

SUMMARY

UDC 7.02

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RESEARCH METHODS OF STYLISTIC GUIDANCE 21th CENTURY IN DESIGN JEWELRY AND ACCESSORIES

This work is devoted to accessories and jewelry bearing system signs in their elements.

Keywords: tie, tie clip, cufflinks, cuffs, design, visual cognitive information dynamic system (VKIDS).

References

1. Ivanov V. V. *Praktika avangarda i teoreticheskoe znanie XX veka. T. 4: Znakovye sistemy kul'tury, iskusstva i nauki* [Practice of vanguard and theoretical knowledge of the 20th century. Vol. 4. Sign systems of culture, art and science]. Moscow, Jazyki slavjanskih kul'tur, 2007, pp. 345–347. (In Russian).

2. Nazaretjan A. P. *Civilizacionnye krizisy v kontekste Universal'nojstorii. Sinergetika — psihologija — prognozirovanie* [Civilization crises in a context of Universal history. Synergetics — psychology — forecasting]. Moscow, Mir, 2004, 368 p. (In Russian).

3. Rozov M. A. *Teorija social'nyh jestafet i problema jepistemologii* [Theory of social relays and problem of an epistemologiya]. Moscow, Novyjkhronograf, 2008, 352 p. (In Russian).

4. Zhukov V. L., Poljakov V. I., Hmyznikova V. A. Research of visual information systems and modules in subject domain of the objects of design provided by a cluster of small architectural plasticity. *Design. Materials. Technologies*. SPb., SPGUTD, 2013, no 4 (29), pp. 27–33. (In Russian).

5. Soroko Je. M. *Kul'tura kak antientropijnyj process: garmonizacija raznoobrazija*.

Sistemnye issledovanija kul'tury [Kultura as anti-entropy process: variety harmonization. System researches of culture]. SPb., Aleteja, 2009, 604 p. (In Russian).

6. Brazhe R. A. *Sinergetika i tvorchestvo* [Synergetik and creativity]. Ul'janovsk, UIGTU, 2002, 204 p. (In Russian).

7. Melik-Gajkazjan I. V. *Mif, mechta, ral'nost': postneklassicheskie izmerenija prostranstva kul'tury* [Myth, dream, ralnost: post-nonclassical measurements of space of culture]. Moscow, Nauchnyjmir, 2005, 256 p. (In Russian).

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CREATING TREND BOARDS IS A KEY STAGE OF FASHION TREND FORECASTING. RECOMMENDATIONS: HOW TO CREATE A SUCCESSFUL TREND BOARD

Trend boards allow for visual presentations that are created as a result of a cursory research of the fashion market, fashion trends, and fashion forecasting. Trend boards are basically presentation boards that would be used by members of the fashion industry to create fashion goods. The article is devoted how to create a successful trend board.

Keywords: fashion industry, fashion forecasting, fashion trends, trend board.

References

1. Novikova A. S. *Rabota trend-bjuro i specifika prognozirovanija modnyh trendov* [Work trend bureau and specifics of forecasting of fashionable trends]. *Kachestvo i zhizn'*, 2014, no 4, pp. 75–78. (In Russian).

2. Official site of the Carlin International Groupe. Available at: <http://carlin-groupe.fr/> (accessed 20 december 2014).

3. Siteabout Composition. Available at: <http://www.coposic.ru/> (accessed 07 january 2015).

UDC 747.012

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LIGHT DESIGN OF THE URBAN ENVIRONMENT IN MODERN URBANISTICS

Now it is difficult to present life of the modern city without artificial consecration. Owing to the developed way of life of citizens their free time is the share of an evening which is connected with visit of markets, theaters, exhibitions and in general movements around the city. It has historically developed that external lighting in all forms and shapes at the solution of town-planning tasks joined in the section of the engineering equipment of urban areas.

Professional interest of designers and architects in a problem of artificial light in environmental design and architecture was designated the XX century in recent years. There was a requirement of mastering lighting art which has to be solved architects and designers on design stages of the city and an urban environment when esthetic qualities of architecture and environmental design are formed. The integrated approach to the solution of this task is dictated not only economic profitability, but also is defined by the social party of business. It is established that at competent and high-quality lighting the number of road accident is sharply reduced, the capacity of roads and the psychological atmosphere of the city improves.

Keywords: lighting design, artificial light, light architecture, esthetic quality of lighting.

References

1. Shchepetkov N. I. Light design of the city. Moscow, Architecture-C, 2006, 320 p. (In Russian).
2. Bolshakov A. G. Contradictions of a development of the city and town-planning education. Management by development of territories, 2010, no. 4, pp. 34–38. (In Russian).
3. Mikhaylov S. M. Design of the modern city: complex organization of the subject and spatial environment (teoretiko-methodological concept). Moscow, 2011, 57 p. (In Russian).
4. The cities for People / Jan Gale; Prod. In Russian — KROST Concern, the lane with English. Moscow, Alpina Publisher, 2012, 276 p. (In Russian).

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V. E. Yanchus, M. A. Kozina

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CREATIVE ASPECTS OF HARMONIZATION OF A SHOT IN THE PROCESS OF MAKING A FILM

The article discusses creative aspects of artistic color correction in movie making using digital tools. The authors review typical color solutions in movies depending on their genre with the special attention to colour contrasts applied. Focusing on the complexity of the task of working with color in the shot, the authors suggest application of the shot harmonization methods at each technological stage of video production.

Keywords: coloristics, cinematograph, digital color correction, grading, film genres, videoart.

References

1. Itten I. *Iskusstvo cveta* [Color art]. Translation from German and Foreword L. Monahova. Moscow, Izd. D. Aronov, 2001, 96 p. (In Russian)
2. Denver R. Why the so called “Blockbuster” look. URL: <http://www.digitalcinemafoundry.com/2010/04/02/why-the-so-called-blockbuster-look-color-grading-explained/> (accessed 15 september 2015).

3. Bazyma B. A. *Psihologija cveta. Teorija i praktika* [The psychology of color. Theory and practice]. Izd. Rech', 2005, 208 p. (In Russian).

4. Abramova D. Interview “How created effects in Stalingrad”. URL: <http://www.lookatme.ru/mag/people/experience/197121-stalingrad> (accessed 3 december 2015).

5. Seitz D. 5 Annoying Trends That Make Every Movie Look the Same. URL: http://www.cracked.com/article_18664_5-annoying-trends-that-make-every-movie-look-same.html (accessed 24 november 2015).

6. Desjaterik D. Video art // Encyclopedia “alternative culture”. Ekaterinburg, Ul'tra.Kul'tura, 2005. (In Russian).

7. Ivanov V., Yanchus V. Problems of training in digital color correction video. *Vestnik SpbGUTD*, 2014, no 3, pp. 33–36. (In Russian)

8. Kevin S. When is Color Correction a Necessity. URL: <http://www.finalcolor.com.htm> (accessed 18 september 2015).

9. Laptev V. V., Janchus V. Je. Basics of film directing. Color correction of video images: a tutorial. SPb., SPGUTD, 2015, 35 p. (In Russian).

10. Novak D. Musings about cinema and photography. Part 4: Color in cinematography. URL: <http://dmitry-novak.livejournal.com/82136.html> (accessed 14 november 2015).

11. Tarkovsky A. A. Conversation about color. Film history notes, 1988, no 1. (In Russian).

UDC 766.003.63

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USING MODULE COMPOSITION IN THE DIFFERENT FIELDS OF DESIGN, PATTERN PIED DE POULE AS THE EXAMPLE

The pattern Pied de Poule has a simple module composition as basement, which has a basic geometrical figure — a square. In this reason, the pattern Pied de Poule can have the different variation of colors and combinations of the composition. The construction of the pattern Pied de Poule is analyzed. Using the pattern in the different field of design is investigated.

Keywords: module, module composition, pattern, knitting fabric, pattern Pied de Poule, fashion design, interior design, product design, graphic design, architecture

References

1. Muller V. English-Russian dictionary. Modern editorial: 180000 words and phrases. Moscow, UNVEK, 2005. (In Russian).
2. *BSE*: 2-d edition. T.13. (In Russian).
3. Govibeveva O. *The fundamentals of composition*. Moscow, Publ. Art. 2004. (In Russian).
4. Aav, M. *Marimekko: Fabrics, Fashion, Architecture*. Italy, The Brand Graduate Center, 2003.
5. Milchin A. *Publishing dictionary-reference book*. Moscow, OLMA-press, 2006. (In Russian).
6. Dunbar J. *The Costume of Scotland*. London, Batsford, 1984

■ Summary

7. Marie-France-Pochna. *Dior*. Paris, Octavo, 1996. Official site of Christian Dior. Available at: <http://www.dior.com/> (accessed 15 November 2014) Site of Christian Dior perfume. Available at: <http://www.fragrantica.com/news/Miss-Dior-Decoding-a-Bottle-of-Love-4704.html> (accessed 15 November 2014)

8. Buxbaum G. *Icon of fashion: the 20th century*. London, Prestel Publishing, 2006.

9. Knox K. Alexander McQueen: Genius of generation. London: A&C Black Publishers limited. 2010. Official site of Alexander McQueen. Available at: <http://www.alexandermcqueen.com/it/alexandermcqueen> (accessed 16 November 2014)

10. Gale C. *Fashion and Textile: An Overview*. London, Bloomsbury: Academic, 2004.

11. Le Corbusier. *The modular*. Moscow. Stroiizdat, 1976. (In Russian).

12. Site of architecture. Available at: <http://www.fasadnews.ru> (accessed 3 May 2015)

13. Official site of Polly Apfelbaum. Available at: <http://www.pollyapfelbaum.com> (accessed 20 November 2014).

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I. V. Nikolaev, L. T. Zhukova

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RESEARCH OF DECORATIVE AND OPTICAL PROPERTIES OF ANODIC COATING ON THE ALUMINUM PRODUCTS SURFACE

Investigated dependence of surface roughness and gloss of anodic coatings from the concentration and temperature of the electrolyte of aluminum alloy AMg6.

Keywords: the design of the surface, aluminum alloys, protective and decorative coatings, anodizing, galvanizing.

References

1. Berkovich M. I., Galanin S. I. Jewelry production in Russia. *EKO*, 2009, no. 7, pp. 163–174. (In Russian).

2. Jakovlev A. D. *Himija i tehnologija lakokrasochnyh pokrytij* [Chemistry and technology of coatings]. Leningrad, Himija Publ., 1989. (In Russian).

3. Azhogin F. F., Belen'kij M. A. *Gal'vanotekhnika* [Galvanotechnics]. Moscow, Metallurgija Publ., 1987. (In Russian).

4. Gamburg U. D. *Gal'vanicheskie pokrytija* [Electroplating]. Moscow, Technosfera Publ., 2006. (In Russian).

5. Kaznachei B. Ya. *Galvanoplastika v promishlennosti* [Galvanoplastics in industry]. Moscow, Kniga po trebovaniju Publ., 2012. (In Russian).

