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Function of Zinc Oxide in antifouling paints.

This document outlines how zinc oxide is used in antifouling paints, and provides a general explanation of the function of zinc oxide in antifouling paints. From this it is clear that zinc oxide is added to antifouling paints to fulfil a non-biocidal function. It should be noted that in countries with existing registration schemes for antifouling paints, zinc oxide is not considered a biocide[1]. The information presented below justifies the fact that zinc oxide is not used as a biocide and therefore should not be subjected to the BPD review process for product type 21.

This paper refers to the use of zinc oxide in antifouling paints only and not other product types regulated under the Biocidal Products Directive (98/8/EC).

Zinc oxide - function in A/F Paints

In antifouling coatings zinc oxide is added to the formulation to:

* Regulate the dissolution of the paint film during service (i.e. control the film polishing rate)
* Stabilise wet paint in the can
* Modify dry film properties e.g. act as a UV absorber
* Pigment the system

Zinc oxide is primarily used in antifouling paints due to its unique solubility characteristics. In addition, zinc oxide has a number of properties described in the following sections, which are beneficial for the final antifouling formulation. To date no alternatives have been found that provide the equivalent solubility characteristics of zinc oxide.

Regulation of dissolution of the paint film during service

Controlling the solubility of the paint film, and hence the polishing rate, is critical to the effective performance of the paint. Zinc oxide is a critical paint ingredient used to control the polishing rate of the paint. Creating a paint that is too soft (i.e. having poor mechanical integrity) when dry will mean it polishes away rapidly revealing the inert undercoating and making it accessible to fouling organisms. In combination with the resin system chosen, zinc oxide is incorporated into the film at the product design level to give the right balance of mechanical strength and solubility. This ensures that the required in service life time is achieved.

Stabiliser for wet paint

Zinc oxide combines readily with free acid groups present in the paint to form zinc soaps. If not neutralised, the acids might react with other paint ingredients and result in an unstable wet paint. Viscosity increase or even gelation could be the result of such incompatible systems.

[1] Both the UK and Dutch authorities have reviewed the use of zinc oxide in antifouling paints under existing local laws and judged its use as non-biocidal. This has been communicated to individual companies within CEPE.

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Other compounds with the same properties of neutralising free acid groups exist, but the solubility characteristics of these compounds are not suited for use in antifouling paints.

Modify dry film properties
Zinc oxide absorbs ultra-violet light which is damaging to the stability of organic biocides and some binder systems. For antifouling paints this is an important issue whenever films are not continually immersed e.g. the boot-top area, or in cases where extended dry-docking periods are required (such as in yacht refitting). Zinc oxide actively absorbs UV and hence protects photo-sensitive binders and pigments from degradation by UV-light. Current alternatives to zinc oxide do not show comparable UV-absorbing properties.

Pigment the system
Zinc oxide can be used to create the desired colour of the paint system (especially for white and bright colours) i.e. zinc oxide acts as a pigment in this context. Other antifouling coating pigments can be used but do not have the same opacity or are prohibitively expensive.

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