

Laboratory-Scale Remediation Experiment of Bottom Sediment by Irradiation of the Light

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In many sites of semi-enclosed waters, the bottom sediments are improved by dredging. However, it is difficult to discard huge amounts of dredged sediments, because there are not enough disposal sites. Thus many kinds of not-dredging remediation measures have been studied. We focus on the irradiation of light to the sediments.

To clarify the efficiency, laboratory-scale experiments were performed. The sediments were collected from Kishiwada Port in Osaka Bay, Japan. The not-disturbed sediments were taken by using pipes of 80mm diameter. The upper water was exchanged with filtrated on-site seawater. The sediments were irradiated with the light of halogen lamp, which were transmitted inside the water with an optical fiber. The intensity of irradiation on the surface of sediment was controlled 0, 500, 3000 lux by changing the position of optical fiber. The liquid paraffin was filled to the surface of water to prevent dissolution of oxygen from the air.

Water samples were periodically analyzed ORP, DO, pH, TOC, T-N, NO₃-N, NO₂-N, NH₄-N, T-P, PO₄-P, chlorophyll a. One or two weeks later, ORP were risen and stench gases were disappeared at the irradiated samples. Time course of nutrient salts' concentration of two irradiated cases was similar. The color of water became reddish. And the surface 3 to 5mm layer of bottom sediment was changed from black into brownish. It is suggest that the effective bacteria were activated with the irradiation of light in the bottom sediments. The reddish water sample was examined by a phase-difference-microscope. Most of the microorganisms had spherical shape with a single flagellum. The spectrum of their photosynthetic pigments was analyzed. Bacteriochlorophyll a and d were main components of photosynthetic pigments. It is found that purple sulfur bacteria or green sulfur bacteria were activated with the irradiation.