

USING FULL ENERGETIC POTENTIAL OF PLANT BIOMASS IN PRODUCTION OF BIOETHANOL

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ABSTRACT

The process of bioethanol production from non-edible of plant biomass (bagasse, corn stover and switchgrass) has been studied. This process included pretreatment of the initial biomass (IB) with dilute acid, enzymatic saccharification, conversion of fermentable sugar into ethanol and distillation of the hydrated alcohol. It was shown that about 20% of IB only are spent for production of bioethanol, while about of 55% of IB remained as solid residues. The calorimetric measurements and calculations revealed that the residues have energetic potential of 20 MJ/kg. Thus, burning of all amounts of the accumulated residues yields about 3.2 MWh of energy for \$320. As it follows from economic calculations, the income from utilization of solid residues for energy generation covers the main part of total expenses, which reduces the final production price of bioethanol to \$1.2 per gal. As a result, the production of fuel ethanol from non-food plant biomass can be competitive. Furthermore, utilization of the solid waste decreases expenses of their transportation and landfilling.

SPECIFIC STRUCTURAL FEATURES OF CELLULOSES OF DIFFERENT ORIGIN

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ABSTRACT

Parameters of supramolecular structure of celluloses isolated from various natural sources have been studied, such as type of crystalline allomorph, crystallinity and amorphicity degrees, interplanar distances and specific volume of crystalline unit cells, as well as sizes and area of specific surface of crystallites. It was found that in the sequence of various CII β samples, from tunicate cellulose to celluloses of cotton, bast fibers (flax), wood and herbaceous plants, a gradual decrease in crystallinity degree and sizes of crystallites was observed, whereas the area of specific surface of crystallites, specific volume of crystalline unit cells and interplanar distance increased. Among CII α samples, the cellulose isolated from Valonia algae has the more ordered supramolecular structure than the isolated bacterial cellulose. Comparison of CII α and CII β cellulose samples having the close crystallinity, lateral size of crystallites and area of specific surface showed that the CII α lattice is more distorted than CII β lattice. It was found that independently on the type of crystalline allomorph, hydrophilic properties of isolated celluloses (sorption of water vapor and heat of wetting) are directly proportional to amorphicity degree, whereas specific gravity is directly proportional to crystallinity degree of celluloses. On the other hand, content of CII after alkalization of cellulose samples with 12% NaOH is inversely proportional to lateral size of crystallites.

**STRUCTURAL COMPOSITES
BASED ON NONYSOCIANATE POLYURETHANES**

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ABSTRACT

Synthesis and manufacture bases non-isocyanate polyurethane are considered by domestic and foreign manufacturers. Their use as ecologically safe binding building composites is proved. Results of experiments on an establishment of constructional properties nonisocyanate polyurethane concrete are presented. Prospects of use of the developed structures in elements of buildings and the constructions maintained in excited environments are shown.

**NEW RESEARCH AND DEVELOPMENT IN THE FIELD
OF INORGANIC COMPOSITE MATERIALS**

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ABSTRACT

The paper is concerned with the use of sol-gel processes for obtaining of new composite heat-resistant materials, highly disperse materials and thin films. The sol-gel technology made possible to create new efficient catalyzers and composite matrix-isolated flocculants-coagulants for removing of oil products and heavy metals from natural water sources and wastewaters. Based on inorganic ion-exchange materials a recovery method of lithium from natural brines with low lithium content is developed.

NANOMATERIALS BASED ON SOLUBLE ALUMINUM COMPOUNDS

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ABSTRACT.

This article is devoted to the use of soluble aluminum compounds for the production of nanocomposite materials. Simple aluminum compounds based on aluminum oxides are precursors for the nanocomposite materials production. An analysis was made of the aluminum Al³⁺ ions state in aqueous solutions. The state of Al³⁺ ions in aqueous solutions determines the mechanism and structure of the resulting nanocomposites. The analysis of phase transformations in systems of aluminum salts, hydrated oxides and oxides is carried out. Based on these data, the main conditions for obtaining final materials are determined. An analysis

was made of various methods for the preparation of colloidal solutions of hydrated aluminum oxides, which are the main precursors in the production of nanocomposite materials . The processes of alumina-sol obtaining by precipitation-peptization method were investigated as one of the main methods. For the synthesis of alumina-sol, the possibilities of using ion exchange methods and controlled hydrolysis of aluminum compounds have also been considered. Analysis of the silica-sol and alumina-sol interaction processes was conducted to obtain a mixed oxide material, in the system $\text{SiO}_2\text{-Al}_2\text{O}_3$. The possibility of applying homogeneous precipitation of hydrated alumina to prepare nanocomposites based on aluminum oxide has been studied.

HIGH PERFORMANCE POLYMER FILMS

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ABSTRACT

This paper presents some modern aspects and trends in the development of high performance thermoplastic materials and processing technologies providing manufacturing of advanced film and film structures. Described are the most important types of thermoplastics being used in high performance applications,- fluoropolymers and high temperature aromatic polymers. Discussed are also some novel processing technologies for fabrication of films such as multi-layer film containing fluoropolymer materials, micro-coextruded structures, etc. It is emphasized that the demand in high performance thermoplastic films for various applications is rising constantly

MODIFIED T. POWERS'S CONCRETE MIXTURE VISCOSITY EQUATION AND CALCULATED DEPENDENCES BASED ON IT

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ABSTRACT

The article proposed modified Powers equation for cement systems. On the basis of this equation analytically substantiated rule of constant water content concrete mixtures used in the compositions design. Experimentally shown that within certain limits change the amount of cements does not showing any changes concrete mixtures viscosity and workability.

SOIL DETOXICATION BY THE MEANS IN BREEDING PROCESS

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ABSTRACT

The paper describes results of vegetative tests of activated carbon as a detoxicant of herbicide remains in soil on eight varieties of summer rapeseed. The tests were performed with the purpose to align soil fertility on different breeding and test sites. The research is based on attempts to apply coal absorbent as a means of soil detoxication to neutralize herbicides remains in the process of oilseed brassica crops breeding. Several summer rapeseed varieties were used as research objects. Similar approaches have not encountered in literature references available