6. Salem R. *Teoreticheskaja elektrohimiia* [Theoretical electrochemistry]. Moscow, Vuzovskaja kniga Publ., 2012. (In Russian).

7. Lobanov S. A. *Prakticheskie sovety gal'vaniku* [Practical advice electroplating]. Moscow, Kniga po trebovaniju Publ., 2012. (In Russian).

8. Nikolaev I. V., Zhukova L. T. Improved design surface of the aluminum products by anodizing. *Design. Materials. Technology*, 2015, no. 3 (38), pp. 43–45. (In Russian).

9. Nikolaev I. V., Zhukova L. T. Filling porous oxide coating of aluminum and its alloys. *Design. Materials. Technology*, 2015, no. 4 (39), pp. 61–64. (In Russian).

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METASUBJECT TECHNOLOGY BRICOLAGE AS A TOOL FOR MUSEUM PEDAGOGY

Teaching activities in vocational education high school in the conditions of implementation of the new national standard requires the use of active forms and methods of training students through a variety of innovative technologies to form the specialists of different spheres of our society skills needed in life and work, which suggests flexibility and adaptation, initiative and independence, productivity and inclusion, leadership and responsibility, as well as social and cross-cultural quality. In the article the author's view on the possibility of using innovative tools of the teacher implementing metasubject approach to educational activities, which allows you to create in students the skills and qualities of a modern specialist. The experience of the use of traditional approaches in the new educational environment.

Keywords: standard, bricolage, museum education, educational technology, quality and human skills of the XXI century education.

References

1. The federal state educational standards [electronic resource] / Order of the RF Ministry of 31.05.2011 no 1975. Available at: <http://fgosvo.ru/fgosvpo/7/6/1> (accessed 30 July 2015).

2. Gromyko Y. V. *Thought-activity pedagogy (theoretical and practical guide to the development of higher pedagogical models of art)*. Minsk, 2000. (In Russian).

3. Sharafadina K. I. *Literature in the synthesis of the arts. T. II. Therefore FLORO = LOGIA: monograph*. SPb., SPGUTD, 2012. (In Russian).

4. Kochneva S. V. *Professional and ethical communication: a tutorial*. SPb., SPGUTD, 2014. (In Russian).

5. Kolesina K. Y. *Meta Project-based learning: theory and implementation of technology in the educational process*. Rostov-on-Don, Publishing house "Old Russian", 2008. (In Russian).

6. Claude Levi-Strauss, *untamed thought / Primitive thinking*. Moscow, Republic, 1994. (In Russian).

7. Available at: <https://edugalaxy.intel.ru/index.php?Automodule=blog&blogid=8&showentry=7144> (accessed 11 January 2016).

8. Trishin V. N. Synonym dictionary. Moscow, ASIS, 2013. (In Russian).

9. Mysheva T. P. museum pedagogy in the contemporary socio-cultural educational context. Taganrog, 2007. (In Russian).

10. Yukhnovich, M. Yu child in a museum: Children's Museum new vectors of movement. Moscow, Akademich. project; RIC, 2006. (In Russian).

11. Stolyarov B. A. Museum Education: History, Theory, Practice. Moscow, Higher School, 2004. (In Russian).

12. Lichtwark A. Exercises in contemplation of works of art. Berlin, Verlag Bruno Cassire, 1909, pp. 130.

13. Komarovskaya E. P., Akhunov V. M. Cultural and educational activities of museums and museum education. Bulletin of Moscow University. Ser. 20, Teacher Education, 2009, no 1, pp. 69–72. (In Russian).

14. Bakushinskii A. V. Artistic creativity and education: research experience on the material spatial arts. Moscow, Culture and Education, 1992. (In Russian).

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G. G. Har'kovskaja, A. M. Medvedev

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FEATURES OF THE DESIGN AND MANUFACTURING TECHNIQUES OF THE TRANSFORMED PALATINE

The features improve the efficiency of the design process and manufacturing of convertible stole technology to extend the functionality and range of clothing. Material costs and complexity of manufacturing the product be minimized by maximizing the simplified design.

Keywords: palatine, transformation, design and technology, with outstretched wings inside cords, loops, loop buttons.

References

1. Detali. Jelegantnyj aksessuar // Dobrye soveti. Moscow, Burda, 2015, no 4, pp. 30–31. (In Russian).

2. Mancevich, A. Ju. *Sovershenstvovanie metodov transformativnogo formoobrazovaniya v dizajne kostjuma*. Moscow, 2013, 16 p. (In Russian).

3. Har'kovskaja G. G., Medvedev A. M. *Povyshenie jeffektivnosti rannih jetapov proektirovaniya mnogofunkcional'noj detskoj odezhdy s ispol'zovaniem resursosberegajushhih tehnologij* [Increase of efficiency of early design stages of a multipurpose kidswear with use of resource-saving technologies]. Design. Materials. Technology. SPb., SPbGUTD, 2013, no 2 (27), pp. 46–48. (In Russian).

4. *50 sposobov zavjazat' palantin, sharf, platok*. Available at: <http://www.adme.ru/video/50-sposobov-zavyazat-palantin-sharf-platok-787060/> (accessed 10 february 2016).

5. Har'kovskaja G. G., Medvedev A. M. *Sovershenstvovanie prakticheskogo ispol'zovaniya priemov morfologicheskoy*

transformacii pri proektirovanii odezhdy. Blagoveshhensk, Izdatel'stvo AmGU, 2013. (In Russian).

6. Patent 132957RU, MPKA41D 15/00. Transformiruemyj palantin / Savvateeva N. S., Har'kovskaja G. G.; zajavitel' i patentoobladatel' FGBOU VPO «AmGU». — № 2013122309/12; zajavl. 14.05.2013; opubl. 10.10.2013. Bjul. № 28. (In Russian).

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INFLUENCE OF ELEMENTS OF WOOD LASER ENGRAVING MODES ON AESTHETIC VALUE OF ENGRAVINGS

A method of creating a database of rational values of engraving power and speed, based on expert evaluation of the aesthetic value of experimental engraved patterns are proposed to ensure the quality of tone images made by wood laser engraving.

Keywords: laser, engraving, wood, aesthetics, power, speed, resolution, layout.

References

1. Chernykh M. M., Dryukova A. E., Ryabov V. M., Vladimirova O. N. The relationship of methods of engraving, engraved materials and images. Design. Materials. Technology, 2014, no. 1 (31), pp. 17–20. (In Russian).

2. Chernykh M. M., Yapparova E. F. The method of designing the layout of the bitmap in wood laser engraving. Design. Materials. Technology 2012, no. 2 (22), pp. 78–81. (In Russian).

3. Chernykh M. M., Churakov I. L., Dryukova A. E. The preparation of the tone image to a laser engraving of wood. Design. Materials. Technology, 2014, no. 4 (34), pp. 57–59. (In Russian).

4. Chernykh M. M., Dryukova A. E., Usolceva A. V. Engraving of raster images on charring materials by laser. Design. Materials. Technology, 2015, no. 4 (38), pp. 17–20. (In Russian).

5. Photograv. Available at: <http://www.photograv.com/aspnet2/TipsAndTricks.aspx> (accessed 15 marth 2016).

6. Ysto Group LaserCut 5.0/5.1/5.3. Available at: <http://www.yusto.ru/articles/56-software-for-tools/16-lasercut-rusifikator/> (accessed 15 marth 2016).

7. CNC Modeler. Available at: <http://cncmodelist.ru/stati/stati-porabote-s-chpu-stankom/170-podgotovka-fajla-dlya-gravirovki-lazerom-v-programme-artcam> (accessed 15 marth 2016).

8. Newsinphoto. Pleton: the power of a portrait. Available at: <http://www.newsinphoto.ru/iskusstvo/pleton-mogushestvo-portreta/> (accessed 15 marth 2016).

9. Features of print design [Electronic resource]. Available at: <http://www.dialektika.com/PDF/5-8459-0906-6/part.PDF> (accessed 15 marth 2016).

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**THE RESISTANCE
OF COTTON YARN DYEING
BY ACTIVE DYES
TO THE ACTION OF FUNGI MOLDS**

The results of studies demonstrating improved sustainability of cotton yarn to the action of moldy mushrooms during its dyeing with reactive dyes with quaternary ammonium salts.

Keywords: cotton, yarn, dyeing, reactive dye, microorganisms, quaternary ammonium salts.

References

1. Ipatko L. I. *Vliyanie mikroorganizmov na strukturu i svoystva hlopkovogo volokna i ocenka biostojkosti volokon raznykh selekcionnykh sortov hlopchatnika* [Influence of microorganisms on structure and property of cotton fiber and assessment of bioproofness of fibers of different selection grades of a cotton]. Leningrad, LIST, 1988, 143 p. (In Russian).

2. Mihajlovskaja A. P., Kalugina M. S. *Krashenie hlopchatobumazhnykh tekstil'nykh materialov aktivnymi krasiteljami v prisutstvii chetvertichnykh ammonievnykh solej. Technologia tekstil'noj promyshlennosti, serii Izvestija vuzov* [The news of higher educational institutions. technology of light industry], 2014, no 3, pp. 33–36. (In Russian).

3. Ping Zhu, Gang Sun Antimicrobial Finishing of Wool Fabrics Using Quaternary Ammonium Salts // *Journal of Applied Polymer Science*, 2004, vol. 93, pp. 1037–1041.

4. Yuong-A Son, Byung-Soon Kim, K. Ravikumar, Seung-Goo Lee Imparting durable antimicrobial properties to cotton fabrics using quaternary ammonium salts through 4-aminobenzenesulfonic acid-chloro-triazine adduct // *European Polymer Journal*, 2006, no 42, pp. 3059–3067.

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**TO THE QUESTION
OF THREE-DIMENSIONAL
PRINTING GLASS**

The article reveals the main methods of producing art glass using the technology of 3D-prototyping.

Keywords: 3D-printing, glass, technology.

References

1. Vasilkova O. V., Zhukova L. T. *K voprosu o tehnologijah izgotovlenija vitrazha* [To the question of technologies of making stained glass]. *Design. Materials. Technology. SPb.*, 2015, no 1 (36), pp. 70–75. (In Russian).

2. Berdnikova I. P., Kokorev B. S., Melikaev K. A. 3D-prototipirovanije kak alternativnyj sposob izgotovlenija kolodki obuvi [3D prototyping as an alternative method for producing shoes]. *Design. Materials. Technology. SPb.*, 2015, no 1 (36), pp. 61–63. (In Russian).

3. Gibson I., Rosen D. W., Stucker B. Chapter 2: Development of Additive Manufacturing Technologies. In: *Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing*. Springer Science + Business Media, LLC, 2010, pp. 34–40.

4. Marchelli G., Prabhakar R., Storti D., Ganter M. The guide to glass 3D printing: developments, methods, diagnostics and results. *Rapid Prototyp. J.*, 2011, no 17 (3), pp. 187–194.

5. Razrabotana 3D pechat, iz stekla: Daily Digital Digest, 28 september 2009. Available at: http://www.3dnews.ru/news/razrabotana_3d_pechat_iz_stekla/ (accessed 04 april 2015).

