Archives of Industrial Biotechnology

Economic Approach: Assessment of Water and Waste Water Quality and its Biological Treatment

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Abstract

Industrialization and modern agricultural practices poses a serious threat on human health all over the World. Effluents from large number such as of industries electroplating, leather, tannery, textile, pigment & dyes, paint, wood processing, petroleum refining, photographic film production etc., contains significant amount of heavy metals in their wastewater. The conventional methods are costly, energy intensive and often associated with generation of toxic byproducts. A possible solution can be approached through developing new sorbents based on cost-effective and environmentally friendly natural biomass. Thus, the adsorption has been investigated as a cost effective method of removal of heavy metals from water and wastewater. In the present work an attempt has been made to develop low cost and easy technique to remove heavy metals from ground and waste water using waste biomass. These low cost adsorbent includes materials of natural origin like agricultural, industrial wastes, Since biomass from these sources can serve as an economical and constant supply of biomass for biosorption of metal ions have been explored for their technical feasibility to remove toxic heavy metals from contaminated water. Water and waste water samples were collected from Haryana and Punjab regions of India. Biomass, Water and waste water were characterized for Physico-chemical parameters and heavy metals from the samples were determined using standard procedures. Adsorbents screened for heavy metals removal efficiency from synthetic water for parameters including adsorbent dosage, pH, metal concentration, temperature and contact time were standardized in batch mode and investigate the mechanism of metal uptake by Fourier transform infrared (FTIR) and X-ray diffraction (XRD) analysis was done. Fourier transform infrared studies with waste biomass revealed the involvement of C=N, C=C, C-H and C-O functional groups in metal binding and SEM analysis was also done to understand the morphology of biomass before and after adsorption process. Langmuir and Freundlich adsorption isotherms were predicted from the equilibrium sorption data. Correlation coefficient (r^2) values indicate that the adsorption pattern for heavy metals followed both the Langmuir ($r^2 > 0.988$) and Freundlich ($r^2 > 0.993$) isotherms. A comparison of kinetic models applied to the biomass such as Lagergren, Ho and McKay, Elovich and Morris-Weber kinetic models indicates that adsorption of heavy metals on biomass follows a best Ho and McKay pseudo second-order rate equation and correlation coefficient (r^2) correlated with the experimental data.

Biography

Indu Sharma was awarded PhD in Biotechnology and Environmental Sciences from Thapar University, Patiala, Punjab. She has interdisciplinary profile MSc (Botany), MPhil (Microbiology) from CCS University, Campus, Meerut, U.P. She started her academic profession as MoEF-Research Fellow in Genetics, University of Delhi, South Campus. She was worked as Lecturer in Meerut Medical Institute. During her PhD she worked as Teaching Assistant (Lecturer) in Biotechnology, Thapar University, and she was worked as CSIR-SRF. She also worked as Resource person at Science and Technology Entrepreneurs Park (STEP) for training programs in Thapar University and subsequently worked as Senior Lecturer in Biotechnology, UCTBMS Dehradun, Assistant Professor in Biotechnology Engineering, ACE, Ambala. Presently, She is working as Assistant Professor, Botany in Department of Biotechnology, MMEC, Maharishi Markandeshwar (Deemed to be University) Mullana, Ambala, Haryana.

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