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SYSTEM ANALYSIS, CONTROL AND INFORMATION PROCESSING

Wagner V. I., Pereborova N. V.

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DIGITAL PREDICTION OF DEFORMATION PROCESSES OF FABRICS FOR PARACHUTE DOMES

The digital prediction of the deformation processes of polyamide fabrics used for the manufacture of parachute domes is considered. The specificity of these processes is their transience. Digital forecasting is carried out using computer methods based on mathematical modeling of creep and Boltzmann-Volterra integral constitutive relations.

Keywords: parachute canopies, polyamide fabrics, viscoelasticity, deformation, mathematical modeling, digital prediction

Demidov A. V., Makarov A. G., Wagner V. I.

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COMPUTATIONAL PREDICTION OF DEFORMATION AND RELAXATION PROCESSES OF ARAMID MATERIALS AT VARIABLE TEMPERATURE

The article deals with the issues of numerical prediction of deformation-relaxation processes of aramid materials under conditions of variable temperature. A generalization of methods for predicting nonlinear relaxation and nonlinear creep is proposed for the case of processes occurring under conditions of varying temperature by introducing temperature-strain-time and temperature-force-time analogies into consideration.

Keywords: aramid materials, deformation-relaxation processes, mathematical modeling, numerical prediction, variable temperature

Egorova M. A., Kozlov A. A.

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MODELING AND ANALYSIS OF THE FUNCTIONAL PROPERTIES OF MINING AND FIRE RESCUE ARAMID MATERIALS

The article deals with the modeling and analysis of the functional properties of textile aramid cords and other materials used in rescuing people during fires, in the mountains and in mines. These materials have both increased strength and high resistance to temperature effects. Analysis of the deformation properties of aramid cords is carried out on the basis of mathematical modeling of relaxation and creep processes, as well as with the use of computational technologies.

Keywords: aramid materials, mine rescue equipment, fire rescue equipment, functional properties, system analysis, mathematical modeling, numerical prediction

Kiselev S. V.

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MATHEMATICAL MODELING OF DEFORMATION PROCESSES OF HEAT-RESISTANT ARAMID MATERIALS

The methods of mathematical modeling of deformation processes of heat-resistant aramid materials are considered. The basis for predicting the deformation processes of these materials is mathematical models of relaxation and creep. A technique for solving problems of systemic analysis of the properties of heat-resistant aramid materials, studying the relationship between properties and structure, predicting short-term and long-term mechanical effects is proposed.

Keywords: mathematical modeling, deformation processes, aramid materials, viscoelasticity

Kozlov A. A., Kiselev S. V.

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CONDUCTING A QUALITATIVE ANALYSIS OF THE PERFORMANCE PROPERTIES OF PARACHUTE LINES

A qualitative analysis of the operational properties of polymeric parachute lines is carried out on the basis of mathematical modeling and numerical prediction of the deformation processes of these materials. Polymeric parachute slings belong to the class of textile materials, because. are ribbons and cords made of synthetic threads. Qualitative analysis of the deformation properties of polymeric parachute lines, including comprehensive studies, underlies the creation of modern parachute systems.

Keywords: parachute lines, operational properties, mathematical modeling, system analysis, qualitative analysis

Kozlov A. A.

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SYSTEMIC STUDY OF THE FUNCTIONAL PROPERTIES OF POLYMERIC TEXTILE MATERIALS ON THE BASIS OF MATHEMATICAL MODELING OF THEIR DEFORMATION PROCESSES

A systematic study of the functional properties of polymeric textile materials is possible only on the basis of mathematical modeling and a systematic analysis of their deformation processes. This study includes: conducting a test experiment in relaxation and creep modes; construction of an adequate mathematical model of deformation properties, determination of viscoelastic parameters-characteristics of the mathematical model; modeling of deformation processes, the use of specially developed computer techniques for system analysis and qualitative assessment of the deformation properties of polymeric textile materials.

Keywords: textile materials, functional properties, mathematical modeling, system analysis, computer forecasting, operational processes

Nebaev I. A., Pervushina M. O., Kokorin E. S.

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DEVELOPMENT OF INTELLIGENT INFORMATION SYSTEM IN THE FIELD OF MICROBIOLOGY SUPPORTING DECISION-MAKING FUNCTIONS ON THE BASIS OF MACHINE LEARNING

The article discusses the key components and implementation of the architecture of an intelligent information system designed to solve informatization problems in the field of microbiology. The general architectural approach and structure, as well as the applicative model implemented within the IS, are described. An approach to the implementation of decision support functions based on machine learning programs is considered, and the effectiveness of the algorithms used is evaluated. In conclusion, a conclusion is made about the principles that have become widespread in the field of the implementation of applied information systems in the context of supporting the state strategy of technological sovereignty.