6. 3D Printing Meets Glass Making — College Student Casts Custom Glass Objects with 3D Printer. March 29, 2015 Available at: <http://3dprint.com/52818/3d-printing-glass/> (accessed 02 may 2015).

7. Additive Manufacturing of Optically Transparent Glass. 2015. Available at: <http://online.liebertpub.com/doi/pdfplus/10.1089/3dp.2015.0021> (accessed 02 september 2015).

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**SUBSTITUTION OF THE INDUSTRIAL
IMPORT OF FOREIGN PRODUCTS
BY IMPROVING DESIGN
OF THE DOMESTIC COUNTERPARTS**

The article examines the design of modern heating devices. Identified problems, improving design of the heating devices based on the experience of cooperation with a domestic manufacturer — “Borinskoe”.

Keywords: heating apparatus, forming, design, patent, 3D-technology.

References

1. Vladimir Kulik. *Na nashe gazovoe otopitel'noe oborudovanie neizmenno vysokij spros*. *Komsomolskaya Pravda*, 2015, no. 9 (26337), pp. 18–19. (In Russian).

2. “Borinskoe” *Sto luchshih tovarov Rossii 2007*. Economical equipment. Product catalog 2012. Issue 11. Devices and gas boilers. Russian equipment for the Russian winter! (In Russian).

3. Website of domestic manufacturers of heating apparatus. Available at: <http://aogv-shop.ru/> (accessed 23 april 2016).

4. *Sovetskij jenciklopedicheskij slovar' / CH.* edited by A. M. Prokhorov. 2-e Izd. Moscow, Sov. encyclopedia, 1983, pp. 390. (In Russian).

5. *Dizajn. Illjustrirovannyj slovar' — spravocnik / G. B. Minervin, V. T. Shimko, A. V. Efimov, and others: Under the General editorship of G. B. Minervina and V. T. Shimko.* Moscow, Architecture, 2004, pp. 26; 59. (In Russian).

6. Kuhta M. S., Zhukova L. T., Goldschmidt M. H. *Osnovy dizajna* / Tomsk Polytechnic University. Tomsk, Publishing house of Tomsk Polytechnic University, 2009, pp. 6–8. (In Russian).

7. *Tekhnicheskaja jestetika i dizajn: slovar'*. Moscow, Academic project; Culture, 2012, pp. 69; 222. (In Russian).

8. *Hudozhestvennoe proektirovanie* / Neshumov B. V., Shchedrin, E. D., G. B. Minervin, etc. Under the editorship of B. V. Nasonova, E. D. Shchedrin. Moscow, Education, 1979, pp. 172. (In Russian).

9. Glejzer Dzh., Najt K. *Dizajn. Razrabotka proektov. Razbudi svoe vdohnovenie*. SPb., Piter, 2014, pp. 16; 56; 126. (In Russian).

10. Runge V. F., Sen'kovskij V. V. *Osnovy teorii i metodologii dizajna*. Moscow, M3 Press, 2001, p. 113. (In Russian).

11. Patent RU 68766, mkpo 23–20. Boiler heating, published 16.12.2008, 2 p. (In Russian).

12. Patent RU 74316, mkpo 23–03. Boiler heating published 16.03.2010, 9 p. (In Russian).

13. Vladimir Kulik. “*Kachestvo nashego gazovogo otopitel'nogo oborudovanija provereno vremenem*” // *Komsomol'skaja pravda / Regional'naja zhizn'*, 2014, no. 10 (26188), pp. 15. (In Russian)

14. Patent “Apparat otopitel'nyj gazovyj. The patent owner: Donetsk engineering and technological Institute “Gazoapparat”. Application number: 61267. Publication date: 25.10.1994, according to 17.07.2015 — terminated. (In Russian)

15. Patent: boiler heating. Patentee: Bizjarkin V. Ja. Application number: 2000501445. Publication date: 16.10.2002. Date of the termination of the patent: 18.08.2002. (In Russian)

16. Patent: Boiler heating. Patentee: Anatoly Serdyukov, A. A. Application number: 2007501102. Publication date: 16.10.2008. Date of termination of patent validity: 06.04.2010. (In Russian)

17. Design View. Number industrial design 1990VRO063293–0007. The language code of the application it. Publication date: 24.12.1990.

18. Design View. Industrial design 80307–0003. The language code fr. Date of application: 03-06-1966. Publication date: 27-09-1966.

19. Design View. Industrial design No. 20141020–0001. Language code: fr. Date of application: 03-03-2014. Publish date: 25-04-2014.

20. Design View. Industrial design No. D0521562–0001. The language code es. Date of application: 13-07-2015. Publication date: 20-07-2015.

21. Design View. Industrial design No. 3004474560000M01. Language code: ko. Proposal date: 04-09-2006. Publication date: 24-04-2007.

22. Design View. Industrial design No. 3005528160000M01. Language code: ko. Application date: 09-02-2009. Publication date: 16-02-2010.

23. *Na 3D-printere napechatan pervyj avtomobil'*. Available at: <http://www.dni.ru/tech/2014/9/9/280283.html> (accessed 23 april 2016).

24. *Metallicheskiy pistolet napechatali na 3D printere*. Available at: Website: <http://geektimes.ru/post/240746/> (accessed 23 april 2016).

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RESEARCH OF PROPERTIES OF THE HOSIERY DEVELOPED FROM NEW TYPES OF RAW MATERIALS. Message 2

Socks from a bamboo yarn are developed. Research of their hygienic, mechanical and bactericidal properties is executed. It is noted that on a complex of properties new products considerably exceed similar of a cotton yarn. Socks can be recommended to people with diseases of mycoses of feet, and also to athletes.

Keywords: bamboo, sock, shrinkage, tensile properties, resistance to attrition, hygroscopicity, antimicrobial properties.

References

1. SanPiN 2.4.7./1.1.1286–03 «*Gigienicheskie trebovanija k odezhde dlja detej, podrostkov i vzroslyh*» [1. A SanPiN 2.4.7./1.1.1286–03 “Hygienic requirements to clothes for children, teenagers and adults”].

UDC 745.512

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FORMS OF DISHES THAT EXISTED IN RUSSIA IN XVI–XVII CENTURIES, IN PRODUCTS OF FABERGE

The article investigates the form of the national Russian dishes used by Faberge craftsmen to style silver utensils under articles of Russian masters of the seventeenth century.

Keywords: form, utensil, Faberge, neo-russian style.

References

1. *Muzei moskovskogo kremlj: Orycheinaj palata. Russkaya posuda XVII veka*. Available at: <http://armoury-chamber.kreml.ru/exposure/view/vitrina-10-russkaya-posuda-xvii-veka/> (accessed 28.02.2016).

2. Morozova O. V., Solin A. A. *Izdelij iz dragozennyh metallov XVI–XX vekov*. Available at: <http://www.hermitagemuseum.org/wps/portal/hermitage/explore/collections/master/sub/1254019474/?lng=ru> (accessed 03 marth 2016).

3. *Muzei moskovskogo kremlj: Orycheinaj palata. Proizvedeniya russkogo zolotogo i serebryanogo dela XII–XV vekov*. Available at: <http://armoury-chamber.kreml.ru/exposure/view/vitrina-2-proizvedeniya-russkogo-zolotogo-i-serebryanogo-dela-xii-xv-vekov/> (accessed 04 marth 2016).

4. *Muzei moskovskogo kremlj: Bratiny zazdravnye*. Available at: <http://www.kreml.ru/exhibitions/virtual-exhibitions.venchaniya-na-tsarstvo-v-moskovskom-kremlje/venchanie-na-tsarstvo-tsarskiy-pir/> (accessed 04 marth 2016).

UDC 687.122:687.01

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**APPLICATION ILLUSIONS SUIT
FOR IDEALIZATION FIGURES CLIENT**

The article deals with the illusion of perception costume, are examples of the use of illusion in a historical costume. Presents works in two directions bachelors degree projects preparation «Designing products of light industry» idealization of the figure of the client.

Keywords: illusion, the figure of the client, the line of division, the design model dresses, idealization.

References

1. Gusejnov G. P. *Kompozicija kostjuma* [Komposition costume]. Moscow, Akademija, 2003, 432 p. (In Russian).
2. Safina L. A. *Dizajn kostjuma* [Kostume Design]. Rostov n/D, Feniks, 2006, 390 p. (In Russian).
3. Rachinskaja E. I. *Modelirovanie i hudozhestvennoe oformlenie odezhdy* [Modeling and decoration of clothes]. Rostov n/D, Feniks, 2002, 608 p. (In Russian).
4. Kozlova T. V. *Hudozhestvennoe proektirovanie kostjuma* [The artistic design of the suit]. Moscow, Legprombytizdat, 1982, 144 p. (In Russian).
5. Blagova T. Ju., Kukushkina Z. I. *Kompozicija kostjuma* [Komposition costume]. Blagoveshchensk, Izd-vo AmGU, 2014, 55 p., il. (In Russian).
6. Shershneva L. P. *Osnovy prikladnoj antropologii i biomehaniki* [Fundamentals of applied anthropology and biomechanics]. Moscow, INFRA-M, 2004, 144 p. (In Russian).

UDC 7.01, 74, 75, 76

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**THE ROLE AND IMPORTANCE
OF "SCHOOL" IN RUSSIAN CULTURE
KARDOVSKY (TO THE 150TH
ANNIVERSARY
OF ACADEMICIAN DMITRY
NIKOLAYEVICH KARDOVSKY)**

This article discusses the biography, training activities and highlights the school issuing the artist-teacher of the academician, Professor, honored worker of Arts of RSFSR Dmitry Nikolaevich Kardovsky (1866–1943).

Keywords: school Kardovsky, artist-educator. academician Dmitry Kardovsky, illustration D. N. Kardovsky, theatrical activities Kardovsky, tone figure.

References

1. *Dmitrii Nikolaevich Kardovskij ob iskusstve. Vospominanija, stat'i, pis'ma* / Sost. E. D. Kardovskaja, nauch. redak. D. A. Shmarinov. Moscow: Izdatel'stvo Akademii Hudozhestv SSSR, 1960, 257 s. (In Russian).
2. Podobedova O. I. *Dmitrii Nikolaevich Kardovskij*. Moscow, Sovetskii hudozhnik, 1957, 183 p. (In Russian).

3. Vasilij Shuhaev. *Zhizn i tvorcestvo* / Ator — sostav. N. A. Elizbarashvili, nauch. red. E. P. Jakovleva. Moscow, Izd-vo «Galart», 2010, 286 p. (In Russian).

4. Suvorov V. I. *Risunok — osnova izobrazitel'nogo iskusstva* / Red. i avt. sost. I. B. Kuzjmina. SPb., Izdatel'stvo «Sistema», 2010, 64 p. (In Russian).

5. *Posobie po risovaniju* / Pod. obshh. red. prof. Kardovskogo D. N. i dr. [pereizd. s M. — L.: Gosstrojiizdat, 1938]. Moscow, Izd-vo «V. Shevchuk», 2006, 208 p. (In Russian).

