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Abstract

Copper pyrithione (CuPT) is an antifouling agent used in paints for vessel hulls as an alternative to TBT. Environmental concentrations of CuPT for 2008, when the AFS treaty will take effect, were estimated using the chemical fate model.

In the effects assessment of CuPT, 0.25μg L^{-1} (the 96-h NOEC (No Observed Effect Concentration) of CuPT on *Skeletonema costatum*) was selected as the critical toxic concentration of CuPT. Risk was determined based on whether the Margin of Exposure (MOE) was equal to or less than an uncertainty factor (UF) of 100.

In the case of 3.66% content of CuPT in antifouling paints, MOE at each port or navigation route was equal to or less than the UF value of 100, indicating a significant ecological risk. Similarly, in the case of 1.45% content of CuPT, the MOE at each port was also equal to or less than the UF. However, the MOE was more than the UF in areas other than ports, indicating that risk is not significant and can be ignored.

We also investigated the effectiveness of replacing TBT with alternative agents by comparing the ecological risk of TBT and CuPT. The abnormal calcification of the giant Pacific oyster was selected as the assessment endpoint. A concentration of 0.001 μg L^{-1} was used as the NOEC(No Observed Effect Concentration) for TBT with a UF of 1. For CuPT 11 μg L^{-1} (96-h EC_{50}) was selected as the critical toxic concentration and a UF value of 10 was selected by the extrapolation of laboratory toxicity data to the field. The MOE of TBT was equal to or less than 1 in the entire Bay (except at the mouth) throughout the year, indicating a high or significant risk of abnormal calcification. The MOE of CuPT was more than 10 in the whole Bay, indicating no risk to the giant Pacific oyster. Our results indicate that ecological risk will be reduced as the TBT in antifouling paints is replaced with CuPT.