Keywords: informatization, information systems, machine learning, decision trees, artificial intelligence, microbiology

Pereborova N. V., Klimova N. S., Wagner V. I.

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CALCULATION OF THE IRREVERSIBLE DEFORMATION COMPONENT OF THE DEFORMATION PROCESSES OF NONWOVEN MATERIALS

The article considers the determination of the component of irreversible deformation of nonwoven materials, which is essential for improving the accuracy of predicting the deformation processes of these materials. The specified increase in the accuracy of predicting deformation processes is achieved by introducing an appropriate correction for the irreversibility of deformation in the integral constitutive equations of these processes.

Keywords: deformation, geotextile nonwoven materials, deformation processes, mathematical modeling

Pereborova N. V., Egorova M. A., Tomashevich Ya. S.

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MATHEMATICAL MODELING OF OPERATING PROCESSES OF PARACHUTE LINES

Mathematical modeling of the operational processes of polymer parachute lines makes it possible to identify the patterns of their dynamic behavior during the operation of parachutes, which is extremely important for conducting a qualitative analysis and evaluating the functional and operational properties of developed and existing parachute systems. On the basis of the indicated mathematical modeling, computer prediction of the processes of stress relaxation and creep of the studied materials, which are fundamental in the theory of viscoelasticity, is also carried out.

Keywords: parachute lines, operational processes, mathematical modeling, polymeric materials

Pereborova N. V., Kozlov A. A.

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MATHEMATICAL MODELING AND SYSTEM ANALYSIS OF DEFORMATION PROCESSES OF ARAMID MATERIALS

Mathematical modeling and system analysis of the deformation processes of aramid materials used as rescue equipment in case of fires makes it possible to carry out both a qualitative analysis of these materials according to the criteria for operational suitability, and to select these materials that most satisfy the set goal - saving people in case of fires.

Keywords: aramid materials, operational processes, mathematical modeling, numerical prediction, system analysis

Pereborova N. V., Egorov I. M., Tomashevich Ya. S.

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MODELING AND SPECTRAL ANALYSIS OF DEFORMATION AND RELAXATION PROCESSES OF POLYMERIC TEXTILE MATERIALS

The article considers the methods of spectral modeling of deformation-relaxation processes of polymeric textile materials. The development of new methods for studying the deformation-relaxation processes of polymeric textile materials contributes to the most reliable prediction of their functional properties.

Keywords: polymeric textile materials, deformation-relaxation processes, spectral modeling, numerical prediction

Sidelnikov V. I., Koksharov A. V.

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MATHEMATICAL MODEL OF SULPHATE HARDWOOD PULP COOKING

The article is devoted to the issue of obtaining and using a mathematical model for cooking sulfate hardwood pulp. The dependences of the main output indicators on the modes of the cooking process and the properties of the feedstock are obtained. The mathematical model can be used to create and optimize automatic control systems.

Keywords: digester, cellulose, mathematical model, control system, controlled parameters, productivity, rigidity

Shterenberg S. I., Nefedov V. V., Andrianov V. I., Lipatnikov V. A.

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THE METHOD OF HIDDEN INTRODUCTION OF EXECUTABLE CODE INTO DISTRIBUTED INFORMATION SYSTEMS USING THE AGENT APPROACH

Software binary translation and dynamic optimization technologies are actively used to ensure the compatibility of widely used traditional and newly developed promising architectures of distributed information systems at the level of executable program codes, which have a certain vulnerability in the conditions of cybernetic warfare. Dynamic optimization is one of the main ways to achieve high performance in dynamic binary translation systems, but it can also be a source of significant vulnerabilities, since optimization is performed directly during the operation of translated codes. Covert injection of executable code into distributed information systems is a way to increase cybersecurity.

Keywords: software agent, covert code injection, distributed information systems, steganography, executable files

Shterenberg S. I., Shelukhin O. I., Lebedeva A. D.