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**ART IN THE MODERN CULTURAL
AND COMMUNICATIVE SPACE**

Article is complex research of a culturological perspective of transformational changes of art during masskulturny revolution in system of the modern market relations and communicative technologies.

Keywords: modern art, masskulturny revolution, art market, communicative technologies.

References

1. Gasratyan K. The sphere of culture in post-industrial economy // World economy relations, 2001, no 7, pp. 84–90. (In Russian).
2. Dolgin A. B. Economy of a symbolical exchange. Moscow, Infra-M, 2006, 632 p. (In Russian).
3. Ivanov G. P. Problems of development of the sphere of culture in market economy // Vestn. Mosk. un-ta, 1999, no 6, pp. 41–57. (In Russian).
4. Olenina O. Yu. Stanovlennya that a rozvitok the hudozhn_kh rinkiv =vrop in the XVII–XIX station // Ukrani's Culture: ZB. sciences. the ave. / In culture i to Ukrašni's tourism, Khark. derj. academician to culture, X., 2010, VIP. 31, pp. 143–155. (In Russian).
5. Badinova T. V. Stages of formation of the art market in culture of Russia: yew.... edging. sciences: 24.00.01. SPb., 2004, 191 p. (In Russian).
6. Cuckoo N. V. Stages of development of the market of objects of the fine arts. Theory and practice of pricing: yew.... edging. econ. sciences: 08.00.01. Moscow, 2007, 178 p. (In Russian).
7. Genisaretsky O. I. Experience of methodological designing of public systems//Modelling of social processes. Moscow, Science, 1970, pp. 48–63. (In Russian).
8. Glazychev V. L. Design as it is. Moscow, Europe publishing house, 2006, 320 p. (In Russian).

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**CURRENT TRENDS IN THE TEXTILE ART:
DANISH TAPESTRY WEAVING**

The article examines the trends of the modern textile art (for example, woven carpets), identifies their features.

Polemically examining the tapestry of modern Danish artists, the author defines the characteristic for their synthesis of traditional and modern technologies. Special attention is paid to several compositions of the exhibition.

Keywords: textile, carpet weaving, tapestry Danish, concept, technology, modern direction.

References

¹ Savickaja V. *Prevrashhenie shpalery*. Moscow, Galart, 1995, pp. 25–26. (In Russian).

² Ibid, pp. 36.

³ Migal' B. G. *Katalog vystavki v Elaginoostrovskom dvorce-muzee*. SPb., 2012. (In Russian).

⁴ Ibid.

⁵ Savickaja V. *Ukaz. soch.* pp. 36.

⁶ Cvetkova N. N. *Sovremennye tendencii razvitiya iskusstva ruchnogo tkachestva // Moda i dizajn: istoricheskij opyt — novye tehnologii*. SPb., SPGUTD, 2009, pp. 316. (In Russian).

⁷ Ibid.

⁸ *Sovremennye datskie shpalery*. SPb., Gos. Jermitazh, 2015, pp. 50. (In Russian).

⁹ Ibid, pp. 28.

¹⁰ Ibid.

¹¹ Ibid.

¹² Ibid, pp. 26.

¹³ Ibid, pp. 42.

¹⁴ Ibid.

¹⁵ Ibid, pp. 34.

¹⁶ Ibid, pp. 62.

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ESTIMATED DEFORMATION PROCESSES PREDICTION FOR POLYAMIDE FABRIC CANOPY

We consider the estimated forecasting of deformation processes of polyamide fabric, used to make the canopy. The specificity of these processes is their transience. Calculated prediction is carried out using computational methods based on mathematical modeling of creep and integral determining the Boltzmann-Volterra relations.

Keywords: parachute canopy polyamide fabric, viscoelasticity, deformation, mathematical modeling, numerical prediction.

References

1. Makarov A. G. Control parameters of the nonlinear-relaxation hereditary nuclei and delay synthetic fibers. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti* [The News of higher educational institutions. Technology of Textile Industry]. 2000, no 2, pp. 12–16. (In Russian)

2. Stalevich A. M., Makarov A. G. Spectrum Option hereditary viscoelastic relaxation synthetic fibers. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti*. [The News of

higher educational institutions. Technology of Textile Industry], 2000, no 3, pp. 8–13. (In Russian).

3. Makarov A. G., Stalevich A. M. Option prediction of filament deformation processes. *Himicheskie volokna* [Fiber Chemistry], 2001, no 4, pp. 67–69. (In Russian).

4. Makarov A. G., Stalevich A. M. Methods of refinement and control of synthetic materials predictable conditions. *Himicheskie volokna* [Fiber Chemistry], 2001, no 5, pp. 58–61. (In Russian).

5. Stalevich A. M., Makarov A. G. Determination of the viscoelastic characteristics of the example of polyacrylonitrile yarn. *Himicheskie volokna* [Fiber Chemistry], 2001, no 6, pp. 68–70. (In Russian).

6. Makarov A. G., Stalevich A. M. Option relaxation and retardation spectra in amorphous-crystalline synthetic fibers. *Himicheskie volokna* [Fiber Chemistry], 2002, no 3, pp. 52–55. (In Russian).

7. Stalevich A. M., Makarov A. G., Saidov E. D. Settlement and experimental evaluation of the mechanical work absorbed during deformation of synthetic filament. *Himicheskie volokna* [Fiber Chemistry], 2002, no 3, pp. 55–57. (In Russian).

8. Makarov A. G., Stalevich A. M. Forecast feedback relaxation and deformation-recovery processes synthetic fibers. *Himicheskie volokna* [Fiber Chemistry], 2002, no 6, pp. 62–64. (In Russian).

9. Makarov A. G. Determination of the analytical relationship of normalized nuclear relaxation and creep in the linear theory of viscoelasticity of textile materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti* [The News of higher educational institutions. Technology of Textile Industry], 2002, no 2, pp. 13–17. (In Russian).

10. Makarov A. G., Stalevich A. M. Prediction restorative deformation process and reciprocal relaxation of polymeric materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti* [The News of higher educational institutions. Technology of Textile Industry], 2002, no 3, pp. 10–13. (In Russian).

11. Stalevich A. M., Makarov A. G., Saidov E. D. Elastic components of synthetic filament stretching charts. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti* [The News of higher educational institutions. Technology of Textile Industry], 2002, no 4–5, pp. 15–18. (In Russian).

12. Stalevich A. M., Makarov A. G., Saidov E. D. Relaxation Spectrometry synthetic yarn. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti* [The News of higher educational institutions. Technology of Textile Industry], 2003, no 1, pp. 16–22. (In Russian).

13. Demidov A. V., Makarov A. G., Stalevich A. M. System analysis of viscoelastic polymeric materials. *Voprosy materialovedenija*. [Material science issues], 2005, no 4 (44), pp. 50–58. (In Russian).

14. Makarov A. G., Ovsjannikov D. A. Computer determination of the spectral and energy characteristics of synthetic fabrics. *Vestnik Sankt-Peterburgskogo gosudarstvennogo universiteta tehnologii i dizajna*. [Vestnik of St. Petersburg State University of Technology and Design], 2005, no 11, pp. 5–9. (In Russian).

15. Ovsjannikov D. A., Makarov A. G., Stalevich A. M., Demidov A. V. Mathematical modeling of processes of viscoelastic polymers. *Vestnik Sankt-Peterburgskogo gosudarstvennogo*

■ Summary

universiteta. Serija 10 [Vestnik of Saint-Petersburg University. Series 10. Applied Mathematics. Computer Science. Control Processes], 2006, no 3, pp. 46–54. (In Russian)

16. Demidov A. V., Makarov A. G., Stalevich A. M. Option mathematical modeling of deformation processes of polymer materials. *Voprosy materialovedenija*. [Material science issues], 2006, no 3, pp. 101–111. (In Russian).

17. Demidov A. V., Makarov A. G., Stalevich A. M. Methods of computer analysis of technical fabrics viscoelasticity. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti*. [The News of higher educational institutions. Technology of Textile Industry], 2006, no 3, pp. 13–17. (In Russian).

18. Demidov A. V., Makarov A. G., Stalevich A. M. Research of changes of deformation properties of polyester yarns, depending on the degree of twist. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti*. [The News of higher educational institutions. Technology of Textile Industry], 2006, no 4, pp. 9–13. (In Russian).

19. Demidov A. V., Makarov A. G., Stalevich A. M. Criteria for the selection of optimal mathematical model of viscoelasticity of textile materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti*. [The News of higher educational institutions. Technology of Textile Industry], 2006, no 5, pp. 18–22. (In Russian).

20. Demidov A. V., Makarov A. G., Stalevich A. M. Determination of mechanical properties of textile materials at variable temperature. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti*. [The News of higher educational institutions. Technology of Textile Industry], 2006, no 6, pp. 14–19. (In Russian).

21. Demidov A. V., Makarov A. G., Stalevich A. M. Determination of deformation characteristics of synthetic fibers under variable temperature. *Himicheskie volokna* [Fiber Chemistry], 2006, no 3, pp. 58–61. (In Russian).

22. Demidov A. V., Makarov A. G., Stalevich A. M. Computer investigation of viscoelastic polymeric materials. *Himicheskie volokna* [Fiber Chemistry], 2006, no 5, pp. 38–43. (In Russian).

23. Demidov A. V., Makarov A. G., Stalevich A. M. Optimization model selection viscoelasticity of synthetic fibers. *Himicheskie volokna* [Fiber Chemistry], 2006, no 6, pp. 47–51. (In Russian).

24. Demidov A. V., Makarov A. G., Stalevich A. M. Option forecasting of deformation processes of polymer materials. *Materialovedenie* [Material science], 2006, no 8, pp. 5–10. (In Russian).

25. Demidov A. V., Makarov A. G., Stalevich A. M. Identifying the computer prediction of deformation properties of textile materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti*. [The News of higher educational institutions. Technology of Textile Industry], 2007, no 2, pp. 14–17. (In Russian).

26. Demidov A. V., Makarov A. G., Stalevich A. M. System analysis of the viscoelasticity of textile materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti*. [The News of higher educational institutions. Technology of Textile Industry], 2007, no 3, pp. 20–24. (In Russian).

27. Demidov A. V., Makarov A. G., Stalevich A. M. System analysis viscoelasticity polyester yarn. *Himicheskie volokna* [Fiber Chemistry], 2007, no 1, pp. 62–65. (In Russian).

28. Demidov A. V., Makarov A. G., Stalevich A. M. The study of elastic, viscoelastic and plastic characteristics filaments. *Himicheskie volokna* [Fiber Chemistry], 2007, no 6, pp. 52–55. (In Russian).

29. Demidov A. V., Makarov A. G., Stalevich A. M. Option mathematical modeling of deformation processes of synthetic fibers. *Himicheskie volokna* [Fiber Chemistry], 2007, no 6, pp. 49–52. (In Russian).

