

TREATMENT OF TRIBUTYLTIN CONTAMINATED MARINE SEDIMENTS, EXPERIMENTS AND MODELING

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Endocrine disrupters are at present among the most serious environmental concerns because of their still unexplained toxicity and possible harmful effects on the total ecosystem. In particular, Tributyltin (TBT) and PCBs have been widely found in sediments, fish, and mammals (Kannan et al., 1997) despite regulation or use prohibition of these chemicals. Considering the degradation of TBT in sediments and sea water and a nationwide survey by the Ministry of Environment, Japan, the legislation of TBT usage at least since 1990 has not been effective to marine ecosystems (Takeuchi et al., 2004). Besides, illegal use after the ban is assumed due to heavily contaminated sediments. On the other hand, global legislation against TBT usage by 2008 will likely result in severe environmental damage in developing countries due to export of the contaminants.

This study reports results from a research project started 2001 in western Japan. The aim of this project is to establish a total treatment system with reasonable cost, which can remediate marine sediment polluted by TBT and other harmful contaminants. The project puts emphasis on improving existing methods for cost-effective treatment that also should be easy to put into practical use. The project also considers the entire sequence of handling TBT from its original location through final treatment. Consequently, this sequential treatment system is as follows; managing the polluted marine environment in and around harbors which has elevated levels of TBT, development of dredging machines that minimize stirring surrounding bottom sea sediments in order not to spread the pollutants, coagulation and settling with condensation agents to facilitate the further treatment processes, treatment system using filtration and absorbing processes, and final deposition of treated sediments. The aim of the present study, reported herein, is analyses of filtration and absorbing processes and development of a simulation model to estimate the treatment effect of marine sediments polluted by TBT.

Preliminary experiments and modeling were studied for a pilot plant of Tributyltin(TBT) contaminated sediments in prospect of a sequential treatment system. Flocculation test by four kinds of coagulant showed that PSI-100 is better than the other agents and that its optimal amount of applied coagulant was 0.3 mL/L. The prototype treatment plant consisted of filtration by polyethylene fiber sheet, sand and activated

carbon was tested in order to know the decrease in the TBT concentration through the filtering materials. The experiment showed that the outlet TBT concentration can be optimally controlled by designing the length of each material taking account for their cost. A quantitative evaluation that can reflect local conditions, for example, societal, geographical, and environmental characteristics, becomes indispensable for the systematic treatment when remediation of marine environment is planned. In order to satisfy these demands, the sensitivity analysis for a mathematical model was done. It was concluded that the adopted mathematical is applicable for designing the efficient treatment plant.

REFERENCES

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