# Abstract review of biodegradable hydrophobic materials

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**Аннотация:** The review describers an eco-friendly strategy based on aqueous system. Easy biodegradability and an eco-friendly nature make paper a very good packaging material for food as well as non-food items. The review contained many abstracts of an international patent's documentations.

**Ключевые слова:** principles of biodegradable hydrophobic materials' creations, review of an international patents

Non-degradable polymers cause serious environmental pollution problem, such as the widely-used while unrecyclable coatings which significantly affect the overall degradation performance of products. It is imperative and attractive to develop biodegradable functional coatings. The natural cellulose and cinnamic acid were as raw materials. Via reducing the degree of polymerization (DP) of cellulose and regulating the degree of substitution (DS) of cinnamate moiety. Traditional superhydrophobic coatings prepared from non-degradable materials tend to do harm to the environment throughout the fabrication process as well as after being discarded. Great efforts have been devoted to exploring more environmentally friendly approaches and materials to settle this problem. Here we report an eco-friendly strategy based on aqueous systems to construct superhydrophobic coatings on various fabrics. Fabrics were first coated with polydopamine (PDA) and then modified with the stearic acid emulsion to introduce the desired surface morphology and energy.

Biodegradable, hydrophobic, and injectable liquid polymers are capable of achieving the minimally invasive, sustained, and local release of drugs. These hydrophobic injectable polymers also have potential in the area of regenerative medicine where the biomaterial should be stable for a certain period and then degrade to allow the growth of cells/tissues. Easy biodegradability and an eco-friendly nature make paper a very good packaging material for food as well as non-food items.

**CN118459708 (A) - Biodegradable waterborne polyurethane as well as preparation method and application thereof**

The invention belongs to the technical field of waterborne polyurethane preparation, and particularly relates to biodegradable waterborne polyurethane as well as a preparation method and application thereof. Hydrophilic modified polypropylene carbonate polyol and diisocyanate are adopted as main raw materials and are modified and synthesized through single-ended dihydroxyl polysiloxane, structural fragments with dense side chain organic silicon are synthesized by designing a molecular structure, so that an organic silicon microphase region appears during film forming of the waterborne polyurethane emulsion, the lotus effect is generated, and the water-based polyurethane emulsion has the advantages that the water-based polyurethane emulsion has a good water-based property, and the water-based polyurethane emulsion has a good water-based property. The surface energy of a polyurethane adhesive film is extremely low, super-hydrophobic and oleophobic effects are brought, and the prepared waterborne polyurethane has the outstanding advantages of low cost, biodegradability, high water resistance and high oil resistance, is used for preparing a waterborne coating for paper, and has excellent water and oil permeability resistance.

**US2024254297 (A1) - BIODEGRADABLE AND/OR BIOCOMPATIBLE FILMS AND COATINGS WITH LOW CONTACT ANGLE HYSTERESIS FOR OMNIPHOBIC APPLICATIONS**

This invention relates to a biodegradable hydrophobic or omniphobic coating with tailorable properties for various applications. The technology's hydrophobic modifications, surface functionalization, and surface roughness modifications enable low contact angle hysteresis for easy roll-off and self-cleaning properties. The composite is based on polymer substrate(s) or functionalized polymer substrate(s), filler(s), inorganic(s), binder(s), Lycopodium,

or a combination of materials. The Lycopodium may be functionalized with suitable end groups for better adhesion or to impart beneficial properties. The polymer(s) and other constituents may be deposited on the substrate by various methods including spin coating, dip coating, spray coating, sputter coating, electrospinning, solvent casting, or extrusion. Binders and chemicals are incorporated in suitable chronology with or without the solvents of choice.