30. Demidov A. V., Makarov A. G., Stalevich A. M. Option forecasting nonlinear hereditary viscoelasticity of polymers. *Prikladnaja mehanika i tehnickaja fizika* [Journal of Applied Mechanics and Technical Physics], 2007, vol. 48, no 6 (286), pp. 147–157. (In Russian).

31. Zhukovskij V. A., Makarov A. G., Rostovceva N. G., Slucker G. Ja., Stoljarov O. H., Terushkina O. B., Gridneva A. V. Deformation properties of synthetic monofilaments medical appointment. *Himicheskie volokna* [Fiber Chemistry], 2008, no 4, pp. 25–28. (In Russian).

32. Zhukovskij V. A., Makarov A. G., Rostovceva N. G., Slucker G. Ja., Stoljarov O. H., Terushkina O. B., Gridneva A. V. Deformation properties of synthetic monofilaments medical appointment. *Himicheskie volokna* [Fiber Chemistry], 2008, no 4, pp. 25–28. (In Russian).

33. Demidov A. V., Makarov A. G., Novoselova A. G., Stalevich A. M. Methods of spectral simulation of mechanical relaxation of textile materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti*. [The News of higher educational institutions. Technology of Textile Industry], 2007, no 1, pp. 15–19. (In Russian).

34. Demidov A. V., Makarov A. G., Stalevich A. M. Option modeling nonlinear hereditary viscoelasticity of polymer materials. *Izvestija Rossijskoj akademii nauk. Mehanika tverdogo tela* [Bulletin of the Russian Academy of Sciences. Mechanics of Solids], 2009, no 1, pp. 143–153. (In Russian).

35. Rostovceva N. G., Litvinov A. M., Fedorova S. V., Makarov A. G. Option spectral interpretation of relaxation and creep of polymer filaments. *Dizajn. Materialy. Tehnologija*. [Design. Materials. Technology], 2009, no 4, pp. 66–68. (In Russian).

36. Rostovceva N. G., Litvinov A. M., Fedorova S. V., Makarov A. G. Prediction of deformation processes of polymer materials in a changing temperature. *Dizajn. Materialy. Tehnologija*. [Design. Materials. Technology], 2009, no 3, pp. 69–71. (In Russian).

37. Makarov A. G., Rostovceva N. G., Fedorova S. V., Lebedeva S. V. Omputer simulation of viscoelastic polymeric ropes sea. *Dizajn. Materialy. Tehnologija*. [Design. Materials. Technology], 2010, no 1, pp. 100–105. (In Russian).

38. Makarov A. G., Rostovceva N. G., Artem'eva E. N., Lebedeva S. V. Modeling of deformation properties of aramid materials. *Dizajn. Materialy. Tehnologija*. [Design. Materials. Technology], 2010, no 2, pp. 25–29. (In Russian).

39. Rostovceva N. G., Makarov A. G., Pushkar' D. V. Forecasting processes reverse the relaxation of polymeric

materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2010, vol. 7, no 1, pp. 64–65. (In Russian).

40. Makarov A. G., Kiselev S. V., Rybachuk S. V., Zurahov V. S. Criteria for reliability prediction of viscoelasticity of polymer materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti*. [News of higher educational institutions. The technology of light industry], 2011, vol. 11, no 1, pp. 56–60. (In Russian).

41. Makarov A. G., Kiselev S. V., Rybachuk S. V., Pushkar' D. V. Option modeling relaxation and creep uniaxially oriented polymer materials. *Dizajn. Materialy. Tehnologija* [Design. Materials. Technology], 2011, no 1, pp. 91–94. (In Russian).

42. Makarov A. G., Kiselev S. V., Rybachuk S. V., Zurahov V. S. High-speed deformation of uniaxially oriented polymer materials. *Dizajn. Materialy. Tehnologija* [Design. Materials. Technology], 2011, no 2, pp. 64–66. (In Russian).

43. Demidov A. V., Grebenkin A. N., Ivanov K. G., Pereborova N. V. Prediction of complex deformation processes of polymer materials used in clothing, footwear and textile industries. *Dizajn. Materialy. Tehnologija* [Design. Materials. Technology], 2011, no 5 (20), pp. 19–21. (In Russian).

44. Druzhkina Ju. D., Makarova M. A., Fomina A. V., Pereborova N. V. The dependence of the effect of the degree of twist elastomeric yarns on their strength and deformation properties. *Dizajn. Materialy. Tehnologija* [Design. Materials. Technology], 2012, no 1 (21), pp. 73–76. (In Russian).

45. Makarov A. G., Gorshkov A. S., Rymkevich P. P., Pereborova N. V. Method of correction parameters of the mathematical model of relaxation of polymers by experimental stress-strain diagram points. *Dizajn. Materialy. Tehnologija* [Design. Materials. Technology], 2012, Vol. 1, no 21, pp. 23–28. (In Russian).

46. Makarov A. G., Gorshkov A. S., Rymkevich P. P., Ishmuratova R. R. Method for determination of the spectral and energy characteristics of elastomers. *Dizajn. Materialy. Tehnologija* [Design. Materials. Technology], 2012, vol. 2, no 22, pp. 38–42. (In Russian).

47. Makarov A. G., Slucker G. Ja., Terushkina O. B., Drobotun N. V. Physical analysis of the kinetics of creep filaments of polypropylene and PVDF. *Dizajn. Materialy. Tehnologija* [Design. Materials. Technology], 2012, vol. 3, pp. 41–44. (In Russian).

48. Makarov A. G., Egorova M. A., Zurahov N. S., Fomina A. V. Determination of the analytical relationship of normalized nuclear relaxation and delay in the linear theory of viscoelasticity of polymer materials. *Dizajn. Materialy. Tehnologija* [Design. Materials. Technology], 2012, vol. 3, pp. 48–50. (In Russian).

49. Rymkevich P. P., Romanova A. A., Gorshkov A. S., Makarov A. G. Physical fundamentals of the viscoelastic behavior of oriented amorphous-crystalline polymers. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2012, vol. 16, no 2, pp. 70–73. (In Russian).

50. Slucker G. Ja., Zhukovskij V. A., Terushkina O. B., Drobotun N. V., Filipenko T. S., Edomina N. A., Makarov A. G. The elastic properties of polyvinylidene fluoride and polypropylene monofilament mesh implants and on their basis. *Himicheskie volokna* [Fiber Chemistry], 2012, no 5, pp. 28–32. (In Russian).

51. Makarov A. G., Demidov A. V., Pereborova N. V., Vagner V. I. Spectral analysis of relaxation properties of polymer filaments amorphous-crystalline structure. *Himicheskie volokna* [Fiber Chemistry], 2013, no 5, pp. 44–47. (In Russian).

52. Golovina V. V., Rymkevich P. P., Makarov A. G., Romanova A. A. Prediction of deformation and relaxation processes in polymer materials pultruded. *Himicheskie volokna* [Fiber Chemistry], 2013, no 6, pp. 33–40. (In Russian).

53. Rymkevich P. P., Romanova A. A., Golovina V. V., Makarov A. G. The Energy Barriers Model for the Physical Description of the Viscoelasticity of Synthetic Polymers: Application to the Uniaxial Orientational Drawing of Polyamide Films. *Journal of Macromolecular Science. Part B: Physics*, 2013, vol. 52, is. 12, pp. 1829–1847.

54. Makarov A. G., Pereborova N. V., Vagner V. I., Rymkevich P. P., Gorshkov A. S. Basics of mathematical modeling of relaxation and creep of polymer materials for textile and light industry. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2013, vol. 21, no 3, pp. 27–31. (In Russian).

55. Makarov A. G., Pereborova N. V., Vagner V. I., Rymkevich P. P., Gorshkov A. S. Fundamentals of confidence predict relaxation and deformation processes of polymer materials for textile and light industry. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2013, vol. 22, no 4, pp. 32–34. (In Russian).

56. Golovina V. V., Makarov A. G., Rymkevich P. P. The method of analogies and physical justification for describing Thermoviscoelasticity amorphous-crystalline polymer filaments. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2013, vol. 19, pp. 67–70. (In Russian).

57. Rymkevich P. P., Gorshkov A. S., Makarov A. G., Romanova A. A. Mainly determined by the equation of the viscoelastic behavior of pultruded plastics. *Himicheskie volokna* [Fiber Chemistry], 2014, no 1, pp. 31–35. (In Russian).

58. Makarov A. G., Demidov A. V., Pereborova N. V., Vagner V. I. Spectral analysis of the deformation properties of polymer filaments amorphous-crystalline structure. *Himicheskie volokna* [Fiber Chemistry], 2014, no 1, pp. 60–63. (In Russian).

59. Makarov A. G., Pereborova N. V., Egorova M. A., Vagner V. I. Option modeling of deformation and relaxation properties of textile materials with a complex structure. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti*. [News of higher educational institutions. The technology of the textile industr], 2014, no 3 (351), pp. 110–115. (In Russian).

60. Makarov A. G., Pereborova N. V., Vagner V. I., Rymkevich P. P., Gorshkov A. S. Fundamentals of spectral-temporal analysis of relaxation and deformation properties of polymeric

■ Summary

materials for textile and light industry. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2014, vol. 23, no 1, pp. 19–23. (In Russian).

61. Makarov A. G., Maksimov V. V., Pereborova N. V., Vagner V. I. Computer modeling of deformation processes of textile materials with a complex structure. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2014, vol. 24, no 2, pp. 47–52. (In Russian).

62. Makarov A. G., Pereborova N. V., Egorova M. A., Vagner V. I. Modeling and prediction of viscoelastic properties of textile materials with a complex structure. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti* [News of higher educational institutions. The technology of the textile industry], 2014, no 6 (354), pp. 120–124. (In Russian).

63. Egorova M. A., Zurahova T. A., Pereborova N. V., Vagner V. I., Kononov A. S. Simulation of deformation and elastic properties of polyester yarns of varying degrees of twist. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2014, vol. 26, no 4, pp. 97–103. (In Russian).

64. Makarov A. G., Pereborova N. V., Egorova M. A., Zurahov N. S., Kiselev S. V. Forecasting and the comparative analysis of deformation processes of polymer textile yarn. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2015, vol. 28, no 2, pp. 78–86. (In Russian).

65. Pereborova N. V., Egorov I. M., Kozlov A. A., Ogluzdina L. V., Kondrashov V. V. A comprehensive study of the mechanical properties of textile materials and forecasting of deformation processes. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2015, vol. 28, no 2, pp. 87–98. (In Russian).

66. Rymkevich P. P., Golovina V. V., Gorshkov A. S., Makarov A. G., Romanova A. A. Averaging physical quantities by normal distribution. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2015, vol. 28, no 2, pp. 98–103. (In Russian).

67. Pereborova N. V. Development of innovative methods for monitoring the performance characteristics and quality of materials for textile and light industry. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2015, vol. 29, no 3, pp. 11–19. (In Russian).