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ARCHITECTURE DESIGN OF INTRUSION DETECTION SYSTEM WITH DEEP AND MACHINE LEARNING BASED ON QUASI-BIOLOGICAL PARADIGM

The concept of the fourth industrial revolution (hereinafter referred to as Industry 4.0) is the massive introduction of information technologies in industry, the automation of business processes and the spread of artificial intelligence (hereinafter referred to as AI). Industry 4.0 has enabled some countries to achieve and become leaders in the global economy. Russia has a chance to realize its potential in the digital revolution and take a place among the leaders. The development of domestic AI systems may be, in a certain part, breakthrough and correct in terms of building information security systems (hereinafter referred to as IPS). The AI-protected construction is based on a multi-agent system, where the software agent (hereinafter referred to as the PA, also known as the «neuron») is of key importance in building the perceptron, and in the future the entire AI neural network. This becomes an important and starting point in the development of biosimilar AI, capable of integrating into a common technological singularity and preserving the technological base of the Russian Federation within the framework of the Industry 4.0 concept.

Keywords: industry 4.0, artificial intelligence, neural networks, big data, machine learning, quasi-biological paradigm

CHEMICAL SCIENCES

Ganiev I. N., Abdukholikova P. N., Berdiev A. E., Alikhonova C. D.J.

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INVESTIGATION OF KINETIC AND ENERGY CHARACTERISTICS OF THE OXIDATION PROCESS OF ZINC ALLOYS WITH THALLIUM, IN THE SOLID STATE

The kinetics of oxidation of zinc alloy TSAMSV4-1-2,5 doped with thallium in the solid state was studied by thermogravimetric method. It is shown that gallium additives within the studied concentration increase the oxidability of the initial zinc alloy TSAMSV4-1-2,5, as evidenced by a decrease in the apparent activation energy of the oxidation process of alloys from 136.8 to 106.5 kJ/mol. It is established that the mechanism of oxidation of alloys is described by the hyperbola equation.

Keywords: zinc alloy tsamsv4-1-2, 5, thallium, thermogravimetric method, oxidation kinetics, true oxidation rate, activation energy

Ganiev I. N., Saidov Sh. Kh., Khodzhanazarov Kh. M., Khodzhaev F. K., Umarov M. A.

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INFLUENCE OF GALLIUM ON THE CORROSION-ELECTROCHEMICAL BEHAVIOR OF THE LEAD BABBIT BGA (PBSB15SN10GA) IN THE MEDIUM OF THE ELECTROLYTE NaCl

The article presents the results of studying the effect of gallium additive (0.01 ÷ 1.0 wt %) as a structure modifier on the anodic behavior of lead babbitt BGa (PbSb15Sn10Ga) in NaCl electrolyte medium. The studies were carried out by the potentiostatic method in the potentiodynamic mode with a potential sweep rate of 2 mV/s. Studies have shown that over time, the free corrosion potential of alloys shifts to the positive side and with an increase in the concentration of the additive of gallium in lead babbitt, it acquires a positive value. Gallium doping of lead BGa (PbSb15Sn10Ga) babbitt up to 15 % increases its corrosion resistance. An increase in the corrosion rate of alloys was noted, regardless of their composition from the NaCl concentration in the solution. It is shown that an increase in the chloride ion concentration in the NaCl electrolyte leads to a decrease in the potentials of free corrosion, repassivation, and pitting formation of alloys.

Keywords: lead bga babbitt (pbsb15sn10ga), gallium, potentiostatic method, electrochemical behavior, nacl electrolyte, free corrosion potential, corrosion rate

Kuzmenko A. A., Beterina O. P., Kalugina M. S., Mikhailovskaya A. P.

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APPLICATION OF NANOSIZED GOLD PARTICLES IN PHOTOCATALYTIC

OXIDATION OF ALIPHATIC ALCOHOLS

In this work, we studied the effect of gold nanoparticles on the selectivity of catalysts based on titanium dioxide in the oxidation of aliphatic alcohols (ethanol and propanol-2). The composition of the catalyst has been established, which makes it possible to carry out the photocatalytic oxidation of ethanol to acetaldehyde with the achievement of complete conversion of the substrate and 87 % yield of the target reaction product after 120 min.

Keywords: photocatalysis, alcohols, titanium dioxide, catalyst selectivity, uv spectroscopy, gas chromatography

Yakovlev V. A., Kim D. A., Abramova E. S., Drozdova L. V.

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MATHEMATICAL MODEL OF A THREE-STAGE INSTALLATION FOR ABSORPTION CLEANING OF FLUE GASES FROM SULFUR DIOXIDE WITH SODA SOLUTION

The problem of a high degree of flue gas purification becomes relevant due to the need to build and operate waste incinerators, since for economic and logistical reasons such plants should be located within the city. In the work, using mathematical modeling methods, the possibility of cleaning flue gases from sulfur dioxide by the soda absorption method in a three-stage plant was studied, and the criterion for cleaning was the compliance with the requirement that the content of sulfur dioxide at the outlet of the plant does not exceed the MPC value of the residential area.