**CN118344714 (A) – Functional master batch capable of improving water resistance of biological state mulching film and application of functional master batch**

The invention belongs to the technical field of high polymer materials, and relates to a functional master batch capable of improving the water resistance of a biodegradable mulching film and application of the functional master batch. The functional master batch provided by the invention comprises the following components in parts by weight: 60-95 parts of biodegradable polyester; 5-30 parts of a hydrophobic auxiliary agent; 0.1 to 1 part of an antioxidant; and 0-10 parts of a filler. According to the invention, the biodegradable polyester is taken as a carrier, the blown biodegradable mulching film is added into the functional master batch prepared by adding the functional additive according to a certain proportion, the hydrophobic additive can form a hydrophobic layer on the surface of the film in the blowing process, and the affinity of water molecules and the film is reduced, so that the water blocking performance of the mulching film is greatly improved; the water retention and soil moisture conservation effects are realized. The preparation method is simple, low in cost and suitable for large-scale popularization.

**WO2024228619 (A1) - COLLAGEN-BASED MATERIALS**

Disclosed is a functionalized collagen material comprising insoluble collagen fibrils having attached acrylic side groups, preferably methacrylate

groups, and a crosslinked network of said functionalized collagen. Also disclosed is a hybrid polymer co-network made of acryl-functionalized collagen, particularly insoluble collagen fibrils, and an acryl-functionalized hydrophobic biodegradable polymer, preferably poly(trimethylene carbonate). The polymers are dissolved or dispersed in a common solvent, and subjected to reaction so as to enable the acryl groups to form crosslinks within either polymer, and between both of the polymers.

**CA3235520 (A1) - SEED CONTAINERS FOR ENABLING WATER AND VEGETATION TO PENETRATE A HYDROPHOBIC LAYER AFTER A FOREST FIRE**

A device and method for penetrating a hydrophobic layer caused by a fire and introducing new vegetation into a forest floor includes seeds, seedlings, and/or saplings carried within a plurality of tapered containers, possibly mixed with soil, sand, gravel, fertilizer, SAP granules, and/or water. The containers are inserted into the ground through the hydrophobic layer by dropping or propelling them from an aircraft, or manually pressing on them. One or more holes proximate the bottoms of the containers enable rain water and germinating roots to penetrate into soil beneath the hydrophobic layer. A perforated lid can prevent the seeds or seedlings from being ejected upon impact with the forest floor. A weighted tip can improve penetration of the containers into the forest floor. A plurality of tapered containers can extend downward from a tray or frame. The container and/or perforated lid can be made from biodegradable materials.

**CN117445118 (A) - Preparation method of biodegradable hydrophobic poplar veneer**

The invention discloses a preparation method of a biodegradable hydrophobic poplar veneer, which comprises the following steps: immersing a poplar veneer in alkali liquor, reacting at 50-80 DEG C for 4-8 hours, cleaning,

bleaching with a hydrogen peroxide aqueous solution, cleaning, and freeze-drying to obtain a pretreated poplar veneer; the preparation method comprises the following steps: adding triglycidyl isocyanurate and fumaropimaric acid into a solvent, and stirring and mixing to obtain a mixed solution; immersing the pretreated poplar veneer in the mixed solution under a vacuum condition; and the soaked poplar veneer is heated and cured, and the biodegradable hydrophobic poplar veneer is obtained. According to the method, triglycidyl isocyanurate and fumaropimaric acid are adopted as raw materials, and the hydrophobicity, flame retardance, corrosion resistance and heat resistance of the poplar veneer are improved through the method that the poplar veneer is soaked and then cured and cross-linked.

**US2024016709 (A1) - BIODEGRADABLE MICROCAPSULES. PROCESS FOR PREPARING THE SAME AND METHOD OF USE THEREOF**

The present invention provides biodegradable microcapsules, that can encapsulate and retain cargoes such as, lipophilic or hydrophobic core materials comprising fragrances, butters, essential or other oils; or oil solubilized ingredients process of making said biodegradable microcapsules and their applications in various industries. Present invention further provides biodegradable shell materials that show evidence of biodegradation or non-persistence in aquatic based and/or soil or compost based environments.