68. Pereborova N. V. Development of criteria for quality assessment of consumer properties of functional textiles and light industry products to product quality control. *Dizajn. Materialy. Tehnologija* [Design. Materials. Technology], 2015, no 4 (39), pp. 98–102. (In Russian).

69. Pereborova N. V. The development of a strategic program to create an engineering center for textile and light industry. *Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2015, vol. 29, no 3, pp. 35–42. (In Russian).

70. Makarov A. G., Pereborova N. V., Egorova M. A., Ledov D. S., Busygin K. N., Kononov A. S. Methodology Spectral modeling of strain-relaxation processes of polymer materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2015, vol. 30, no 4, pp. 7–16. (In Russian).

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SYSTEM ANALYSIS OF DEFORMATION PROPERTIES OF POLYMER PARACHUTE LINE

For the qualitative study of deformation properties of polymer parachute sling system needs a comprehensive analysis based on mathematical modeling of deformation processes and the relaxation of these materials. Polymeric slings parachute classified as textile materials because are tapes and cords of synthetic fibers. Conducted a systematic analysis is built taking into account the basic provisions of the theory of viscoelastic polymers.

Keywords: parachute straps, viscoelasticity, deformation, relaxation, creep, mathematical modeling, system analysis.

References

1. Makarov A. G. Control parameters of the nonlinear-relaxation hereditary nuclei and delay synthetic fibers. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti* [The News of higher educational institutions. Technology of Textile Industry], 2000, no 2, pp. 12–16. (In Russian).

2. Stalevich A. M., Makarov A. G. Spectrum Option hereditary viscoelastic relaxation synthetic fibers. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti*. [The News of higher educational institutions. Technology of Textile Industry], 2000, no 3, pp. 8–13. (In Russian).

3. Makarov A. G., Stalevich A. M. Option prediction of filament deformation processes. *Himicheskie volokna* [Fiber Chemistry], 2001, no 4, pp. 67–69. (In Russian).

4. Makarov A. G., Stalevich A. M. Methods of refinement and control of synthetic materials predictable conditions. *Himicheskie volokna* [Fiber Chemistry], 2001, no 5, pp. 58–61. (In Russian).

5. Stalevich A. M., Makarov A. G. Determination of the viscoelastic characteristics of the example of polyacrylonitrile yarn. *Himicheskie volokna* [Fiber Chemistry], 2001, no 6, pp. 68–70. (In Russian).

6. Makarov A. G., Stalevich A. M. Option relaxation and retardation spectra in amorphous-crystalline synthetic fibers. *Himicheskie volokna* [Fiber Chemistry], 2002, no 3, pp. 52–55. (In Russian).

7. Stalevich A. M., Makarov A. G., Saidov E. D. Settlement and experimental evaluation of the mechanical work absorbed during deformation of synthetic filament. *Himicheskie volokna* [Fiber Chemistry], 2002, no 3, pp. 55–57. (In Russian).

8. Makarov A. G., Stalevich A. M. Forecast feedback relaxation and deformation-recovery processes synthetic fibers. *Himicheskie volokna* [Fiber Chemistry], 2002, no 6, pp. 62–64. (In Russian).
9. Makarov A. G. Determination of the analytical relationship of normalized nuclear relaxation and creep in the linear theory of viscoelasticity of textile materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti* [The News of higher educational institutions. Technology of Textile Industry], 2002, no 2, pp. 13–17. (In Russian).
10. Makarov A. G., Stalevich A. M. Prediction restorative deformation process and reciprocal relaxation of polymeric materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti* [The News of higher educational institutions. Technology of Textile Industry], 2002, no 3, pp. 10–13. (In Russian).
11. Stalevich A. M., Makarov A. G., Saidov E. D. Elastic components of synthetic filament stretching charts. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti* [The News of higher educational institutions. Technology of Textile Industry], 2002, no 4–5, pp. 15–18. (In Russian).
12. Stalevich A. M., Makarov A. G., Saidov E. D. Relaxation Spectrometry synthetic yarn. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti* [The News of higher educational institutions. Technology of Textile Industry], 2003, no 1, pp. 16–22. (In Russian).
13. Demidov A. V., Makarov A. G., Stalevich A. M. System analysis of viscoelastic polymeric materials. *Voprosy materialovedenija*. [Material science issues], 2005, no 4 (44), pp. 50–58. (In Russian).
14. Makarov A. G., Ovsjannikov D. A. Computer determination of the spectral and energy characteristics of synthetic fabrics. *Vestnik Sankt-Peterburgskogo gosudarstvennogo universiteta tehnologii i dizajna*. [Vestnik of St. Petersburg State University of Technology and Design], 2005, no 11, pp. 5–9. (In Russian).
15. Ovsjannikov D. A., Makarov A. G., Stalevich A. M., Demidov A. V. Mathematical modeling of processes of viscoelastic polymers. *Vestnik Sankt-Peterburgskogo gosudarstvennogo universiteta. Serija 10* [Vestnik of Saint-Petersburg University. Series 10. Applied Mathematics. Computer Science. Control Processes], 2006, no 3, pp. 46–54. (In Russian).
16. Demidov A. V., Makarov A. G., Stalevich A. M. Option mathematical modeling of deformation processes of polymer materials. *Voprosy materialovedenija*. [Material science issues], 2006, no 3, pp. 101–111. (In Russian).
17. Demidov A. V., Makarov A. G., Stalevich A. M. Methods of computer analysis of technical fabrics viscoelasticity. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti*. [The News of higher educational institutions. Technology of Textile Industry], 2006, no 3, pp. 13–17. (In Russian).
18. Demidov A. V., Makarov A. G., Stalevich A. M. Research of changes of deformation properties of polyester yarns, depending on the degree of twist. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti*. [The News of higher educational institutions. Technology of Textile Industry], 2006, no 4, pp. 9–13. (In Russian).
19. Demidov A. V., Makarov A. G., Stalevich A. M. Criteria for the selection of optimal mathematical model of viscoelasticity of textile materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti*. [The News of higher educational institutions. Technology of Textile Industry], 2006, no 5, pp. 18–22. (In Russian).
20. Demidov A. V., Makarov A. G., Stalevich A. M. Determination of mechanical properties of textile materials at variable temperature. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti*. [The News of higher educational institutions. Technology of Textile Industry], 2006, no 6, pp. 14–19. (In Russian).
21. Demidov A. V., Makarov A. G., Stalevich A. M. Determination of deformation characteristics of synthetic fibers under variable temperature. *Himicheskie volokna* [Fiber Chemistry], 2006, no 3, pp. 58–61. (In Russian).
22. Demidov A. V., Makarov A. G., Stalevich A. M. Computer investigation of viscoelastic polymeric materials. *Himicheskie volokna* [Fiber Chemistry], 2006, no 5, pp. 38–43. (In Russian).
23. Demidov A. V., Makarov A. G., Stalevich A. M. Optimization model selection viscoelasticity of synthetic fibers. *Himicheskie volokna* [Fiber Chemistry], 2006, no 6, pp. 47–51. (In Russian).
24. Demidov A. V., Makarov A. G., Stalevich A. M. Option forecasting of deformation processes of polymer materials. *Materialovedenie* [Material science], 2006, no 8, pp. 5–10. (In Russian).
25. Demidov A. V., Makarov A. G., Stalevich A. M. Identifying the computer prediction of deformation properties of textile materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti*. [The News of higher educational institutions. Technology of Textile Industry], 2007, no 2, pp. 14–17. (In Russian).
26. Demidov A. V., Makarov A. G., Stalevich A. M. System analysis of the viscoelasticity of textile materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti*. [The News of higher educational institutions. Technology of Textile Industry], 2007, no 3, pp. 20–24. (In Russian).
27. Demidov A. V., Makarov A. G., Stalevich A. M. System analysis viscoelasticity polyester yarn. *Himicheskie volokna* [Fiber Chemistry], 2007, no 1, pp. 62–65. (In Russian).
28. Demidov A. V., Makarov A. G., Stalevich A. M. The study of elastic, viscoelastic and plastic characteristics filaments. *Himicheskie volokna* [Fiber Chemistry], 2007, no 6, pp. 52–55. (In Russian).
29. Demidov A. V., Makarov A. G., Stalevich A. M. Option mathematical modeling of deformation processes of synthetic fibers. *Himicheskie volokna* [Fiber Chemistry], 2007, no 6, pp. 49–52. (In Russian).
30. Demidov A. V., Makarov A. G., Stalevich A. M. Option forecasting nonlinear hereditary viscoelasticity of polymers. *Prikladnaja mehanika i tehnickaja fizika* [Journal of Applied Mechanics and Technical Physics], 2007, vol. 48, no 6 (286), pp. 147–157. (In Russian).
31. Zhukovskij V. A., Makarov A. G., Rostovceva N. G., Slucker G. Ja., Stoljarov O. H., Terushkina O. B., Gridneva A. V. Deformation properties of synthetic monofilaments medical

■ Summary

appointment. *Himicheskie volokna* [Fiber Chemistry], 2008, no 4, pp. 25–28. (In Russian).

32. Demidov A. V., Makarov A. G., Novoselova A. G., Stalevich A. M. Methods of spectral simulation of mechanical relaxation of textile materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti*. [The News of higher educational institutions. Technology of Textile Industry], 2007, no 1, pp. 15–19. (In Russian).

33. Demidov A. V., Makarov A. G., Stalevich A. M. Variant modelirovaniya nelinejno-nasledstvennoj vjzskouprugosti polimernyh materialov. *Izvestija Rossijskoj akademii nauk. Mehanika tverdogo tela*, 2009, no 1, pp. 143–153. (In Russian).

34. Rostovceva N. G., Litvinov A. M., Fedorova S. V., Makarov A. G. Option spectral interpretation of relaxation and creep of polymer filaments. *Dizajn. Materialy. Tehnologija*. [Design. Materials. Technology], 2009, no 4, pp. 66–68. (In Russian).

35. Rostovceva N. G., Litvinov A. M., Fedorova S. V., Makarov A. G. Prediction of deformation processes of polymer materials in a changing temperature. *Dizajn. Materialy. Tehnologija*. [Design. Materials. Technology], 2009, no 3, pp. 69–71. (In Russian).

36. Makarov A. G., Rostovceva N. G., Fedorova S. V., Lebedeva S. V. Omputer simulation of viscoelastic polymeric ropes sea. *Dizajn. Materialy. Tehnologija*. [Design. Materials. Technology], 2010, no 1, pp. 100–105. (In Russian).

37. Makarov A. G., Rostovceva N. G., Artem'eva E. N., Lebedeva S. V. Modeling of deformation properties of aramid materials. *Dizajn. Materialy. Tehnologija*. [Design. Materials. Technology], 2010, no 2, pp. 25–29. (In Russian).

38. Rostovceva N. G., Makarov A. G., Pushkar' D. V. Forecasting processes reverse the relaxation of polymeric materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2010, vol. 7, no 1, pp. 64–65. (In Russian).