Keywords: flue gas cleaning, sulfur dioxide, mathematical modeling, absorption

AUTOMATION AND CONTROL OF TECHNOLOGICAL PROCESSES AND PRODUCTION

Gradusov K. A.

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ANALYSIS OF THE FIRST RESULTS OF THE TRANSITION TO THE EXCHANGE OF ELECTRONIC DOCUMENTS USING THE INTERDEPARTMENTAL ELECTRONIC DOCUMENT MANAGEMENT SYSTEM IN THE 2.7.1 FORMAT ON THE EXAMPLE OF THE MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

The emergence of electronic document management systems marked a new stage in the functioning of all types of organizations and companies, including state ones. Thanks to the existing electronic document management systems in public authorities it became possible to integrate them into a single common system - interdepartmental electronic document management (MEDO), which led to significantly optimize the ways of implementing the tasks set in public authorities due to a multiple reduction in resources and time spent on processing, sending and monitoring the execution of documents.

Keywords: information security, electronic document management systems, electronic document, interdepartmental electronic document management

Kanevsky M. A.

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PERSPECTIVES OF USE OF CHATGPT IN THE FASHION INDUSTRY

In recent years, artificial intelligence (AI) has become not only a promising technology in the world of e-commerce, but also a tool for everyday work. With the development of the fashion industry, new innovative solutions regularly appear to improve the shopping experience of customers. In this article, we'll take a look at ChatGPT's conversational bot technology platform and evaluate its capabilities as an alternative to a copywriter, sales manager, support specialist, and even a virtual stylist.

Keywords: chatgpt, fashion, computer science, data science, artificial intelligence, natural language processing, machine learning, chatbot, cognitive psychology

Kanevsky M. A.

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PROBLEMS OF IMPLEMENTATION NATURAL LANGUAGE PROCESSING TECHNOLOGIES IN CREATING CHAT-BOTS AT E-COMMERCE PROJECTS FOR THE FASHION INDUSTRY

The fashion industry for a long time has been actively applying artificial intelligence technologies in the production and sale of goods, forecasting and planning consumption, as well as inventory management in the supply chain. Natural Language Processing (NLP) is a branch of artificial intelligence and mathematical linguistics. On its technological basis, one of the tools of the human-machine dialogue system, namely the chatbot, works. In this article, we will look at the features of using NLP tools to create chatbots in the fashion industry.

Keywords: fashion, computer science, data science, artificial intelligence, cognitive technologies, machine learning, natural language processing, natural language understanding, chatbot

Kovalev D. A., Gorobchenko S. L.

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A SYSTEMIC APPROACH TO THE ANALYSIS OF THE EMERGENCY SITUATION «EXPLOSIONS OF COMBUSTIBLE GASES IN THE SRC FURNACE» AND CLAIMING THE REQUIREMENTS TO THE EMERGENCY PROTECTION SYSTEM OF SODIUM GENERATION BOILERS

The issues of application of a systematic approach to the analysis and forecast of emergency situations according to the process model «Explosions of combustible gases in the furnace of the RMS» are considered. It is shown that RMS should be treated more as a process-technological subsystem than a system that provides energy to the pulp and paper mill. The main subsystems of the RMS that determine the course of development of an emergency are identified. A structural, functional-flow model of the RMS has been developed and the categorization of the main subsystems by the probability of occurrence and development of the emergency situation «Explosions of combustible gases in the RMS furnace» has been shown. Proposals are presented to clarify the requirements for the emergency protection system, taking into account the identified categorization of subsystems in the development of the emergency situation «Explosions of combustible gases in the furnace of the RMS».

Keywords: soda recovery boiler, explosions of combustible gases in the rms furnace, system approach, structural-functional model, functional-flow model, process models for the development of an emergency, emergency protection system, clarification of requirements

Mayorova E. V.

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GENERAL ISSUES IN DATA ENGINEERING

The article discusses the main stages of data engineering. Ways for cleaning data are described. Particular attention is paid to Ha-doop technologies as mandatory skills for a data engineer.

Keywords: data engineering, data, hadoop, hive, kafka, airflow

AUTHORS LIST

INFORMATION FOR AUTHORS