**CN117144712 (A) - Thymol-loaded chitosan-based emulsion coating, preparation method thereof and application of thymol-loaded chitosan-based emulsion coating in preparation of hydrophobic and oil-proof packaging paper**

The invention belongs to the technical field of high polymer materials, and particularly relates to a thymol-loaded chitosan-based emulsion coating as well as a

preparation method and application thereof in preparation of hydrophobic and oil-proof packaging paper. The preparation method of the thymol-loaded chitosan-based emulsion coating comprises the following steps: dissolving thymol in cinnamyl aldehyde or cinnamon oil to form an oil phase; uniformly mixing the polylactic acid grafted glutinous rice starch nanocrystal solution and the chitosan solution to obtain a water phase; and mixing and stirring the oil phase and the water phase. Polylactic acid grafted glutinous rice starch nanocrystals are used as a particle emulsifier to stabilize thymol Pickering emulsion, modified chitosan is used as a film forming substrate, and the hydrophobic, oil-proof and antibacterial emulsion coating is prepared in one step. After the emulsion coating prepared by the invention is coated on the surface of paper and dried, a film is formed, so that the permeation of water and oil into the paper can be reduced, and an antibacterial, hydrophobic, oil-resistant and biodegradable paper material package can be quickly and effectively obtained.

**WO2023137224 (A2) - BIODEGRADABLE MICROCAPSULES WITH IMPROVED STORAGE STABILITY, PROCESS FOR PREPARING THE SAME AND METHOD OF USE THEREOF**

The present application provides biodegradable microcapsules, based on specific poly ß-amino ester shells that can encapsulate and retain cargoes such as, lipophilic, or hydrophobic core materials comprising fragrances, butters, essential or other oils; or oil solubilized ingredients, process of making said biodegradable microcapsules and their applications in various industries. Present application further provides biodegradable shell materials that show evidence of biodegradation or non-persistence in aquatic based and/or soil or compost based environments, and which are stable on storage before use.

**WO2023098008 (A1) - HIGH-STRENGTH STARCH FROZEN GEL HAVING SUPER-HYDROPHOBICITY AND PREPARATION METHOD THEREFOR**

The present invention relates to the field of oil-water separation. Disclosed in the present invention are a high-strength starch frozen gel having super-hydrophobicity and a preparation method therefor. According to the present invention, compounding a small amount of polyvinyl alcohol (less than 10 wt%, relative to dry starch) and starch improves the strength of starch frozen gel, and the starch frozen gel is not easy to crack and damage in chemical and physical processing processes. Moreover, the starch frozen gel is modified by hexadecyl trimethoxysilane and tetraethoxysilane, so that the starch frozen gel is endowed with a super-hydrophobic characteristic. The used starch and polyvinyl alcohol are both biodegradable materials, and the preparation process does not relate to a modification reagent having toxicity and pollution, and conforms to the green and environmental protection requirements. The prepared high-strength super-hydrophobic starch frozen gel shows excellent water repellency and oil

absorption, and is suitable for cleaning work of marine oil leakage.

**CN116162338 (A) - Flexible biodegradable material with low moisture permeability and preparation method thereof**

The invention provides a low-moisture-permeability flexible biodegradable material and a preparation method thereof, and relates to the technical field of degradable materials. The low-moisture-permeability flexible biodegradable material is prepared from the following raw materials: polyhydroxyalkanoate, polyvinyl alcohol, hydrophobic fumed silica, lanolin magnesium soap, a silane coupling agent, erucyl amide and the like. The low-moisture-permeability flexible biodegradable material disclosed by the invention has biodegradability and also has excellent waterproof and water-blocking properties.

