



SEA-NINE™ 211N Marine Antifouling Agent

General

SEA-NINE™ 211N marine antifouling agent is a rapidly biodegradable settlement inhibitor, developed by The Dow Chemical Company for the new generation of environmentally acceptable marine antifouling paints for ships and marine structures.

Physical Properties

The following are typical properties of SEA-NINE 211N; **they are not to be considered product specifications.**

| | |
|--------------------------------------|-------------------------|
| Appearance | clear, yellowish liquid |
| Flashpoint (closed cup) | 28°C (solvent) |
| Vapour pressure | 5.0 mmHg at 16°C |
| Boiling point | 138-144°C |
| Melting or freezing point | -3°C |
| Density at 25°C | 0.94 g/ml |
| Viscosity (Brookfield) at 25°C | 1.3 mPa.s |
| Colour, Gardner (VCS) | 6 |

Special Features and Benefits

- Highly effective antifouling agent against bacterial slime, algae, barnacles, tubeworms, hydroids, bryozoa, tunicates and diatoms
- Free from heavy metals
- Excellent long term efficacy
- Stable in all major types of marine coating systems
- Global registrations including BPD notification and support
- Global environmental acceptance and compatibility

Key Environmental Characteristics

- Rapid degradation of the antifouling agent in the environment
- Rapid environmental partitioning, resulting in a limited bioavailability to non-target organisms
- Acceptable risk to non-target organism at concentrations presents in the environment
- Minimal bioaccumulation of toxicologically significant compounds
- Non-hazardous environmental concentrations at recommended use levels

For its environmental properties, SEA-NINE 211N gained the first ever Green Chemistry Challenge Award in the category for Designing Safer Chemical Products awarded by the United States Environmental Protection Agency.

Product Stability

SEA-NINE 211N marine antifouling agent is a 30% solution of 4,5-dichloro-2-n-octyl-4-isothiazolin-3-one in mixed xylenes SEA-NINE 211N is stable for at least two years at 22-25°C and 6 months at 40°C.

Performance Benefits

Fouling of ships by marine organisms (barnacles, seaweed, algae) is a phenomenon, which, if not prevented proves costly to the ship operators, because of the increased fuel consumption necessary to overcome the drag, and detrimental to the environment, because of the effects (global warming, acid rain) of the extra fuel consumed.

SEA-NINE™ 211N is highly effective at controlling a wide range of fouling organisms while having an acceptable environmental risk at recommended use concentrations. SEA-NINE 211N works by interfering with the microorganism settlement process thus preventing the initial colonisation of the painted surface. It has a broad spectrum activity against bacterial slime, algae, barnacles, tubeworms, hydroids, bryozoa, tunicates and diatoms.

Use of SEA-NINE 211N containing paints prevents the fouling of treated surfaces and eliminates the associated costs of increased fuel usage and more frequent dry docking for repainting.

Efficacy of SEA-NINE 211N Marine Antifouling Agent

| Organism | MIC (ppm a.i.) | Organism | MIC (ppm a.i.) |
|----------------------------------|----------------|------------------------------------|-----------------------------------|
| Diatoms | | Marine Bacteria | |
| <i>Amphora coffeaeformis</i> | 0.4 | <i>Pseudomonas atlantica</i> | 0.1 |
| <i>Amphipora paludosa</i> | 8 | <i>Pseudomonas nautical</i> | 0.1 |
| <i>Navicula incerta</i> | 0.05 | | |
| Freshwater Green Algae | | Freshwater Blue Green Algae | |
| <i>Chlorella pyrenoidosa</i> | 0.06 | <i>Anabaena flos-aquae</i> | 0.3 |
| <i>Chlorococcum oleofaciens</i> | 1.0 | <i>Synechococcus leopoliensis</i> | 0.6 |
| <i>Scendesmus quadricuada</i> | 1.3 | <i>Nostoc commune</i> | 0.6 |
| <i>Ulothrix acuminata</i> | 0.6 | <i>Scytonema hofmanni</i> | 0.6 |
| | | <i>Microcystis aeruginosa</i> | 0.6 |
| Marine Algae | | Barnacles | LC₅₀ (ppm a.i.) |
| <i>Enteromorpha intestinalis</i> | 0.1 | <i>Balanus amphitrite</i> | 0.34 |
| <i>Ectocarpus siliculosus</i> | 0.2 | <i>Balanus amphitrite</i> | |

Recommended Use Rates

SEA-NINE 211N Antifouling Agent is highly effective at controlling a wide range of fouling organisms while having an acceptable environmental risk at recommended use concentrations. SEA-NINE 211N Antifouling Agent has a very broad spectrum of activity and when used in combination with cuprous oxide, it provides an excellent, costeffective system, giving protection against all types of fouling organisms. Under normal use patterns concentrations of 3-10% of SEA-NINE 211N Antifouling Agent (as sold, 1-3% in active ingredient) are sufficient in most applications.

Applications/ Directions for Use

SEA-NINE 211N Antifouling Agent can be used in all types of Antifouling Paints such as: self-polishing antifouling paints as well as soluble or insoluble matrix paints.

SEA-NINE 211N Antifouling Agent can be applied to:

- Ship hulls (building and maintenance/repair)
- Commercial vessels and super yachts
- Buoys and other offshore structures

SEA-NINE 211N Antifouling Agent is recommended for use in:

- Marine (deep sea) and brackish/Estuarine
- Commercial harbors, shipping lanes, open sea

Conditions of Application: professional and industrial users only

- No use by the general public in Do-It-Yourself applications
- Application by airless spraying and by brushing/rolling
- Removal by high pressure water jet and blasting

Storage, Handling and Disposal

Since antimicrobial products are, by definition, biologically active, they invariably have the potential to induce toxicological effects in humans. It is, therefore, essential to take precautions to prevent skin or eye contact, ingestion or direct inhalation of such products. Indeed, the procedures used for handling microbicide solutions will be very similar to those necessary for the use of concentrated acids and alkalis.

