



OUR PATENTS

1. Method of producing hybrid polyhydroxyurethane network on a base of carbonated-epoxidized unsaturated fatty acid triglycerides

US 9,102, 829 B2

Birukov O., Figovsky O., Leykin A., Potashnikov R., Shapovalov L.

A method of obtaining hybrid polyhydroxyurethane compositions cross-linked at ambient temperatures. The method comprises: (a) reacting epoxidized unsaturated fatty acid triglycerides with carbon dioxide in the presence of a catalyst to obtain carbonated-epoxidized unsaturated fatty acid triglycerides, wherein conversion of oxirane groups to 2-oxo-1,3-dioxolane groups (cyclic carbonate groups) for said carbonated-epoxidized unsaturated fatty acid triglycerides ranges from 35% to 85%; (b) mixing and reacting the carbonated-epoxidized unsaturated fatty acid triglycerides with a compound having amine functionality comprising at least one primary amine group realized at stoichiometric or within nearly balanced stoichiometry; (c) mixing and reacting the product of step (b) with a compound having amine functionality comprising at least two primary amine groups realized at excess of an amine-functional compound; (d) subsequently mixing the product of step (c) with a compound having amino-reactive groups.

2. Polymer concrete composition

US 9,051,447 B1

Figovsky O., Potashnikov R., Trossman A., Yanov I.

A polymer concrete composition, preferably for decorative and shock resistant building structures and goods includes a binder based of polyfunctional unsaturated compounds, namely acrylated/methacrylated vegetable oil, preferably acrylated/methacrylated soybean oil in an amount of not less than 60 part by weight and at least one acrylated/methacrylated monomer and/or oligomer in an amount of not more than 40 part by weight, and an aggregate blend. The polymer concrete composition based on acrylated/methacrylated vegetable oil has high wear and shock resistance with low shrinkage and can be used for prefabricated building decorative structures and particularly in civil engineering.

3. Method of manufacturing a track membrane

US 8,980,148 B2

Figovsky O., Gotlib E., Pashin D., Leykin A.

Method of manufacturing track membranes by penetration of working substances into and through the membrane matrix of polymer material is disclosed. The matrix is placed into holder that is inserted into one end of a tubular shell, the other end of which contains a cartridge with an explosive material and a working substance in the form of a supersaturated solution of a water-soluble salt. When the explosive material is detonated, the particles of the water-soluble salt interact with the matrix in the form of a high-speed jet with the velocity of particles in the range of 3800 to 4200 m/sec. As a result of penetrating of the particles into and through the material of the matrix, a plurality of holes is formed in the matrix. The track membranes are produced by slicing the membrane matrix after removal of the residue of the particles by washing the pierced membrane with water.



4. Construction element for erecting structure and method of erecting structure with use thereof
US 8,615,967 B1

Figovsky O., Futoriynsky A.

A construction element for erecting a structure has a first panel extending vertically to form a wall and a second panel extending horizontally to form a horizontal partition when they are arranged in an erected structure, the panels together form a three-dimensional configuration and are connected with one another so that in the erected structure they extend perpendicularly to one another and are turnable to include an angle there between to reduce a horizontal extension of the construction element for transportation purposes.

5. Method and apparatus for manufacturing submicron polymer powder
US 8,485,456 B2

Gryaznov I., Gryaznov S., Gryaznova A., Figovsky O.

A method and apparatus for manufacturing a submicron polymer powder from solid polymer bodies or coarse particles, preferably of polytetrafluoroethylene powder, wherein powder is ground into fibrous particles in the first stage and is disintegrated into submicron particles by aerodynamic treatment in the second stage, where a gas-particle mixture is subject to the effect of centrifugal forces and suction forces acting in the direction opposite to the centrifugal forces, a pulsating sign-alternating temperature field generated by a pulsed supply of liquid nitrogen, turbulent forces of vortexes, and aerodynamic forces that cause alternating compression and expansion of the gas-particle mixture.

6. Biodegradable nano-composition for application of protective coatings onto natural materials
US 8,268,391 B2

Ioelovich M., Figovsky O., Leykin A.