**CN113788991 (A) - Biodegradable high-performance modified particle material and preparation method thereof**

The invention relates to a biodegradable high-performance modified particle material and a preparation method thereof. The biodegradable high-performance modified particle material is prepared from polylactic acid PLA, a natural organic plant fiber material, oxidized modified high-amylose starch, a composite plasticizer, a combined modifier, a functional aid, a modifier, modified carbon nanofibers and an inorganic filler. By carrying out melting reaction extrusion at 55-185 DEG C through a double-stage serial screw granulating unit, and carrying out mixing, reaction, extrusion, cooling, cutting, drying, sterilization and packaging, the particle material is obtained. Various household and industrial products, toys, stationery and electronic product shells are produced by adopting universal equipment such as extrusion molding, plastic uptake or injection molding units. The adopted raw materials are rich in source, the raw material cost is low, the process is simple, the production cost is low, and the prepared particle material has high strength and good antibacterial performance, anti-aging performance and hydrophobic performance and can meet the requirements of various biodegradable hard material products.

**CN114752051 (A) - Continuous preparation method of hydrophobic modified biodegradable polyester, hydrophobic modified biodegradable polyester and application of hydrophobic modified biodegradable polyester**

The invention relates to the technical field of polyester plastics, in particular to a continuous preparation method of hydrophobically modified biodegradable polyester, the hydrophobically modified biodegradable polyester and application of the hydrophobically modified biodegradable polyester, the method comprises the following steps: S1, cooling esterified melt, S2, mixing the cooled esterified melt with 1-alkyl ethylene oxide, and carrying out extrusion molding to obtain the

hydrophobically modified biodegradable polyester. S3, the mixture is input into a melt homogenizer to be homogenized; the invention discloses a preparation method of biodegradable polyester, which comprises the following steps: S1, homogenizing the raw materials, S2, homogenizing the raw materials, S4, pre-polymerizing the homogenized product in a pre-polymerization kettle, S5, carrying out polycondensation reaction on the pre-polymerized product in a polycondensation kettle, and S6, tackifying the polycondensation product to prepare the biodegradable polyester, and the preparation method has the advantages of energy saving, high reaction speed and complete reaction. The prepared biodegradable polyester has a long-chain alkyl side group, the hydrophobic property of the material can be improved, and the water resistance of the mulching film can be improved when the prepared biodegradable polyester is applied to preparation of the mulching film, so that the service life of the mulching film is prolonged.

**US2021380725 (A1) - CELLULOSE ACETATE AEROGELS**

Mechanically strong, biodegradable and reusable aerogels are disclosed, which can be made with a cross-linked cellulose ester, and which exhibit a low density and high porosity. The aerogels disclosed herein may be used as sorbent materials and can be modified with a hydrophobic and/or oleophilic agent.

**US2021354405 (A1) - METHOD OF MANUFACTURING OF A COMPOSTABLE PACKAGING ARTICLE COMPRISING AT LEAST TWO COMPOSTABLE MATERIALS**

The present disclosure is directed to methods and apparatus for making beverage containers that deteriorate after they are disposed of. Beverage containers or cartridges of the present disclosure may be similar to conventional non-biodegradable single-use coffee beverage pods or cartridges. Beverage containers

of the present disclosure may be made from two or more different types of materials that readily decompose in the environment based on the different types of materials having different characteristics. For example, a first material may have a low porosity and be more hydrophobic than a second material that decomposes faster than the first material. Decomposition of the second material may cause the first material to decompose faster than it normally would as this accelerated decomposition may be based on the first material being in close proximity to microbes decomposing the second material.

