The calculation data, the optimization pattern search algorithm, the selection of technology and material for 3D printing of the prototype were presented and a brief comparative analysis of the solid template and bionic structure of the pendant was described.

Keywords: topology optimization, additive manufacturing, art casting, generative design, bionic design

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Original article

THE USE OF NEURAL NETWORKS IN TEXTILE DESIGN

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Abstract. The aim of the work is to study the possibilities of using neural networks in the textile design. Research objectives: 1. Analysis of scientific literature on the research topic. 2. Creation of textile ornament images using a neural network. 3. Assessment of the need to refine the generated images and interpretation of the results obtained. Research methods: review and analysis of scientific literature; image generation using the Kandinsky 2.2 neural network.

Results: It is established that the use of an artificial neural network generating images significantly expands the choice of possible options for the artist when creating textile patterns and their combinations. It is concluded that generative textile design using artificial neural networks is one of the modern and promising directions in the artistic design of fabric.

Generated images, as a rule, are not a textile rapport. However, many of them may contain fragments that are interesting from an artistic point of view-motifs suitable for creating a textile pattern. Thus, in most cases, the images created by the neural network need to be refined in a specialized graphic editor to a rapport drawing. In order to reduce the share of manual labor when refining images, it is necessary machine learning of a neural network to create rapport ornaments.

Keywords: textile design, textile ornaments, artificial intelligence, machine learning, GAN, photography, fractal

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Original article

DEVELOPMENT OF METHODS FOR DIGITAL PREDICTION OF DEFORMATION PROCESSES OF POLYMER TEXTILE MATERIALS

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Abstract. Traditionally, predicting the deformation processes of polymer textile materials faces certain objective difficulties caused by the heterogeneity of the rheological structure of these materials. The widespread use of polymer textile materials in various fields of technology — from household polymers to the lining of space rockets and deep-sea vehicles — dictates the need to develop modern methods for predicting increased accuracy of their functional properties, including various deformation-relaxation processes. The development of new digital methods for predicting deformation processes of polymer textile materials is justified by the need to design new innovative products based on these materials that have the required functionality and increased competitiveness.

Keywords: polymer materials, deformation processes, forecasting, performance properties, competitiveness

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