39. Makarov A. G., Kiselev S. V., Rybachuk S. V., Zurahov V. S. Criteria for reliability prediction of viscoelasticity of polymer materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti*. [News of higher educational institutions. The technology of light industry], 2011, vol. 11, no 1, pp. 56–60. (In Russian).

40. Makarov A. G., Kiselev S. V., Rybachuk S. V., Pushkar' D. V. Option modeling relaxation and creep uniaxially oriented polymer materials. *Dizajn. Materialy. Tehnologija* [Design. Materials. Technology], 2011, no 1, pp. 91–94. (In Russian).

41. Makarov A. G., Kiselev S. V., Rybachuk S. V., Zurahov V. S. High-speed deformation of uniaxially oriented polymer materials. *Dizajn. Materialy. Tehnologija* [Design. Materials. Technology], 2011, no 2, pp. 64–66. (In Russian).

42. Demidov A. V., Grebenkin A. N., Ivanov K. G., Pereborova N. V. Prediction of complex deformation processes of polymer materials used in clothing, footwear and textile industries. *Dizajn. Materialy. Tehnologija* [Design. Materials. Technology], 2011, no 5 (20), pp. 19–21. (In Russian).

43. Druzhkina Ju. D., Makarova M. A., Fomina A. V., Pereborova N. V. The dependence of the effect of the degree of

twist elastomeric yarns on their strength and deformation properties. *Dizajn. Materialy. Tehnologija* [Design. Materials. Technology], 2012, no 1 (21), pp. 73–76. (In Russian).

44. Makarov A. G., Gorshkov A. S., Rymkevich P. P., Pereborova N. V. Method of correction parameters of the mathematical model of relaxation of polymers by experimental stress-strain diagram points. *Dizajn. Materialy. Tehnologija* [Design. Materials. Technology], 2012, vol. 1, no 21, pp. 23–28. (In Russian).

45. Makarov A. G., Gorshkov A. S., Rymkevich P. P., Ishmuratova R. R. Method for determination of the spectral and energy characteristics of elastomers. *Dizajn. Materialy. Tehnologija* [Design. Materials. Technology], 2012, vol. 2, no 22, pp. 38–42. (In Russian).

46. Makarov A. G., Slucker G. Ja., Terushkina O. B., Drobotun N. V. Physical analysis of the kinetics of creep filaments of polypropylene and PVDF. *Dizajn. Materialy. Tehnologija* [Design. Materials. Technology], 2012, vol. 3, pp. 41–44. (In Russian).

47. Makarov A. G., Egorova M. A., Zurahov N. S., Fomina A. V. Determination of the analytical relationship of normalized nuclear relaxation and delay in the linear theory of viscoelasticity of polymer materials. *Dizajn. Materialy. Tehnologija* [Design. Materials. Technology], 2012, vol. 3, pp. 48–50. (In Russian).

48. Rymkevich P. P., Romanova A. A., Gorshkov A. S., Makarov A. G. Physical fundamentals of the viscoelastic behavior of oriented amorphous-crystalline polymers. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2012, vol. 16, no 2, pp. 70–73. (In Russian).

49. Slucker G. Ja., Zhukovskij V. A., Terushkina O. B., Drobotun N. V., Filipenko T. S., Edomina N. A., Makarov A. G. The elastic properties of polyvinylidene fluoride and polypropylene monofilament mesh implants and on their basis. *Himicheskie volokna* [Fiber Chemistry], 2012, no 5, pp. 28–32. (In Russian).

50. Golovina V. V., Rymkevich P. P., Makarov A. G., Romanova A. A. Prediction of deformation and relaxation processes in polymer materials pultruded. *Himicheskie volokna* [Fiber Chemistry], 2013, no 6, pp. 33–40. (In Russian).

51. Rymkevich P. P., Romanova A. A., Golovina V. V., Makarov A. G. The Energy Barriers Model for the Physical Description of the Viscoelasticity of Synthetic Polymers: Application to the Uniaxial Orientational Drawing of Polyamide Films. *Journal of Macromolecular Science. Part B: Physics*, 2013, vol. 52, issue 12, pp. 1829–1847.

52. Golovina V. V., Makarov A. G., Rymkevich P. P. The method of analogies and physical justification for describing Thermoviscoelasticity amorphous-crystalline polymer filaments. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2013, vol. 19, pp. 67–70. (In Russian).

53. Rymkevich P. P., Gorshkov A. S., Makarov A. G., Romanova A. A. Mainly determined by the equation of the viscoelastic behavior of pultruded plastics. *Himicheskie volokna* [Fiber Chemistry], 2014, no 1, pp. 31–35. (In Russian).

54. Pereborova N. V. Improved product quality textile and light industry through the introduction of information technologies in research. *Vestnik Sankt-Peterburgskogo gosudarstvennogo universiteta tehnologii i dizajna. Serija 1. Estestvennye i tehicheskie nauki* [Vestnik of Saint Petersburg State University

of Technology and Design. 1. A series of natural and technical sciences], 2015, no 4, pp. 53–62. (In Russian).

55. Pereborova N. V. Development of innovative methods for monitoring the performance characteristics and quality of materials for textile and light industry. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2015, vol. 29, no 3, pp. 11–19. (In Russian).

56. Pereborova N. V. Development of criteria for quality assessment of consumer properties of functional textiles and light industry products to product quality control. *Dizajn. Materialy. Tehnologija* [Design. Materials. Technology], 2015, no 4 (39), pp. 98–102. (In Russian).

57. Pereborova N. V. The development of a strategic program to create an engineering center for textile and light industry. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2015, vol. 29, no 3, pp. 35–42. (In Russian).

58. Makarov A. G., Pereborova N. V., Egorova M. A., Zurahov N. S., Kiselev S. V. Forecasting and the comparative analysis of deformation processes of polymer textile yarn. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2015, vol. 28, no 2, pp. 78–86. (In Russian).

59. Pereborova N. V., Egorov I. M., Kozlov A. A., Ogluzdina L. V., Kondrashov V. V. A comprehensive study of the mechanical properties of textile materials and forecasting of deformation processes. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2015, vol. 28, no 2, pp. 87–98. (In Russian).

60. Rymkevich P. P., Golovina V. V., Gorshkov A. S., Makarov A. G., Romanova A. A. Averaging physical quantities by normal distribution. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2015, vol. 28, no 2, pp. 98–103. (In Russian).

61. Makarov A. G., Pereborova N. V., Egorova M. A., Ledov D. S., Busygin K. N., Kononov A. S. Methodology Spectral modeling of strain-relaxation processes of polymer materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2015, vol. 30, no 4, pp. 7–16. (In Russian).

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SYSTEM ANALYSIS DEFORMATION PROPERTIES GORNYH- AND FIRE RESCUE ARAMID ROPE

This article discusses the system analysis of the deformation properties of aramid textile cords used in rescuing people from fires in the mountains and in the mines. These

materials have as high strength and high resistance to temperature influences. System analysis of deformation properties of aramid cords is based on mathematical modeling of processes of relaxation and creep, as well as with the use of computer technology.

Keywords: aramid materials, Mine-rescue equipment, equipment požarospasatelnoe, viscoelasticity, deformation, mathematical modeling, numerical prediction.

References

1. Stalevich A. M., Makarov A. G. Spectrum Option hereditary viscoelastic relaxation synthetic fibers. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti*. [The News of higher educational institutions. Technology of Textile Industry], 2000, no 3, pp. 8–13. (In Russian).

2. Makarov A. G., Stalevich A. M. Option prediction of filament deformation processes. *Himicheskie volokna* [Fiber Chemistry], 2001, no 4, pp. 67–69. (In Russian).

3. Makarov A. G., Stalevich A. M. Methods of refinement and control of synthetic materials predictable conditions. *Himicheskie volokna* [Fiber Chemistry], 2001, no 5, pp. 58–61. (In Russian).

4. Stalevich A. M., Makarov A. G. Determination of the viscoelastic characteristics of the example of polyacrylonitrile yarn. *Himicheskie volokna* [Fiber Chemistry], 2001, no 6, pp. 68–70. (In Russian).

5. Makarov A. G., Stalevich A. M. Option relaxation and retardation spectra in amorphous-crystalline synthetic fibers. *Himicheskie volokna* [Fiber Chemistry], 2002, no 3, pp. 52–55. (In Russian).

6. Makarov A. G., Stalevich A. M. Forecast feedback relaxation and deformation-recovery processes synthetic fibers. *Himicheskie volokna* [Fiber Chemistry], 2002, no 6, pp. 62–64. (In Russian).

7. Makarov A. G. Determination of the analytical relationship of normalized nuclear relaxation and creep in the linear theory of viscoelasticity of textile materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti* [The News of higher educational institutions. Technology of Textile Industry], 2002, no 2, pp. 13–17. (In Russian).

8. Makarov A. G., Stalevich A. M. Prediction restorative deformation process and reciprocal relaxation of polymeric materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti* [The News of higher educational institutions. Technology of Textile Industry], 2002, no 3, pp. 10–13. (In Russian).

9. Makarov A. G., Ovsjannikov D. A. Computer determination of the spectral and energy characteristics of synthetic fabrics. *Vestnik Sankt-Peterburgskogo gosudarstvennogo universiteta tehnologii i dizajna* [Vestnik of St. Petersburg State University of Technology and Design], 2005, no 11, pp. 5–9. (In Russian).

10. Ovsjannikov D. A., Makarov A. G., Stalevich A. M., Demidov A. V. Mathematical modeling of processes of viscoelastic polymers. *Vestnik Sankt-Peterburgskogo gosudarstvennogo universiteta. Serija 10* [Vestnik of Saint-Petersburg University. Series 10. Applied Mathematics. Computer Science. Control Processes], 2006, no 3, pp. 46–54. (In Russian).

11. Demidov A. V., Makarov A. G., Stalevich A. M. Methods of computer analysis of technical fabrics viscoelasticity.

■ Summary

Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti. [The News of higher educational institutions. Technology of Textile Industry], 2006, no 3, pp. 13–17. (In Russian).

12. Demidov A. V., Makarov A. G., Stalevich A. M. Research of changes of deformation properties of polyester yarns, depending on the degree of twist. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti*. [The News of higher educational institutions. Technology of Textile Industry], 2006, no 4, pp. 9–13. (In Russian).

13. Demidov A. V., Makarov A. G., Stalevich A. M. Criteria for the selection of optimal mathematical model of viscoelasticity of textile materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti*. [The News of higher educational institutions. Technology of Textile Industry], 2006, no 5, pp. 18–22. (In Russian).

14. Demidov A. V., Makarov A. G., Stalevich A. M. Determination of mechanical properties of textile materials at variable temperature. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti*. [The News of higher educational institutions. Technology of Textile Industry], 2006, no 6, pp. 14–19. (In Russian).

15. Demidov A. V., Makarov A. G., Stalevich A. M. Determination of deformation characteristics of synthetic fibers under variable temperature. *Himicheskie volokna* [Fiber Chemistry], 2006, no 3, pp. 58–61. (In Russian).