**CN113462033 (A) - Biodegradable packaging material and preparation method thereof**

The invention relates to the technical field of packaging materials, in particular to a biodegradable packaging material and a preparation method thereof. The biodegradable packaging material is prepared from starch, cellulose, chitin, protein, polyvinyl alcohol, a polymerizing agent, a plasticizer and a biodegradable additive; the material is prepared from the following components in parts by weight: 20-40 parts of starch, 15-25 parts of cellulose, 15-25 parts of chitin, 10-20 parts of protein, 2-6 parts of polyvinyl alcohol, 1-3 parts of a polymerizing agent, 2-4 parts of a plasticizer and 3-5 parts of a biodegradable additive. The material is good in hydrophobic capacity, oil resistance, water resistance and high temperature resistance, and has the excellent properties of proper strength, grease resistance, flexibility, transparency, odorlessness, odorlessness, easiness in degradation, and has the good film forming characteristic; The biodegradable packaging material is high in decomposition rate, can realize biodegradation, improves environmental protection, and has better biodegradation characteristics.

**RS20200207 (A1) - TECHNOLOGY FOR PRODUCTION HYDROPHOBIC STARCH FOR THE APPLICATION AS BIODEGRADABLE PACKAGING MATERIALS**

The present invention represents a new ecological process for the production of hydrophobic starch for the preparation of new biodegradable composite materials for use in the packaging industry. The technological process consists of two phases. The first phase refers to the process of hydrophobization of starch with plasticizers such as: dipentanoyl tartrate anhydride (P1), di-5-methylfuran-2-carbonyl tartrate anhydride (P2), di (8-(3-(2-((5-methylhexa-1,5-dien-2-yl)oxy)octyl)oxiran-2-yl) octanoyl tartrate anhydride (P3), di (2-ethylhexyl) furan-2,5-dicarboxylate (P4), di (2-octyl) furan-2,5-dicarboxylate (P5), dihexyl furan-2,5-dicarboxylate (P6) and dibutyl furan-2,5-dicarboxylate (P7) and then the resulting plasticized starch is mixed with MAPP or MAPE in a mold at a temperature of 130-220°C. The second phase refers to the preparation of biodegradable packaging composites with modified / hydrophobic starch and polymer matrix (EAA and EMAA). The two-phase process of obtaining hydrophobic starch yields a product that can be used as a filler to contribute to biodegradability in the production of packaging materials.

**NZ720429 (A) - Biodegradable sheet**

Disclosed is a biodegradable sheet comprising at least one layer which is a direct contact layer, intended to successfully contact materials, such as liquids, while maintaining the mechanical properties of the sheet and to extend the biodegradable sheet shelf life. The direct contact layer may comprise a hydrophobic polymer selected from poly(epsilon-caprolactone) (PCL) polyhydroxybutyrate (PHB), Polydioxanone (PDO) polyglycolic acid (PGA), polybutylene succinate (PBS), polybutylene succinate adipate (PBS A), poly lactic acid (PL A), polybutylene adipate terphtalate (PBAT), polyhydroxyalkanoates

(PHA), such as polyhydroxybutyrates (PHB), polyhydroxyvalerates (PHV), and polyhydroxybutyrate-hydroxyvalerate copolymers (PHBV) or any mixture thereof. The biodegradable sheet may further comprise an additional layer comprising PBS and/or PBSA. The biodegradable sheet may further comprise surface treated nanoclay particles, PVOH grafted with a crosslinker and PBS or PBS A The biodegradable sheet may further include at least one metalized, biodegradable, laminate layer.

**RU2749112 (C1) - FIBROUS BIODEGRADABLE MATERIAL WITH HYDROPHOBIC-HYDROPHILIC PROPERTIES**

FIELD: polymeric materials.SUBSTANCE: invention relates to the field of biodegradable and biocompatible polymeric materials with hydrophobic-hydrophilic properties, and can be used in medicine and cosmetology. Microfiber biodegradable material with hydrophobic-hydrophilic properties based on microfiber poly-3-hydroxybutyrate (PHB) obtained by the interaction of PHB with 2-hydroxyethyl methacrylate (HEMA) at a mass ratio of PHB:HEMA equal to 1:0.6-2.2, in the presence of an ion-coordination catalyst polymerization of VO(DMSO)5(ClO4)2at a temperature of 75-85°C, retains the ability of PHB fibers to complete biodegradation and is characterized by a sorption capacity to water vapor of at least 3%. The fiber diameter of the material does not exceed 16 microns. The material is hydrophilic, several times higher than the hydrophilicity of the original PHB, and at the same time it retains a high biodegradability

