

Electrochemical counting method of the Marine Nitrifying and Denitrifying Bacteria

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Summary

The counting method of marine denitrifying bacteria was developed on the basis of the whole-cell enzyme modified electrode. Measurement were carried out by using ordinary three electrode electrochemistry system. The bacteria were trapped on the nitrocellulose membrane, then a part of the membrane was putted onto the surface of the graphite electrode. The electrode surface was covered with a dialysis membrane and a nylon net to give it physical strength. The geometrical surface area of the whole-cell electrode was 0.09cm^2 . For example, the principle of denitrifying bacteria number determination is based on sensing a redox dye oxidized by the microorganisms in the presence of a final electron acceptor such as nitrate and nitrite ion. Durohydroquinone was selected as a redox dye, mediator, for denitrifying bacteria counting system. The electrode potential was set at $-0.4\text{V}(\text{Ag}/\text{AgCl sat. KCl})$. The steady-state current was obtained within 60 to 120s, and the current magnitude was proportional to the cell populations above 10^6 cells/ml. For marine nitrifying bacteria, hexacyanoferrite (III), $\text{Fe}(\text{CN})_6^{3-}$, was used as a mediator. In this case, the electrode potential was set at $+0.5\text{V}(\text{Ag}/\text{AgCl sat. KCl})$. Unfortunately, the current response of the electrode was not enough. Therefore, additional study have to be done to develop a practical nitrifying bacteria counting system.