The invention relates to a method for manufacturing a biodegradable composition containing nanoparticles of cellulose for forming a protective coating on natural materials. It is an object of the invention to provide a composition for forming a protective coating layer on a biodegradable natural material that imparts to the material improved waterproofing and grease-resistant properties. It is another object to provide a composition for forming a protective coating on natural biodegradable materials that is based on the use of nano-cellulose particles and that protects these materials from swelling, warping, and mechanical damage during contact with water, other aqueous liquids, or grease.

7. Biologically active multifunctional nanochips and method of application thereof for production of high-quality seed
US 8,209,902 B2

Ruban I.N., Voropaeva N.L., Figovsky O.L., Sharipov M.D., Dadajanov T.K.

Proposed is a biologically active nanochip for treating seeds of agricultural plants in order to improve seed germination conditions and development of plants and for protecting plants from anticipated and averaged adverse conditions. The biologically active nanochip contains a solid porous carrier, such as mineral, clay, turf, or polymer, the pores of which are intended for accommodating nanoparticles of biologically active substances that penetrate the pores when the substances are applied onto the nanochip surface, e.g., by spraying. Alternatively, the biologically active substances can be retained on the surface of the carrier by adhesion. The composition of the biologically active nanochips is selected



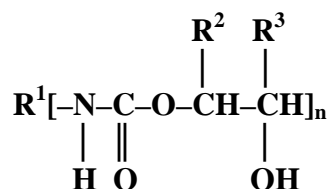
with reference to anticipated and averaged adverse conditions. Also proposed is a method for application of the biologically active substances onto the surfaces of the biologically active nanochips.

8. Epoxy-amine composition modified with hydroxyalkyl urethane

US 7,989,553 B2

Birukov O., Figovsky O., Leykin A., Shapovalov L.

Disclosed is a novel epoxy-amine composition modified a hydroxyalkyl urethane, which is obtained as a result of a reaction between a primary amine (C₁) and a monocyclocarbonate (C₂), wherein modifier (C) is represented by the following formula (1):



wherein R¹ is a residue of the primary amine, R² and R³ are the same or different and are selected from the group consisting of H, alkyl, hydroxyalkyl, and n satisfies the following condition: n ≥ 2. Diluents, pigments and additives can be used. Doping with the hydroxyalkyl-urethane modifier imparts to the cured composition superior coating performance characteristics, such as pot-life/drying, strength-stress, bonding, appearance, resistance to abrasion and solvents, etc., in a well-balanced state.

9. Liquid solventless synthetic rubber-based composition

US 7,989,541 B2

Figovsky O.

A synthetic-rubber-based composition that consists of a low-molecular-weight rubber selected from polybutadiene comprising about 75% to about 92% cis-1,4 units, sulfur, a vulcanization accelerator, and an active filler wherein the sulfur, accelerator, and active filler are each present in the form of powder having a particular particle-size range. Additionally, this composition may be used to form coatings and rubber concretes.

10. Method of strengthening tool material by penetration of reinforcing particles

US 7,897,204 B2

Usherenko S.

A method of strengthening the matrix of a high-speed steel for forming a composite tool material by super-deep penetration of reinforcing particles into and through the matrix of the tool material. The particles interact with the matrix in the form of a high-speed jet generated and energized by an explosion of an explosive material that contains the premixed powdered components of the working medium composed of particles of a hard material and ductile metal, and if necessary, with an addition of a process liquid. The particles of the working medium material have dimensions ranging from 1 to 100 μm. The jet has a pulsating nature with the velocity in the range of 200 to 600 m/sec and a temperature in the range 100 to 2000° C. As a result of strengthening, the steel matrix is reinforced by elongated zones of the working material particles which are oriented in the direction of the jet and

occupy less than 1 vol. % of the matrix material, while less than 10 vol. % is occupied by the zones of the matrix restructured as a result of interaction with the particles of the super-high velocity jet.

11. Nanostructured hybrid oligomer composition

US 7,820,779 B2

Birukov O., Beilin D., Figovsky O., Leykin A., Shapovalov L.

