Technologies Available for Licensing

MARINE COATINGS
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PATENTED TECHNOLOGIES AVAILABLE FOR LICENSING
(Marine Coatings)

LIST OF TECHNOLOGIES

INVENTION TITLE	Tech No.
• Novel Amphiphilic Fouling Release Coatings	RFT 319
• A polymer for non-fouling or fouling release type coatings	RFT 283
• UV-Curable Low Surface Energy Coatings	RFT 254
• Quaternary ammonium functionalized POSS compounds as anti-fouling, anti-microbial agent	RFT 242
• Siloxane-urethane coatings for anti-graffiti and marine antifouling applications	RFT 231
• Unique anti-fouling and anti-microbial coatings for marine applications	RFT 214
• Non-toxic and durable foul-release coatings	RFT 197
• Novel environment friendly coatings for marine and medical applications	RFT 179
• Unique coatings (with phase separation properties) for use as foul release and anti-graffiti paints	RFT 158
• Novel environmental friendly coatings for marine applications	RFT 133

Brief Descriptions

RFT 319

NOVEL AMPHIPHILIC FOULING RELEASE COATINGS

This invention involves the formulation of unique fouling release polysiloxane coatings that contain fluorinated segments and poly(ethylene glycol) segments which inturn demonstrate a synergistic enhancement in fouling-release properties.

Conventional polysiloxane fouling-release formulations provide good release of macrofoulers such as barnacles but exhibit poor fouling-release of slimes. This modified polysiloxane shows good fouling-release toward both barnacles and slimes. Also, it has been shown that conventional polysiloxane fouling-release coatings typically utilize a silicone oil in the formulation to enhance fouling-release properties. The silicone oil eventually leaves the coating and fouling-release performance is reduced. This invention provides good fouling-release without the use of silicone oils which enables longer life for its fouling-release performance.

RFT 283

A POLYMER FOR NON-FOULING OR FOULING-RELEASE TYPE COATINGS

The invention discusses the synthesis of a novel zwitterionic/amphiphilic pentablock copolymer for use in coatings formulations. This penta-block copolymer was synthesized with the necessary properties to qualify as a possible candidate for non-fouling or fouling-release type coatings. The invention combines the low surface energy of PDMS and the protein resistance properties of both zwitterionic and amphiphilic compounds into a single copolymer that makes it an excellent candidate for a non-fouling marine coating.

RFT 254

UV-CURABLE LOW SURFACE ENERGY COATINGS

Radiation-curable chemistry has been instrumental in achieving the industrial regulation goals of zero or low volatile organic content (VOC) coatings. UV-curable coatings have successfully replaced solvent-borne technologies for many applications. Since the coatings are cured by UV radiation, the crosslinking reactions take place at room temperature.

This invention involves the synthesis of novel siloxane-containing unsaturated polyester resins and their UV curing to form coatings having low surface energy. The coatings are useful in applications where low surface energy is desired such as for marine ship hull coatings, anti-graffiti coatings, release coatings, and biocompatible coatings.

The invention relates to the synthesis of siloxane-modified unsaturated polyester oligomers, blending the oligomers with vinyl ethers and a photoinitiator, and curing the formulation to form a coating that has low surface energy.

The curable coating formulation is solvent and water free, and also acrylate-free, eliminating the health hazards associated with acrylates.

RFT 242

QUATERNARY AMMONIUM FUNCTIONALIZED POSS COMPOUNDS AS ANTI FOULING, ANTI-MICROBIAL AGENT

This invention pertains to the synthesis of quaternary ammonium functionalized POSS compounds (Q-POSS) as anti-fouling, anti-microbial agents in a *two step process*.

These compounds could find applications as contact biocides in liquids (disinfectants to contain microbial growth) and could be incorporated into siloxane network in order to develop anti-fouling anti-microbial coatings with improved mechanical properties.

Antimicrobial activity (Bio-efficacy studies) towards gram-negative (*E.coli*) and gram-positive (*S. aureus*) bacterium has been determined).

RFT 231

SILOXANE-URETHANE COATINGS FOR ANTI-GRAFFITI AND MARINE ANTIFOULING APPLICATIONS

This invention pertains to novel siloxane-urethane coatings that were developed from unique single-end-functional siloxane polymers. These coatings have novel properties with good adhesion, low surface energy and mechanical strength.

