

Purification Experiments of Ocean Sludge by Activating Microorganisms and Using Coagulants

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ABSTRACT

Ocean sludge exerts a very big environmental load to local sea area. Here, attention was paid to micro-bubble technology for application to the purification of the sludge. The important point in this technique is to activate the bacteria existing in the area by micro-bubbles. We had developed a method for decomposing the sludge by using of microorganisms in an aerobic state by micro-bubble. We had very good results by the method, and also understood that hydrogen sulfide is reduced at first and then the nutrients will be reduced. Here, we have also a technique for purification by using “coagulants”.

Therefore, we proposed the experimental way which hydrogen sulfide is reduced at first by using “coagulants” and then the nutrients will be reduced by micro-bubble and activating microorganisms. Here, we used the detergents including enzyme as the microorganism activator.

Our research object in this paper is to check the purification performance for sludge by our proposed experimental way. From the results of our experiments, we succeeded in reducing the time needed to purify the sludge, and we obtained the very good performance.

KEY WORDS: Coagulants, detergent, micro-bubble, microorganism activator, purification, sludge.

INTRODUCTION

It is very important to reduce sedimentary sludge in the ocean. Plans to reduce the sludge are usually dredging or sand covering. Dredging is a simple way and aims to cut off the sludge. But after cutting off, treating the dredged sludge takes much more time and, of course, cost. Sand covering, in general, gives a big load to living organisms and the ecological system. Here, a more efficient way is needed to reduce the sludge while not imparting environmental load in the local sea area.

Now, we have micro-bubble technology. Micro-bubbles (that is MB) can change conditions into an aerobic state. So, we had developed a

method for decomposing the sludge by using of microorganisms in an aerobic state by micro-bubble. We had very good results by the method in Okamoto, et al. (2010); for example, it could be reduced the treatment days to 5 days. We had also understood that hydrogen sulfide is reduced at first in an aerobic state by micro-bubble and then the nutrients will be reduced.

Here, we have also a technique for purification by using “coagulants”. We had also very good results by using coagulants in Okamoto, et al. (2006).

Therefore, we propose the way which hydrogen sulfide is reduced at first by using coagulants and then the nutrients will be reduced in an aerobic state by micro-bubble and activating microorganisms, since we are going to reduce the treatment days more.

We used the detergents including enzyme as the microorganism activator, since we can obtain it easily and also put on the market, in Okamoto, et al. (2012).

Our research object in this paper is to check the purification performance for sludge by our proposed experimental way.

EXPERIMENTAL SYSTEM

Our proposed method for purification experiment has 2 steps. First step is that a hydrogen sulfide is reduced at first by using coagulants. Second step is that the nutrients will be reduced in an aerobic state by micro-bubble and activating microorganisms.

Experimental Apparatus and Procedure in Step 1

Sludge and seawater were put in the tank (Long70xWidth47xHeight 28cm) and then were mixed by a water pump (300litter/hour) for 10 minutes after coagulants were put in, shown in Fig.1. In this step, mixing time is 10 (min.) and coagulants were used 500 (ppm)..