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ANTIFOULING COMPOSITION

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This invention relates to an antifouling composition containing metallic copper in combination with zinc oxide and has for its principal object the production of a composition of matter having greatly improved antifouling characteristics.

Metallic copper and zinc oxide have not heretofore been combined in antifouling compositions, although each of these ingredients are well-known in the art. Metallic copper is an old and well-known toxic, and zinc oxide has been used as a pigment or filler almost from the inception of the art relating to antifouling compositions. It was early recognized, however, that metallic copper alone was highly corrosive to iron or steel surfaces, and its antifouling effect was not fully appreciated, possibly due to the fact that it gained but limited use. Later on, when compositions and paint systems had been discovered which decreased the corrosiveness of the metallic copper, it was discovered that this material had a definite toxic effect, but it was not sufficiently toxic to produce a completely satisfactory antifouling composition. Zinc oxide, on the other hand, was known to have no toxic effect and was incorporated merely as a filler to provide a satisfactory pigment-volume ratio and to harden the paint film.

It has been discovered that the use of metallic copper and zinc oxide in combination with one another in an antifouling composition produces antifouling properties markedly superior to those obtained in compositions containing either of these ingredients alone. The improvement obtained by the use of the combination of metallic copper with zinc oxide is so great that the effect is clearly synergistic rather than additive.

Antifouling compositions are generally provided in the form of paints, although they may be produced in other forms. In making antifouling paints, it is the usual procedure to employ a toxic material to prevent or to inhibit the attachment of marine organisms to the structure to be protected while it is immersed in sea water. In addition, these paints may contain a pigment or pigments, such as coloring compounds, fillers, or inert materials, and a binder or vehicle to impart film-forming characteristics to the composition.

The various ingredients may be incorporated in any order, although the usual manner is the incorporation of the pigments in the binder and subsequent addition of the toxic ingredient. A

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suitable solvent may then be added to obtain the desired viscosity, which will vary according to the conditions under which the paint is to be applied.

In order to be effective, the antifouling composition must prevent adherence of marine organisms to the surface of the paint, and the paint must strongly adhere to the structure to be protected; the former effect is obtained by the addition of toxic materials to the composition, and the latter effect is produced by properly preparing the surface over which the paint is to be applied. PVR (pigment-volume ratio) is also a factor in the adherence of the paint to the marine structure, and it, as well as other factors which might contribute to varying results, was controlled during the tests hereinafter described. The pigment-volume ratio may be defined as the ratio between the total volume of the pigments and the total volume of the composition including the vehicle (excluding volatile materials). Its relevancy and adjustment are well known in the art, and a detailed discussion thereof is not material to the present invention.

In the antifouling composition of the present invention, the metallic copper and zinc oxide must, of course, be employed in amounts which are significant and in compositions having a satisfactory vehicle and PVR, but the ratio of the metallic copper to the zinc oxide is considerably more limiting as respects the successful production of an improved antifouling composition. The upper limit of the copper/zinc oxide ratio is established by that amount of zinc oxide which will have a synergistic effect upon the copper, thus producing a highly satisfactory antifouling result. The lower limit of the copper/zinc oxide ratio is established by the minimum amount of copper which, in conjunction with the zinc oxide, will produce a satisfactory antifouling effect over a given period of time. These limits may be fairly definitely established for any particular working conditions, but they will vary according to the place where the composition is to be used and, in some cases, according to the balance of the composition.

By actual tests, it has been found that a copper/zinc oxide ratio of about 13.2 to 1 produces a superior antifouling composition when compared to standard antifouling compositions heretofore in use. However, a copper/zinc oxide ratio varying from 0.53 to 1 to 3.3 to 1 has been found to produce antifouling compositions hav-