**US2021122875 (A1) - Cross-linked Nanoporous Saccharide-based Material and Methods for Fabrication Thereof**

The present invention discloses a cross-linked nanoporous saccharide-based material comprising saccharides as building blocks, also referred as nanoporous Nanosponge materials. The reaction of saccharides with cross-linkers at different

saccharides to cross-linker ratios in one-pot shall allow formation of nanoporous Nanosponge material. This method further allows introduction of new functional groups on this material by the use of suitable cross-linkers and surface grafting agents, and these functional groups shall be able to provide different interaction forces with water, volatile organic vapors (VOCs) and metal ions. Along with larger inner surface area owing to the presence of nanopores or nanocavities in comparison to porous materials, saccharide-based nanoporous Nanosponge materials shall find broad applications in thermal insulation, water retention, hydrophobic finishes, odor removal properties, and metal ions exchange or absorption from water or soil. The nanoporous Nanosponge materials shall be eco-friendly, biodegradable, and allowing recycle or reuse of spent materials.

**MX2019006587 (A) - BIODEGRADABLE SANITARY ARTICLES WITH HIGHER BIOBASED CONTENT**

The present invention is directed to sanitary articles such as disposable diapers, adult incontinent pads, feminine hygiene products, and sanitary napkins comprised of biodegradable polymers with higher biobased content. The sanitary articles include a topsheet, an absorbent core, and a backsheet. The topsheet is comprised of biodegradable polyester polyol polymer foam which may be configured to wick liquid away from a wearers body and may be impregnated with superabsorbent polymer. The absorbent core may be comprised of superabsorbent polymer including a cross-linked and/or partially neutralized polyacrylic acid polymer, cross-linked polyacrylic acids or cross-linked starch acrylic acid graft polymers. The backsheet may be comprised of poly-lactone polymers having generally hydrophobic characteristics. In preferred embodiments, the polymeric materials comprising the topsheet, absorbent core, and backsheet are formed from raw materials with high biobased content.

**IN3079DE2013 (A) - A FACILE SYNTHESIS OF SEAWEED POLYSACCHARIDES BASED HYDROPHOBIC BIOCOMPATIBLE CROSSLINEKED COMPOSITE POROUS MATERIALS FOR ENERGY-EFFICIENT SEPARATION**

The present invention relates to a superhydrophilic biodegradable cross linked foam membrane and a process for preparation of said foam membrane from a seaweed polysaccharides by blending \vith amino biopolymersl amino acids1 proteins/aniino con~pounds followed by crosslinking with a naturally occumng cross linker, genipin. The foam membrane can be used as a substitute for synthetic membrane for varied applications including membrane separation for oil-water emulsions, oil-water nlixtures and otlier aqueousorganic mixtures under ambient conditions. These foam membranes can be recycled and reused more than three times without considerable decrease in flux rate and stability. The separation methodology of the mixtures using the foanl membrane of the present invention is gravity-driven and therefore, simple and energy-efficient.

**TW201200593 (A) - Cell culture plate for rapid screening the effects of biomedical materials on cells**

The present invention is about a cell culture plate, which comprises: an untreated cell culture plate having a plurality of wells; a plurality of biomedical materials coated on the wells; wherein the biomedical materials include: hydrophilic/ hydrophobic materials, surface charged materials, biodegradable materials, blend materials, hydrogel materials; and the biomedical materials are arranged as the following rule: the hydrophilic/hydrophobic materials are arranged by the hydrophilic or hydrophobic strength; the surface charged materials are arranged as continuous positive or negative charged, or positive and negative charged staggered or combination thereof; biodegradable materials are arranged by the ability of biodegradable; the blend materials are arranged by the blend ratio;

and the biomedical materials are arranged on the same line or column of the cell culture plate.