A nanostructured hybrid liquid oligomer composition including at least one epoxy-functional component (A), at least one cyclic carbonate component (B), at least one amine-functional component (C), and, optionally, at least one acrylate (methacrylate) functional component (D), wherein at least one epoxy, amine, or acrylate (methacrylate) component contains alkoxy silane units. The composition is highly curable at low temperatures (approximately 10 to 30° C.) with forming of nanostructure under the influence of atmospheric moisture and the forming of active, specific hydroxyl groups by reaction of cyclic carbonates with amine functionalities. According to the present invention, the cured composition has excellent strength-stress properties, adhesion to a variety of substrates, appearance, and resistance to weathering, abrasion, and solvents.

12. Cyclocarbonate groups containing hydroxyamine oligomers from epoxy cyclocarbonates

US 6,407,198 B1

Figovsky O., Shapovalov L., Blank N., Buslov F.

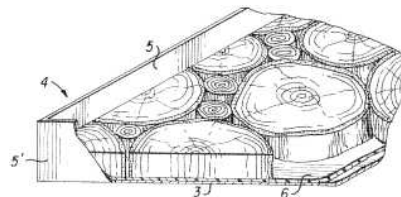
Chemically resistant materials with high mechanical properties are provided by using polycyclocarbonates of special structure. The polycyclocarbonates are prepared by the reaction of oligocyclocarbonates containing ended epoxy groups with primary aromatic diamine.

13. Composite wooden articles and a method of their manufacturing

US 6,186,200 B1

Figovsky O., Teper V.

A method of manufacturing tiles from waste wood uses round crosscut wood slices, a binder, and a filler. The slices, all generally of a thickness, are placed on the flat bottom of a die within side walls. Adhesive is applied to the slices and the die is filled with a mixture of the binder and the filler. The die contents are hot pressed to achieve the required tile thickness. The tile is ejected from the die and then maintained at room temperature for not more than 72 hours. The face side of the tile is ground and the dimensions of the tile are brought within the required tolerances.



14. Light hollow wall element and method of erecting walls of buildings with the use of such elements

IL 121081 (A)

Abramov D., Figovsky O.

Proposed is a wall element with comprises a rigid metal space frame and exterior and interior facing slabs, secured on opposite sides of the above frame, the frame together with the above slabs form a space, having a zone intended for filling in with columns, beams, reinforced concrete, and a zone



intended for filling in insulation material. Method of erecting a building wall with the light hollow wall elements also described.

15. Method of producing soluble silicates with organic cations

US Application No. 14/860,708; filed: September 22, 2015

Kudryavtsev P., Figovsky O.

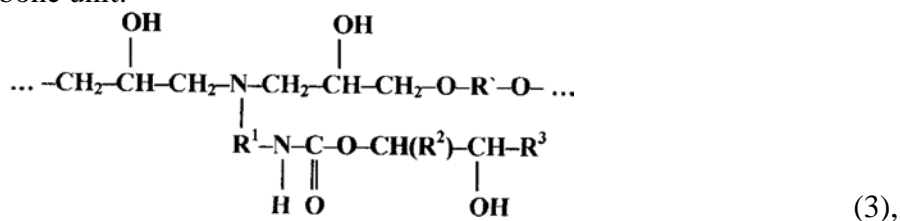
Proposed is a method of producing soluble silicates with organic cations at a given silicate modulus in the range of 1.5 to 20. The method consists of the reacting liquid suspension of a silica sol with the aqueous solution of a strong organic base. The silicate modulus is a molar ratio of $\text{SiO}_2:\text{M}_2\text{O}$, wherein M is an organic alkali cation. The aqueous solution of a strong organic base has a constant of base dissociation pK_b equal to or greater than 4. If necessary, the soluble silicates with organic cations are obtained in a powdered form by evaporating the solution of the soluble silicates under vacuum below 4.2 kPa and at a temperature in the range of 20 to 30°C and the product of evaporation are then dried by spraying.

16. Hybrid epoxy-amine hydroxyurethane-grafted polymer

US Application No. 14/296,478; filed: June 05, 2014

Birukov O., Figovsky O., Leykin A., Shapovalov L.