16. Demidov A. V., Makarov A. G., Stalevich A. M. Computer investigation of viscoelastic polymeric materials. *Himicheskie volokna* [Fiber Chemistry], 2006, no 5, pp. 38–43. (In Russian).

17. Demidov A. V., Makarov A. G., Stalevich A. M. Optimization model selection viscoelasticity of synthetic fibers. *Himicheskie volokna* [Fiber Chemistry], 2006, no 6, pp. 47–51. (In Russian).

18. Demidov A. V., Makarov A. G., Stalevich A. M. Option forecasting of deformation processes of polymer materials. *Materialovedenie* [Material science], 2006, no 8, pp. 5–10. (In Russian).

19. Demidov A. V., Makarov A. G., Stalevich A. M. Identifying the computer prediction of deformation properties of textile materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti*. [The News of higher educational institutions. Technology of Textile Industry], 2007, no 2, pp. 14–17. (In Russian).

20. Demidov A. V., Makarov A. G., Stalevich A. M. System analysis of the viscoelasticity of textile materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti*. [The News of higher educational institutions. Technology of Textile Industry], 2007, no 3, pp. 20–24. (In Russian).

21. Demidov A. V., Makarov A. G., Stalevich A. M. System analysis viscoelasticity polyester yarn. *Himicheskie volokna* [Fiber Chemistry], 2007, no 1, pp. 62–65. (In Russian).

22. Demidov A. V., Makarov A. G., Stalevich A. M. The study of elastic, viscoelastic and plastic characteristics filaments. *Himicheskie volokna* [Fiber Chemistry], 2007, no 6, pp. 52–55. (In Russian).

23. Demidov A. V., Makarov A. G., Stalevich A. M. Option mathematical modeling of deformation processes of synthetic fibers. *Himicheskie volokna* [Fiber Chemistry], 2007, no 6, pp. 49–52. (In Russian).

24. Demidov A. V., Makarov A. G., Stalevich A. M. Option forecasting nonlinear hereditary viscoelasticity of polymers. *Prikladnaja mehanika i tehnickeskaja fizika* [Journal of Applied Mechanics and Technical Physics], 2007, vol. 48, no 6 (286), pp. 147–157. (In Russian).

25. Demidov A. V., Makarov A. G., Stalevich A. M. Variant modelirovaniya nelinejno-nasledstvennoj vjzakuprugosti polimernyh materialov. *Izvestija Rossijskoj akademii nauk. Mehanika tverdogo tela*, 2009, no 1, pp. 143–153. (In Russian).

26. Makarov A. G., Kiselev S. V., Rybachuk S. V., Zurafov V. S. Criteria for reliability prediction of viscoelasticity of polymer materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti*. [News of higher educational institutions. The technology of light industry], 2011, vol. 11, no 1, pp. 56–60. (In Russian).

27. Demidov A. V., Grebenkin A. N., Ivanov K. G., Pereborova N. V. Prediction of complex deformation processes of polymer materials used in clothing, footwear and textile industries. *Dizajn. Materialy. Tehnologija* [Design. Materials. Technology], 2011, no 5 (20), pp. 19–21. (In Russian).

28. Druzhkina Ju. D., Makarova M. A., Fomina A. V., Pereborova N. V. The dependence of the effect of the degree of twist elastomeric yarns on their strength and deformation properties. *Dizajn. Materialy. Tehnologija* [Design. Materials. Technology], 2012, no 1 (21), pp. 73–76. (In Russian).

29. Makarov A. G., Gorshkov A. S., Rymkevich P. P., Pereborova N. V. Method of correction parameters of the mathematical model of relaxation of polymers by experimental stress-strain diagram points. *Dizajn. Materialy. Tehnologija* [Design. Materials. Technology], 2012, vol. 1, no 21, pp. 23–28. (In Russian).

30. Makarov A. G., Demidov A. V., Pereborova N. V., Vagner V. I. Spectral analysis of relaxation properties of polymer filaments amorphous-crystalline structure. *Himicheskie volokna* [Fiber Chemistry], 2013, no 5, pp. 44–47. (In Russian).

31. Makarov A. G., Pereborova N. V., Vagner V. I., Rymkevich P. P., Gorshkov A. S. Basics of mathematical modeling of relaxation and creep of polymer materials for textile and light industry. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2013, vol. 21, no 3, pp. 27–31. (In Russian).

32. Makarov A. G., Pereborova N. V., Vagner V. I., Rymkevich P. P., Gorshkov A. S. Fundamentals of confidence predict relaxation and deformation processes of polymer materials for textile and light industry. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2013, vol. 22, no 4, pp. 32–34. (In Russian).

33. Makarov A. G., Demidov A. V., Pereborova N. V., Vagner V. I. Spectral analysis of the deformation properties of polymer filaments amorphous-crystalline structure. *Himicheskie volokna* [Fiber Chemistry], 2014, no 1, pp. 60–63. (In Russian).

34. Makarov A. G., Pereborova N. V., Egorova M. A., Vagner V. I. Option modeling of deformation and relaxation properties of textile materials with a complex structure. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti*. [News of higher educational institutions. The

technology of the textile industry], 2014, no 3 (351), pp. 110–115. (In Russian).

35. Makarov A. G., Pereborova N. V., Vagner V. I., Rymkevich P. P., Gorshkov A. S. Fundamentals of spectral-temporal analysis of relaxation and deformation properties of polymeric materials for textile and light industry. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2014, vol. 23, no 1, pp. 19–23. (In Russian).

36. Makarov A. G., Maksimov V. V., Pereborova N. V., Vagner V. I. Computer modeling of deformation processes of textile materials with a complex structure. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2014, vol. 24, no 2, pp. 47–52. (In Russian).

37. Makarov A. G., Pereborova N. V., Egorova M. A., Vagner V. I. Modeling and prediction of viscoelastic properties of textile materials with a complex structure. *Izvestija vysshih uchebnyh zavedenij. Tehnologija tekstil'noj promyshlennosti* [News of higher educational institutions. The technology of the textile industry], 2014, no 6 (354), pp. 120–124. (In Russian).

38. Egorova M. A., Zurahova T. A., Pereborova N. V., Vagner V. I., Kononov A. S. Simulation of deformation and elastic properties of polyester yarns of varying degrees of twist. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2014, vol. 26, no 4, pp. 97–103. (In Russian).

39. Makarov A. G., Pereborova N. V., Egorova M. A., Zurahov N. S., Kiselev S. V. Forecasting and the comparative analysis of deformation processes of polymer textile yarn. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2015, vol. 28, no 2, pp. 78–86. (In Russian).

40. Pereborova N. V., Egorov I. M., Kozlov A. A., Ogluzdina L. V., Kondrashov V. V. A comprehensive study of the mechanical properties of textile materials and forecasting of deformation processes. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2015, vol. 28, no 2, pp. 87–98. (In Russian).

41. Pereborova N. V. Development of innovative methods for monitoring the performance characteristics and quality of materials for textile and light industry. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2015, vol. 29, no 3, pp. 11–19. (In Russian).

42. Pereborova N. V. Development of criteria for quality assessment of consumer properties of functional textiles and light industry products to product quality control. *Dizajn. Materialy. Tehnologija* [Design. Materials. Technology], 2015, no 4 (39), pp. 98–102. (In Russian).

43. Pereborova N. V. The development of a strategic program to create an engineering center for textile and light industry. *Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2015, vol. 29, no 3, pp. 35–42. (In Russian).

44. Makarov A. G., Pereborova N. V., Egorova M. A., Ledov D. S., Busygin K. N., Kononov A. S. Methodology Spectral modeling of strain-relaxation processes of polymer materials. *Izvestija vysshih uchebnyh zavedenij. Tehnologija legkoj promyshlennosti* [News of higher educational institutions. The technology of light industry], 2015, vol. 30, no 4, pp. 7–16. (In Russian).

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PRINCIPLES OF ARTISTIC AND EXPRESSIVE MEANS SELECTION IN ORDER TO INCREASE THE AESTHETIC VALUE OF A GAME PROJECT BASED ON AGE, GENDER, AND PSYCHOLOGICAL PECULIARITIES OF THE TARGET AUDIENCE WITHIN THE FRAMEWORK OF GAME DESIGN

The present article describes, systematizes and analyzes the correlation between demographic and psychological features of the target audience of a project and the choice of artistic and expressive means in order to increase the appeal of the project and its aesthetic value. The obtained data are evaluated from the standpoint of their usage at different stages of game development in order to design a most entertaining game experience while taking into consideration the expectations and preference of the target audience. The scientific novelty of the present article lies in the attempt to categorize main demographic and psychological factors influencing various aspects of gameplay and to unify means used to design game experience while paying attention to these factors. The practical importance results from the possible implementation of the discovered correlations in order to optimize the development of competitive projects having high artistic and aesthetic value.

Key words: gameplay, target audience, game industry, psychological types, mechanics, age group.

Reference

- Schell J. The art of game design. A book of lenses. Morgan Kaufmann Publishers, 2008.
- Kazakova N. Ju., Nazarov Ju. V. *Istorija voznikovenija gejmdizajna kak samostojatel'noj formy vizual'nogo iskusstva. Zhanry videoigr i osnovnye jetapy ih razrabotki* [Emergence history game design as independent form of visual art. Genres of video games and main stages of their development] // *Dizajn i tehnologija*, 2015, no 43, pp. 91–99. (In Russian).
- McCloud S. Understanding Comics. Harper, 1993.
- Rogers S. Level up. The guide to great video game design. A John Wiley & Sons, Ltd., Publications, 2010.
- Mitchell B. Game Design Essentials. John Wiley & Sons, 2012.
- Wright B. The art of the Uncharted Trilogy. Dark Horse Books, 2015.

■ Summary

7. Dille F., Platten J. The ultimate guide to video game writing and design. N.-Y., Random House, Inc., 2007.

8. Game studies: 2003, vol. 3, is. 1 may. Available at: <http://www.gamestudies.org/0301/pearce/> (accessed 12 may 2016).

9. Kazakova N. Y., Nazarov Y. V. Tselevaya auditoria geim-dizayana i igrovoiprotsess/Vestnik MGHPA, 2015, no 1, pp. 393–415. (In Russian).

10. URL: www.icagames.comm.msu.edu/cr.pdf (accessed 12 may 2016).

11. Koster R. A theory of fun for game design. O'Reilly Media, Inc., 2014.

12. Skolnick E. Video Game Storytelling. Watson-Guptill Publications, Berkeley, 2014, pp. 134.

13. Juul J. The art of failure: an essay on the pain of playing video games. The MIT Press, 2013, pp. 79.

14. Wu Y. The style of video games graphics: analyzing the functions of Visual styles in storytelling and gameplay in video games. Simon Fraser University, 2012, pp. 195.

15. Demers O. Digital Texturing and Painting. New Riders, 2001, 339 p.

16. Quora. Available at: <http://www.quora.com/Is-there-a-taxonomy-of-names-of-video-game-art-graphical-styles> (accessed 12 may 2016).