Demonstration pilot projects

Remediation Of Coastal Sediments Using Granulated Coal Ash

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In order to evaluate remediation of coastal sediments in terms of removal of phosphate and hydrogen sulfide using granulated coal ash (GCA), a byproduct from coal thermal electric power stations, in-situ experiments were carried out. The bottom sediments of 200 m x 300 m were covered with GCA with the diameter of <50 mm with 5-20 cm height in Kaita Bay, Hiroshima, Japan in June 2010. The pH values increased to 7.6-8.3 in the experimental site covered with GCA due to hydrolysis of CaO while it was kept in 7.3-8.0 in the control sites. The phosphate concentrations were kept below 0.2 mg/l after the application of GCA whereas those in the control site increased up to 1.0 mg/l. It is already revealed that adsorption of phosphate by GCA with forming calcium phosphate. Concentration of hydrogen sulfide in the interstitial water of the sediment decreased to almost 0 mg/l by August 2011 and it increased to ca. 0.25 mg/l in the GCA sites in 2012, whereas it ranged 0-2.5 mg/l in the control site. Decrease in the concentration of hydrogen sulfide may be attributed to chemical reaction of hydrogen sulfide with manganese or iron ion contained in GCA. A batch experiment was carried out to estimate the reducing kinetics of hydrogen sulfide with GCA covered in Kaita Bay. The batch experiments revealed that the removal kinetics of hydrogen sulfide was expressed as a first-order rate equation with a first order constant of 0.018 in August 2012. It is reported the maximum first order constant for reducing kinetics of hydrogen sulfide with GCA is 0.063. Consequently, it can be said that GCA performance in terms of hydrogen sulfide removal was decreased. And this may have led to the increase in concentration of hydrogen sulfide in the interstitial water of the sediment from 2012. From the results obtained in the present study, it was proven that the application of GCA can effectively remove both phosphate and hydrogen sulfide. This means that the GCA covering is a promising method to remediate organically enriched coastal sediments.