Described is a linear hybrid epoxy-amine hydroxyurethane-grafted polymer with the following structure of the polymer backbone unit:



where R' is a residue of a diglycidyl ether (epoxy resin); R¹ is a residue of a di-primary amine; R² and R³ are residues of monocyclic carbonate and are selected from the group consisting of H, alkyl C₁-C₂, and hydroxymethyl; and at least one of R² and R³ is hydrogen. The described polymer may be used in manufacturing of synthetic leather materials.

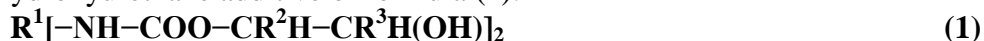
17. Radiation-curable biobased flooring compositions with nonreactive additives

US Application No: 14/160,297; filed: January 21, 2014

Figovsky O., Leykin A., Potashnikov R., Shapovalov L., Birukov O.

A radiation-curable composition comprising (meth)acrylic monomers and/or oligomers, photoinitiators, and a nonreactive composite additive, wherein the nonreactive composite additive comprises

a) a biobased hydroxyurethane additive of formula (1):



wherein R¹ is a residue of the biobased primary diamine, and R² and R³ are the same or different and are selected from the group consisting of H, alkyl, and hydroxyalkyl; and

b) a silane-based hydroxyurethane additive of formula (2):



wherein R² and R³ are the same as stated above, R⁴ is generally an aliphatic group having from 1 to 6 carbon atoms, R⁵ and R⁶, independently, are hydrocarbon radicals containing from 1 to 20 carbon



atoms and selected from the group consisting of aliphatic, cycloaliphatic, and aromatic groups or combinations thereof, and n is equal to 1, 2, or 3.

18. Method for forming a sprayable nonisocyanate foam composition

US Application No: 13/770,319; filed: February 19, 2013

Figovsky O., Potashnikov R., Leykin A., Shapovalov L., Sivokon S.

Provided is a method for the spray application of a nonisocyanate polymer foam composition. The method comprises the steps of supplying dosed quantities of the components of the nonisocyanate polymer composition to the mixing chamber where the components react with each other and form a foamable nonisocyanate polymer composition, transferring the foamable nonisocyanate polymer composition to the intermediate chamber of a foam application apparatus and continuously moving the foamable nonisocyanate polymer composition through the intermediate chamber while constantly controlling the parameters of the foamable nonisocyanate polymer composition in the intermediate chamber for providing conditions most optimal for the spray application onto the substrate.

19. Composition for self-extinguishing monolithic flooring

US Provisional Application No: 61/477,985; filed: April 21, 2011

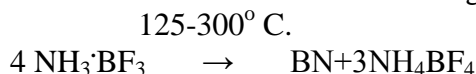
Figovsky O.

20. Method for Synthesis of Boron Nitride Nanopowder

US Application No: 12/879,959; filed: September 10, 2010

Dvali N.V., Tabatadze J.M., Figovsky O.L.

A reaction is carried in a gaseous phase between ammonia (NH₃) and boron trifluoride (BF₃) in a cooled reactor under atmospheric pressure. A boron trifluoride-ammonia complex (NH₃·BF₃) obtained in this reaction is thermally decomposed at a temperature in the range of 125 to 300° C. into boron nitride and ammonium tetrafluoroborate in accordance with the following scheme:



BN is then separated from the mixture of BN with 3NH₄BF₄ by combining the mixture with deionized water, forming a suspension, and separating the suspended BN nanoparticles by centrifugation.

21. Liquid oligomer composition containing hydroxyamine adducts and method of manufacturing thereof

US Application No: 12/315,580; filed: December 4, 2008

Birukov O., Beilin D., Figovsky O., Leykin A., Shapovalov L.

Proposed is a liquid oligomer composition that contains a hydroxyamine adduct and a liquid reacting oligomer. The hydroxyamine adduct includes an epoxy-amine adduct, which contains at least one primary amine group that is a product of the reaction of an epoxy compound with at least one terminal oxyrane group and at least one amine that contains at least two primary amino groups. In order to form the epoxy-amine adduct, 1 to 15 moles of at least one amine are reacted per equivalent of the aforementioned epoxy compound. The composition also contains at least one compound with one or more terminal cyclocarbonate groups. A method of manufacturing a liquid oligomer composition on the basis of the above compounds is also proposed.