**WO2012002715 (A2) - TEMPERATURE-SENSITIVE BIOACTIVE MATERIAL CARRIER AND METHOD FOR PREPARING SAME**

The present invention relates to a temperature-sensitive bioactive material carrier and to a method for preparing same. More particularly, the present invention relates to a temperature-sensitive bioactive material carrier and to a method for preparing same, wherein the carrier comprises a biodegradable amphiphilic block copolymer, wherein said coplymer comprises polysaccharides or both polysaccharides and succinic anhydrides as a hydrophilic block, and polylactides as a nonionic block. The hydrophilic polymer/polylactide copolymer according to the present invention forms stable composites in in-vivo conditions through ionic bonding or temperature-sensitive hydrophobic bonding to bioactive materials such as proteins, polynucléotides, or the like, thus enabling the easy in vivo delivery of bioactive material, and therefore can be used as an in vivo drug delivery system.

**US5985309 (A) - Preparation of particles for inhalation**

Particles incorporating a surfactant and/or a hydrophilic or hydrophobic complex of a positively or negatively charged therapeutic agent and a charged molecule of opposite charge for drug delivery to the pulmonary system, and methods for their synthesis and administration are provided. In a preferred embodiment, the particles are made of a biodegradable material and have a tap density less than 0.4 g/cm3 and a mass mean diameter between 5 mu m and 30 mu m, which together yield an aerodynamic diameter of the particles of between approximately one and three microns. The particles may be formed of biodegradable materials such as biodegradable polymers. For example, the

particles may be formed of poly(lactic acid) or poly(glycolic acid) or copolymers thereof. Alternatively, the particles may be formed solely of a therapeutic or diagnostic agent and a surfactant. Surfactants can be incorporated on the particle surface for example by coating the particle after particle formation, or by incorporating the surfactant in the material forming the particle prior to formation of the particle. Exemplary surfactants include phosphoglycerides such as dipalmitoyl phosphatidylcholine (DPPC). The particles can be effectively aerosolized for administration to the respiratory tract to permit systemic or local delivery of wide a variety of therapeutic agents. Formation of complexes of positively or negatively charged therapeutic agents with molecules of opposite charge can allow control of the release rate of the agents into the blood stream following administration.

One of an industrial material was developed by Polymate Israeli Research Center – it is advanced water-born and environmentally friendly ecopolymer dispersions applied as multifunctional protected coatings for various hydrophilic substrates [patent US6294265 (B1) - Hydrophobic biodegradable cellulose containing composite materials]. A special biodegradable aliphatic polyester was used as such ecopolymer. The ecopolymer was synthesized by the method of emulsion polymerization in water medium. The reaction system contained monomers, emulsifiers, stabilizers, catalysts and water. The product of the synthesis was of 40-50% aqueous dispersion. Latex compositions can contain also modifying additives: surfactants, stabilizers, lubricants, hydrophobizators, anti-blocking and cross-linking agents, pigments, and some other components. The composition is ready for using. Main application fields of developed dispersions are:- producing of various paper and paperboard packaging with protective layers;- protective coating for wood;- protective coating for building materials;- protective coating for other substrates. Biodegradable cellulose substrate is coated

with the modified latex by means of a coater and then dried. As result, the final product- the coated substrate (cellulose-ecoplastic)- can be manufactured.

Cellulose has a complex, multi-level supermolecular architecture. This natural polymer is built from superfine fibrils having diameters in the nano scale, and each such nanofibril contains ordered nanocrystallites and low-ordered nano-domains. In this review, the nano-structure of cellulose and its influence on various properties of the polymer is discussed. In particular, the ability of nano-scale crystallites to undergo lateral co-crystallization and aggregation, as well as to undergo phase transformation through dissolution, alkalization, and chemical modification of cellulose has been the subject of investigation.

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