The invention could find its commercial viability in the paint industry in applications related to anti-graffiti and marine antifouling coatings.

RFT 214

UNIQUE ANTI-FOULING AND ANTI-MICROBIAL COATINGS FOR MARINE APPLICATIONS

This invention pertains to the development of stable polymeric anti-fouling surface coating formulation that contains Quaternary Ammonium Salts (QAS) as the primary disinfectant.

APPLICATIONS: Includes ship hulls, medical devices, and hospital settings.

PROPERTIES: Biocidal activities have been shown on a range of bacteria, diatom and yeast cultures. These coatings are found to be stable even after one month of water immersion.

PREMISE: The quarternary ammonium salt forms a cross-linked network structure with trimethoxy groups in silanol terminated poly-dimethylsiloxane, where the salt is chemically bonded in the network structure. Types of QASs, their levels of concentration, molecular weight of poly-siloxanes, levels of catalyst, and the amount of cross-linker are the critical determinants on the stability and effectiveness of the coating.

RFT 197

NON-TOXIC AND DURABLE FOUL RELEASE COATINGS

The adherence of organisms to surfaces exposed to aquatic environments (fouling) is a major economic concern, particularly in the maritime shipping industry. Fouling on ships can increase fuel consumption by up to 40%. Coatings that prevent fouling currently exist but are an environmental concern due to their release of toxic levels of tin and copper.

Scientists at NDSU have invented a novel non-toxic, cross-linked thermoset polysiloxane-polyurethane coating that exhibits properties as foul release (FR) coating and allows organisms to be sloughed off by shear forces obtained at a ship's cruising speed. In addition to exhibiting its fouling release behavior, these coatings have been demonstrated to provide improved durability to its coating surface.

RFT 179

NOVEL ENVIRONMENT FRIENDLY COATINGS FOR MARINE AND MEDICAL APPLICATIONS

This invention pertains to the synthesis of a formulation that has combined biocidal and foul release activities in a single polymeric compound. The formulation is a unique environmentally friendly coating that holds promise in both marine and medical applications. It consists of biocidal moieties that are tethered to its polymer matrix, which in turn prevent them from leaching into the environment.

APPLICATIONS: In addition to marine applications, this coating has also been shown to render anti-microbial properties on medical devices.

PROPERTIES: The mechanical properties of these coatings are similar to silicone elastomers, yet the coating contains biocidal moieties to deter settlement of organisms. To inhibit leaching of toxic components into the water, biocide moieties are tethered to the polymer matrix.

PREMISE: This invention relates to coating formulations based on the modification of moisture cure siloxane elastomers with an alkoxysilane functional polymer containing ammonium salt groups.

RFT 158

UNIQUE COATINGS (WITH PHASE SEPARATION PROPERTIES) FOR USE AS FOUL RELEASE AND ANTI-GRAFFITI PAINTS

This invention pertains to novel coating compositions that spontaneously phase separate to form uniform micro-domains on the coating surface, providing a multiphase topographical surface structure.

APPLICATIONS: These coatings may have use as foul release coatings in aquatic environments, anti-graffiti coatings, or as release paper for adhesive labels.

PROPERTIES: The micro-domain projections have low adhesion properties which are further augmented by the surface texture that limits the effective surface area for adhesion.

PREMISE: Micro-domain projections extrude approximately five microns from the surface with a separation distance of five microns between projections.

RFT 133

NOVEL ENVIRONMENTAL FRIENDLY COATINGS FOR MARINE APPLICATIONS

Proprietary and novel, silicone-based compounds (and methods for synthesis), some of which incorporate a biocide (for marine applications), have been developed that can be used in coating formulations to prevent or reduce fouling by marine life and related substances on ship surfaces.

APPLICATIONS: Includes ship hulls and other surfaces by aquatic organisms.

PROPERTIES: Prevent or reduce fouling of ship hulls and other surfaces by aquatic organisms. Some compositions meet certain environmental standards (utilize an approved biocide). The coating exhibits effective anti-fouling properties.

PREMISE: The tethered biocide kills organisms that contact coated surfaces and may reduce the incidence of nosocomial infections.

FOR FURTHER INFORMATION

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