

investigated in a batch system. The metamizol sodium biosorption was fast and equilibrium was attained within 10 minutes. The results of the equilibrium experiments have been applied Langmuir and Freundlich models and data fitted better to Freundlich isotherm model ($R=0.96$ for 0.5 g and $R=0.93$ for 1.0 g) compared to the Langmuir model for metamizol sodium. Gibbs free energy values were found to be 1.866 kJ/mol for 0.5 g adsorbent and 4.657 kJ/mol for 1.0 g adsorbent and indicating the not spontaneity of the system.

Keywords: Adsorption kinetics, abiotic removal, veterinary medicine, thermodynamic parameters.

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An Assessment of Chemical Pollutants (Heavy Metals) in Marine Sediments Geochemistry in Lagos Harbour, Nigeria

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ABSTRACT

Activities such as dredging, industrial and domestic discharges, and shipping operations may have a significant detrimental influence on the sediments of Lagos harbour. The harbour is a semi-closed basin with restricted water circulation, which may serve to trap the waste introduced from land-based sources and the harbour. The water quality is always directly related to the sediment quality, as the sediment serves as the final sink for these contaminants, so investigating the sediment is crucial in determining the water pollution control. The overarching aim of this research is to investigate heavy metal geochemistry in the sediments of Lagos harbour. The research objective is to undertake a detailed assessment of the harbour sediments for heavy metal (Cd, Pb, Cu, As, Cr, Zn) concentrations in surficial sediments, using speciation methods and comparing the results with sediment quality guidelines (SQGs).

A limited number of studies on heavy metals within the Lagos Lagoon have been undertaken; however no coordinated studies of these elements, particularly with respect to the shipping activities within the harbour area, have been undertaken. In view of these observations, this study sets to find answers to the following question: 'What are the sources and pathways of heavy metal contaminants into the Lagos harbour-including quantification and fluxes from local sources and shipping activities?'

A two phase method - comparable to those produced by EPA Method 3051 was adopted for the analysis. The bioavailable (leachable) method used a 5% hydrochloric acid digestion using Inductively Coupled Plasma-mass Spectrometry (ICP-MS) in line with the Canadian National Water Research Institute (CNWRI). Total metal concentrations were obtained using X-ray fluorescence (XRF) in accordance with US Environmental Protection Agency (US-EPA) guidelines.

These preliminary findings from the pilot study undertaken at five sites within the harbour showed enrichment factors compared to Background Assessment Concentration (BAC) values ranging from 1.6 to 4 for Cu, Cr and Pb. Total metal data was then compared to Guideline Action Levels for Disposal of Dredged Materials by UK's Centre for Environment Food and Aquatic Services (CEFAS). The findings suggest that Cu and Cr totals for all the five sites are within the two CEFAS' Action values (40-400 mg/kg). Similarly, the result of Pb (50-500mg/kg) also falls within the two action values. The leachable percentage (bioavailable) ranged from 12% to 35% indicating a potential way of assessing highly contaminated sediment within Lagos Harbour area.

Ancillary data including particle size and organic carbon contents were obtained to help normalize the metal data for comparison. Heavy metal data was interpreted using metal/Al ratios and compared to Oslo Paris Commission (OSPAR) and (BAC) to obtain enrichment factors and with other published sediment quality guidelines to ascertain the extent of Lagos harbour metal contamination.

The potential implications for these findings are that if any future dredging activities were to take place within the Lagos harbour area, then further consideration and testing would need to be undertaken before a decision can be made as to whether it could be disposed of in the marine environment or sent to land-fill.

Keywords: Heavy metals, Sediment pollution, Industrial activities, Marine pollution, Lagos harbour

Wastewater Nutrient Removal Using Photobioreactors

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ABSTRACT

After secondary treatment of domestic waste water, mostly species of nitrates and phosphates remain untreated. The solution of which have been found in algal-bacterial photobioreactors which are having the ability to convert nutrients like nitrates and phosphates to proteineous diet; carbondioxide in air to oils (biofuels); BOD in waste water as their food source and so on. The experiments described herein were designed to determine the extent of nutrient uptake in photo bioreactors through algal assimilation at a laboratory scale.