On those limited occasions where personnel are required to handle SEA-NINE™ 211N Antifouling Agent as received, they should always wear appropriate protective clothing. This will include a rubber apron or impervious jacket with apron, suitable impervious, chemical resistant, full length gloves (nitrile rubber, Viton* or Silver Shield**) and footwear. Protective chemical splash goggles should also be worn. In areas where there is poor ventilation it is recommended that for the commercial handling of SEA-NINE 211N Antifouling Agent, as supplied, respiratory protection should be employed using a respirator which incorporates a charcoal cartridge for the adsorption of organic vapours (associated with the solvent in SEA-NINE 211N Antifouling Agent).

*Viton is a trademark of E.I. DuPont de Nemours & Co.

** Silver Shield 1s is a trademark of Norfol

Special care should be taken to avoid contamination of surfaces or materials that may later be handled by unprotected personnel (for example door handles and taps). Should such incidental contamination take place then decontamination of the affected surfaces should be carried out.

After working with SEA-NINE 211N Antifouling Agent, personnel should wash thoroughly with soap and water. These recommendations are especially applicable before eating, drinking or smoking. All clothing that may have been contaminated with SEA-NINE 211N Antifouling Agent should be laundered in hot water with detergent and bleach before it is used again.

Suitable materials for contact with SEA-NINE 211N Antifouling Agent

When setting up handling equipment for use with SEA-NINE 211N Antifouling Agent, any of the following materials may be used for piping, tank linings, fittings and instruments, since all have been found to be compatible.

- Fluorinated high density polyethylene
- Fibreglass reinforced vinyl ester resin (DERAKANE™ 470)
- PTFE-lined steel: Glass-lined steel, Polyethylene terephthalate (PET), Teflon^a

^aTeflon is a trademark of E.I. DuPont de Nemours & Co.

SEA-NINE 211N Antifouling Agent should not come in contact with low density polyethylene, as it can cause softening. SEA-NINE 211N Antifouling Agent is corrosive to uncoated mild and stainless steel and consequently should not come into contact with tanks or pipes of these materials.

The Dow Chemical Company has conducted Risk Assessment studies on antifouling paint application and has established the following appropriate Risk Management Practices which should be carefully followed.

- When handling SEA-NINE 211N Antifouling Agent as received, follow instructions on the label and SDS

- Avoid skin contact with antifouling paint containing typical use concentrations of SEA-NINE™ 211N Antifouling Agent
- Personnel handling formulated products that contain SEA-NINE 211N Antifouling Agent should use protective clothing detailed below:
 - cotton or disposable coverall suit (Tyvek* or similar chemical resistant types are ideal) with snug-fitting wrists, neck and ankles
 - rubber or other chemical resistant boots
 - solvent resistant synthetic rubber gloves (nitrile rubber or neoprene types are ideal). These gloves should be capable of covering the wrist
 - splash goggles

Additionally the following protective clothing is recommended to be worn by those people spray-applying antifouling paints containing SEA-NINE 211N Antifouling Agent to ships in drydock.

- head covering which will cover all exposed skin including lower chin, cheeks and forehead (a Tyvek* cape would be the ideal choice).

*Tyvek is a trademark of E. I. DuPont de Nemours & Co.

Goggles and head covering could alternatively be replaced by an air feedhood.

It is recommended that if disposable items of clothing are used then they should be discarded after use and that new articles be used when new spraying work is begun. Clothing requirements are constantly being reviewed and these may become less stringent as more data is gathered.

SEA-NINE 211N Antifouling Agent has good thermal stability. It is however recommended that it is kept in an area approved for the storage of inflammable industrial chemicals, with containers stored upright in a well ventilated area and not exposed to extremes of temperature. Storage conditions should be in conformance with applicable legal, fire and insurance regulations.

SEA-NINE 211N Antifouling Agent is supplied in 190 kg drums.

Safety Data Sheets

Dow Chemical Company Safety Data Sheets (SDS) contain pertinent information that you may need to protect your employees and customers against any known health or safety hazards associated with our products. Under the principles of Product Stewardship and some government regulations (for example, the US OSHA Hazard Communication Standard), workers must have access to and understand SDS on all hazardous substances to which they are exposed. Thus, it is important that you provide appropriate training and information to your employees and make sure they have available to them SDS on any hazardous products in the workplace.

Upon initial shipment of all products (including samples), The Dow Chemical Company sends the appropriate SDS to the recipient. If you do not have access to one of these SDS, please contact your local Dow Chemical Company representative for a copy. Updated SDS are sent upon revision to all customers of record.

The Dow Chemical Company is a member of the America Chemistry Council (ACC) and is committed to the ACC's Responsible Care® Program.

Product Stewardship

Dow Microbial Control encourages its customers to review their applications of Dow Microbial Control products from the standpoint of human health and environmental quality. To help ensure that Dow Microbial Control products are not used in ways for which they are not intended or tested, Dow Microbial Control personnel are willing to assist customers in dealing with ecological and product safety considerations. Contact your representative if you need any assistance or information. When considering the use of any Dow product in a particular application, review the latest Safety Data Sheet and country-specific product label to ensure the intended use is within the scope of approved uses and can be accomplished safely. Before handling any of the products mentioned in the text, obtain available product safety information and take necessary steps to ensure safety of use.

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¹except Indonesia and Vietnam

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