22. Gas phase synthesis method of monocrystalline nano-sized super hard materials and resulting products

IL Application No: 190262; filed March 18, 2008

Volodashin V., Zaruev V., Zaruev A., Figovsky O.

A gas phase synthesis method of monocrystalline nano-sized super hard materials and resulting products are described.

23. Chemical tagging indicators and method to locate overheated spots in liquid-filled electrical devices

US Application No: 12/867,761; PCT No: PCT/IL08/00224; PCT filed: February 21, 2008

Shkolnik A., Shapovalov L., Figovsky O., Birukov O., Trossman A.

A method for identifying overheated spots in liquid-filled electrical devices, comprising the steps of: a) determining the locations of potentially overheatable spots in said device and mapping said locations; b) positioning a tag consisting of one or more chemical indicators on potentially overheatable spots in said devices, wherein when said tags are exposed to a given high temperature, they are depolymerized into thermal degradation products which are diffused into the liquid; c) identifying the thermal degradation products by analytical methods; and d) locating the overheated places according to the identified thermal degradation products and the map of locations of said tags; wherein the tags comprise polymers and copolymers, which are substantially absent from the liquid of the device at normal working conditions.

24. Water-dispersion paint composition with biocide properties

IL Application No: 155981; filed May 19, 2003

Kudryavtsev B., Gurova N., Vasilyeva L., Figovsky O., Shapovalov L., Trossman A.

Water-dispersion paint composition with biocide properties that contains a binder, pigments, fillers, phosphate or acetate polyhexamethylene guanidine, water, compound of nanostructured particles of silver and salt of 1,8-diazabicyclo[5.4.0]undec-7-ene with SiO₂.

25. Waterborne composition of fire-protective and heat retardant coatings

IL Application No: 154732; filed March 04, 2003

Figovsky O., Karchevsky V., Beilin D., Aksenov O., But A.

A waterborne composition of fire-protective and heat retardant coatings consisting of a binder on the base water glass and chlorinated polymer latexes; inorganic particles, that expand at heating and endothermically release steam-gas mixture at the temperature of flame; fire-resistant ceramic fibres; and air-filled particles.

26. Coating composition

US Application No: 09/983,026; filed: October 22, 2001

Karchevsky V., Figovsky O.

Water-based cross-linkable composition for preparation of protective or adhesive coating applicable to various substrates is disclosed. The composition comprises aqueous dispersion of chlorosulfonated polyethylene (CSPE), epoxydimethylhydantoin resin and aqueous solution of tris-[dimethylaminoalkyl]-phenol. The composition is environmentally friendly and yields coatings with



properties, which are not worse than properties of CSPE-based coatings manufactured with using of toxic organic solvents.

27. Method of vulcanization of rubber

IL Application No: 134400; filed: February 06, 2000

Figovsky O., Karchevsky V.

A vulcanization method for waterborne emulsions of chlorosulfonated polyethylene with Mannich bases is disclosed.

28. Fire resistant composition for coating

IL Application No: 134100; filed: January 18, 2000

Figovsky O.

Fire resistant composition for coating comprising swelling-causing component and thermal-stable component, wherein said swelling-causing component is selected from the group consisting of aluminium hydroxide and organic salts of alkali metals, and said thermal-stable component is selected from the group consisting of alkali metals silicates, and wherein molar ratio between the swelling-causing component and the thermal-stable component is from 2 to 7. Surface, protected of such composition, is, for example, wood.

29. Method of synthesis of polyaminofunctional hydroxyurethane oligomers and hybrid polymers formed therefrom

EP Application No: 990114308.2; filed: July 21, 1999

Figovsky O., Shapovalov L., Blank N., Buslov F.

Chemically resistant materials with high mechanical properties are provided by using adducts of primary diamines (with oligocyclocarbonate and epoxy compounds) and epoxy oligomers with ended epoxy groups (or mixture of epoxy oligomers and oligomercaptanes).