

Memories of Alexander Ivanovich Meos

A. A. Lysenko

SCIENTIST AND TEACHER. TO THE 125TH ANNIVERSARY OF A. I. MEOS'S BIRTH

V. E. Romanov

GRATEFUL AND PROUD

E. L. Akim

IN HONOUR OF ALEXANDER IVANOVICH MEOS

L. I. Friedman

MEMORIES OF ALEXANDER IVANOVICH MEOS

SCIENTIFIC ARTICLES

A. A. Lysenko, O. V. Astashkina, N. V. Diankina, O. V. Kydrinskaya

STUDY OF DIFFUSION PROCESSES INVOLVING METHYLENE BLUE DYE AND ACTIVATED CARBON FIBERS

The characteristics of the initial carbon activated fibers are investigated and the analysis of information sources on the structure and size of the molecule of the methylene blue dye is carried out. The influence of stirring conditions and phase contact interruption on the sorption process of methylene blue has been studied. It is shown that the processes of dye diffusion are limited by both external diffusion and diffusion in the sorbent phase (AUV). Diffusion in the sorbent phase is an important component of the MG AUV adsorption process and is apparently determined by its porous structure.

Keywords: *activated carbon fibers, methylene blue dye, sorption, sorption capacity, kinetics, temperature, mixing rate, phase contact interruption, diffusion.*

D. A. Bondarev, A. V. Bespalov, N. V. Sheldeshov, V. I. Zabolotsky

PREPARATION AND ELECTROCHEMICAL PERFORMANCE OF A BIPOLAR MEMBRANE WITH AN OXIDISED GRAPHITE-BASED CATALYTIC ADDITIVE

The method of obtaining and electrochemical characteristics of the bipolar membrane based on industrial cation-exchange membrane MK-40 and anion-exchange layer containing copolymer of N, N-dimethyl-N, N-diallylammonium chloride and ethyl methacrylate and oxidized graphite in the bipolar region of the membrane as a catalyst for the dissociation of water molecules are considered.

Keywords: *bipolar membrane, graphite oxide, electrochemical impedance spectra, water dissociation.*

V. A. Zhukovsky, A. Brussevich, E. D. Korobova

RESEARCHING THE INFLUENCE OF SOLUTIONS RHEOLOGY ON FORMATION OF THE INTERPOLYMER COMPLEX OF CARBOXYMETHYLCELLULOSE

The viscosity of 2 % solutions of carboxymethylcellulose containing various amounts of polyethylene glycol and polyvinylpyrrolidone and hydrochloric acid was studied, the degree of swelling of films obtained from these solutions was estimated, it was shown that with 100 % substitution of carboxyl groups in carboxymethylcellulose in the hydrogen form, the viscosity of solutions increases and insoluble films with a low degree of swelling, this is due to the formation of an interpolymer complex.

Keywords: *carboxymethylcellulose, polyethylene glycol, polyvinylpyrrolidone, interpolymer complex, viscosity, membranes, swelling.*

S. Yu. Vavilova, N. P. Prorokova, I. V. Kholodkov, T. Yu. Kumeeva

POLYPROPYLENE YARNS WITH POLYTETRAFLUOROETHYLENE-BASED COATED CONTAINING MAGNETITE PARTICLES: RESISTANCE OF COATING TO ADHESION

DESTRUCTION

The resistance of coatings based on polytetrafluoroethylene with embedded magnetite nanoparticles, formed on polypropylene yarns at the stage of obtaining from the melt to long-term exposure of low temperatures and chemically aggressive environments was evaluated. It has been established that the breaking load of a PP yarns with a PTFE-based coating containing magnetite remains at its original level after prolonged exposure to low temperatures and chemically aggressive liquids. The influence of long-term exposure at a temperature of minus 20 °C and the effect of concentrated solutions of alkali and acid on the adhesive strength of the contact between a PTFE-based coating doped with magnetite and a PP substrate was studied. The study was carried out on the model of PP yarn by the method of normal separation of two glued flat surfaces.

Keywords: polypropylene yarns, melt spinning, polytetrafluoroethylene, coating, magnetite, adhesive contact fracture strength.

A. A. Lysenko, O. V. Astashkina, O. I. Gladunova, N. V. Diankina

ABOUT ONE OF THE WAYS TO OBTAIN COMPOSITES AND NANOCOMPOSITES

The article shows the possibility of obtaining modified fibers by introducing nanoadditives into the mass of the spinning solution before spinning. Polyoxadiazole fibers modified with flame retardant nanoadditives have an increased oxygen index. We have proposed a possible mechanism for a high antipyretic effect.

Keywords: polyoxadiazole fibers, modification in spinning solution, nanocomposites.

N. V. Kolokolkina, L. V. Redina, I. L. Ignatov

OBTAINING AND STUDYING THE PROPERTIES OF A MODIFIED FLUOROLONE FIBER CONTAINING POLYFLUOROALKYLACRYLATES IN THE STRUCTURE

In order to increase the level of non-wetting of fluorolone fiber, a composite modification method is considered by introducing polyfluoroalkyl acrylates into its composition. The effect of the molecular weight and amount of a fluorine-containing polymer on the level of anti-adhesive (oil-, water-repellent) properties of modified materials has been studied. It has been shown that the introduction of 2–5 % polyfluoroalkyl acrylate with a low intrinsic viscosity does not disturb the process of forming the fluorolone fiber and makes it possible to increase the level of anti-adhesive properties by 1.5–2 times.

Keywords: polyfluoroalkyl acrylate, molecular weight, fluorolone fiber, modification, anti-adhesion properties, contact angle

T. B. Koltsova, E. S. Tsobkhallo

PATTERNS OF DEFORMATION CHARACTERISTICS OF ELEMENTARY WOOL FIBERS FROM THE STANDPOINT OF STATISTICAL APPROACHES

A statistical analysis of the distribution of discontinuous elongations of the ep was carried out when testing for rupture of single wool fibers carried out at different stretching speeds. The density curves have the form of a Gaussian distribution characteristic of plastic materials, which is also confirmed by the Shapiro-Wilk criterion of the normality of the distribution.

Keywords: strength, polymer fibrous materials, structural and statistical aspects, monofilaments, elementary fibers, plastic materials

N. S. Lukicheva, O. I. Gladunova, D. D. Fedoseenkova, A. A. Lysenko

ON THE CHEMICAL RESISTANCE OF THERMOSETTING MATRICES OF POLYMER COMPOSITE MATERIALS

The chemical resistance of polymer matrices based on epoxy, polyester and vinyl ester resins have been examined. Polymer composite materials (reinforced plastics) were exposed to certain types of organic and inorganic solvents. It was concluded the possible use of the selected solvents for the development of the technology of reinforced plastics secondary processing.

Keywords: chemical resistance, polyester resins, vinyl ester resins, epoxy resins and matrices based on them, polymer composite materials, secondary processing.

A. A. Lysenko, N. S. Lukicheva, I. V. Lishevich, V. V. Martsenyuk, O. V. Astashkina

ABOUT MODELING COMPOSITES

The analysis of modeling schemes and research for the development of optimal structures of polymer composite materials (PCM) is given. It is shown that information, physical and mathematical models are applicable for the development of optimal PCM structures. There are 4 levels of consideration of parameters and components that affect the properties of the created PCM. The application of the results of a complete factorial experiment to construct a linear model is considered. It is established that regression coefficients can be calculated on the basis of experimental data and a mathematical model can be constructed in real factor space.

Keywords: *mathematical modeling, information modeling, physical modeling, experiment planning, polymer composite materials*

Yu. A. Fomenko, S. V. Timofeev, Yu. Yu. Vilachev, A. A. Lysenko, O. V. Astashkina, V. V. Martsenyuk

DEVELOPMENT AND PROPERTIES OF COMPOSITES WITH FLUOROPLASTIC MATRICES

The authors consider carbon plastics based on graphite fibers (fillers) and various fluoroplastics (matrices). The influence of the content of fluoroplastics on the porosity, electrical conductivity (electrical resistivity), and hydrophobicity of the composites has been studied. It is shown that for almost all composites the porosity changes extremely with an increase in the content of fluoroplastics in the samples. An explanation for this phenomenon is given. The electrical resistivity of composites depends on the content of matrices in them. At the same time, a significant increase in resistance is observed when the content of fluoroplastics is more than 5–7 wt. %, i. e. at the same values of the content of fluoropolymers, at which there is a decrease in the porosity of the samples. All composites have increased hydrophobicity.

Keywords: *composites, carbon fibers, fluoroplasts, porosity, electrical resistivity, washout contact angle.*

A. A. Lysenko, V. V. Martsenyuk, N. A. Grozova

OBTAINING AND INVESTIGATION OF SOME PROPERTIES OF CARBON-POLYMER COMPOSITES ON A WOVEN BASIS

The block scheme for the production of carbon-polymer composites with fluoroplastic matrices of various types is proposed. Composite materials with the content of fluoroplastic matrices of 5 and 10 wt. % were obtained by impregnation. Some characteristics for the obtained carbon-polymer composites and analogues were determined. Maps of the thickness distribution over the area of the obtained composites and analogues (maps of different thicknesses) are constructed, depending on the content of fluoroplast and heat treatment. It is shown that by the method of drip impregnation it is possible to obtain carbon-polymer composites with smaller thickness deviations from the average values than for the selected analogues.

Keywords: *gas diffusion layer, carbon graphite fabric, fluoroplast, properties of gas diffusion layer, maps of different thicknesses.*

A. A. Lysenko, V. V. Martsenyuk, D. V. Pyatasheva

INVESTIGATION PROPERTIES OF CARBON-FLUOROPOLYMER COMPOSITE MATERIALS OF FIBROUS STRUCTURE

The method of manufacturing carbon-fluoroplastic composite materials consisting of woven and non-woven carbon fiber materials and fluoroplastic matrices has been worked out. The surface density, hydrophobicity and electrical resistivity of carbon-fluoroplastic composite samples were determined. The dependences of electrical resistivity and apparent density on the content of fluoroplast in composites are investigated.

Keywords: *hydrogen energy, gas diffusion layer, carbon-fluoropolymer composite materials, electrical resistivity, hydrophobicity.*

A. S. Shcherbakov, A. S. Mostovoy, S. V. Arzamastsev, D. A. Petrova

EFFECT OF CARBON NANOTUBES AND MICROWAVE ELECTROMAGNETIC FIELD ON PROPERTIES OF FIBERGLASS BASED ON POLYESTER RESIN

Using Taunit carbon nanotubes as modifying additives has been studied. The efficiency of microwave modification of the polyester composition and the finished polyester composite is considered. The effect of carbon nanotubes and microwave modification on the processes of composite structure formation was studied by differential scanning calorimetry. The introduction of carbon nanotubes into a polyester matrix leads to an intensification of the curing process, and microwave modification additionally accelerates the onset of the reaction has been shown.

Keywords: polyester resin, carbon nanotubes, microwave radiation, homogenization, physical and mechanical properties.

N. A. Sazhnev, N. R. Killdeeva

PREPARATION OF WATER-INSOLUBLE FIBROUS MATERIALS FROM REGENERATED FIBROIN

The regularities of the conformational transition in fibroin in water-alcohol solutions have been established, which made it possible to develop methods for modifying biopolymers in molding solutions or in finished polymer material. The ways of controlling the processes of forming biodegradable fibers and hydrogels by controlled modification of the fibroin biopolymer are determined. Using the proposed technological solutions in the field of forming water-insoluble biopolymer materials based on the implementation of the transition of fibroin to the β -conformation, biopolymer materials based on fibroin was developed.

Keywords: fibroin, hydrogels, β -conformation, nanofibers.

M. A. Seredina

INVESTIGATION OF THE INFLUENCE OF THE CHEMICAL NATURE OF POLYMER FIBERS ON THE COMBUSTION PROCESS OF MIXED COMPOSITIONS

Described studies of the effectiveness of fire-retardant action of the retardants of different chemical nature to reduce the combustibility of polystyrene.

Keywords: thermolysis, carbonized residue, oxygen index, combustion, flame retardants.

L. A. Shcherbina, V. M. Chikunskaya, V. A. Ogorodnikov, I. A. Budkute

PREPARATION AND PROPERTIES OF MATERIALS BASED ON IONOGENIC COPOLYMERS OF ACRYLONITRILE AND 2-ACRYLAMIDO-2-METHYLPROPANESULFONIC ACID (REVIEW)

The results of studies of the processes of homophase synthesis of copolymers based on acrylonitrile and 2-acrylamide-2-methylpropanesulfonic acid in a 51.5 % aqueous solution of sodium rhodanide and dimethylformamide with wide variation in the content of the acidic comonomer in the monomer mixture are summarized. The rheological properties of dilute and concentrated solutions of poly [acrylonitrile — co — 2-acrylamide-2-methylpropanesulfonic acid] are presented. Variants of formation of granular and fibrous sorption-active materials on their basis are considered. Data on their sorption activity with respect to zinc ions are analyzed. The presence of the effect of superequivalent sorption activity in the developed ionogenic materials is noted. A hypothesis has been put forward explaining the possible causes of this effect.

Keywords: acrylonitrile, 2-acrylamide-2-methylpropanesulfonic acid, homophase free radical synthesis, characteristic viscosity, effective viscosity, spinning solution, ionite, sorption, exchange capacity.

L. A. Shcherbina, Y. Yu. Rudenok, V. V. Shablovskaya, I. A. Budkute

STUDY OF THE SYNTHESIS OF FIBER-FORMING ACRYLONITRILE COPOLYMER IN THE PRESENCE OF SILICON OXIDE NANOPARTICLES

The process of copolymerization of acrylonitrile, methyl acrylate and itaconic acid in an aqueous solution of sodium thiocyanate in the presence of nanosized particles of amorphous silicon oxide (IV) grades Aerosil R972 and Aerosil 200 as a modifier at their content in the reaction mixture of 0.1 %, 0.25 %, 0.5 %, 1.0 % (by weight of the reaction mixture). The nonlinear nature of the dependences of the dynamics of this process and its kinetic

parameters, as well as the characteristic viscosity on the content of the modifier in the reaction medium, is determined. Hypotheses explaining the revealed regularities are put forward.

Keywords: *acrylonitrile, methyl acrylate, itaconic acid, copolymer, synthesis dynamics, kinetics, nanoparticle, silicon oxide, intrinsic viscosity, cellular effect, gel effect.*