Wastewater Generated From Scouring of Merino Wool

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Scouring of merino wool generates effluents with high lipid or wool wax content which are less biodegradable in nature and hence have longer residence time for biological wastewater treatments. Electrocoagulation is an electrochemical dissolution technique in which coagulating agents are generated in situ and could be used as an alternative for treating wool scouring effluent. Electrocoagulation system using aluminum electrodes have resulted in removal of upto 90.5% COD and upto 99.9% turbidity of wool scouring effluent.

KEYWORD

Electrocoagulation, Wool scouring, Aluminum, DC current, Wastewater, Merino wool.
Effect of Carbon, Nitrogen, Temperature and pH on the Biodecolourization of Acid Orange 7 by *Phanerochaete chrysosporium* and Optimization of the Decolourization Process in Batch Culture

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Azo dye, derivatives of azo-benzene, constitute the largest group of dyes used in the textile industry. Among the chemical classes of dyes, azo dyes are considered to be recalcitrant, non-biodegradable and persistent as they possess recalcitrant chemical groups, such as those of azo and sulphonylic acid. Due to their complex structure, they are highly persistent in natural environments, which may lead to acute toxicity of ecosystems and they are carcinogenic compounds and also have dermal and immunological effect on human beings. Treatment of dye-based effluents is considered to be one of the challenging tasks in environmental fraternity. Conventional methods are not effective in the treatment of azo dyes. Some microorganisms are able to degrade these aromatic compounds. Environmental biotechnology is based on ability of microorganism (both bacterial and fungal) to decompose larger chemical compounds, which are xenobiotics. So recently biodegradation has been accepted as an efficient and attractive approach to decompose these complex molecules. In recent years, many researches indicate that white rot fungus is a promising microbe in wastewater treatment. The basidiomycete *Phanerochaete chrysosporium*, a white rot fungi, is the most extensively studied and discussed. The aim of present research work is directed as finding the effect of added carbon and nitrogen sources and physical parameters, like temperature and pH on the decolourisation of acid orange 7 by the locally isolated *Phanerochaete chrysosporium* as well optimization of the biodecolourization process.

**KEYWORD**

Biodegradation, Biodecolourization, Azo dyes, Optimization.
Isolation, Characterization and Study of Microorganisms Capable of Decolourizing Triazo Dye Acid Black 210

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Enrichment, screening and isolation of dye degrading bacteria from the vicinity of textile dyeing industries and waste disposal sites were performed using acid black 210 (AB 210) as model dye. Out of 43 AB 210 decolourizing bacterial isolates, 5 morphologically and biochemically distinct isolates, showing dye decolourization zone to colony ratio more than 1.5 were selected and were identified by 16S rRNA gene analysis as Providencia sp. SRS82, Proteus vulgaris sh31BAB1874, Pseudomonas nitroreducens sh10BAB1853, Bacillus pumilus SRS83 and Bacillus firmus shBAB1847. The decolourization ability of the 5 strains was compared during primary and secondary screening. Results showed that Bacillus pumilus SRS83 possess the highest dye decolourization ability, both in terms of extent and rapidity, as compared to the remaining 4 isolates. Additionally, Providencia sp. SRS82 showed decolourization of 200 ppm of dye within 24 hr incubation at medium initial pH 7.0 at 32±2°C under static condition.

KEYWORD

Azo dyes, Screening, Acid black 210, Dye decolourization.
Adsorption Kinetics and Intraparticle Diffusivities of Arsenic Onto Prepared Activated Carbon

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The adsorption kinetics and intraparticle diffusivity of arsenic onto activated Moringa oleifera leaves carbon has been studied. Adsorption kinetic data were tested using pseudo-first order, pseudo-second order, Bangham's equation and intraparticle diffusion models. Kinetic parameters, rate constants, equilibrium adsorption capacities and correlation coefficients, for each kinetic equation were calculated and discussed. The experimental data fitted very well the pseudo second-order kinetic model and also followed by intraparticle diffusion model, whereas diffusion is not only the rate-controlling step.

KEYWORD

Carbon, Adsorption kinetics, Intraparticle diffusivities, Pseudo first order, Pseudo second order.
Anaerobic Treatment of Sago Wastewater Using HUASB Reactor With Rosette as Carrier

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Sago, the common edible starch which is manufactured from Tapioca (*Mannihot utilisema*) in the shape of globules requires a large quantity of water for its processing. The waste produced from the processing gives out a highly foul smelling, organic and acidic wastes in nature. The hybrid upflow anaerobic sludge blanket (HUASB) reactor is a combination of upflow anaerobic sludge blanket reactor and anaerobic filter is used in the treatment of these wastes. The characteristic features of sago wastewater is analysed and the parameters of the reactor has been designed accordingly. A lab scale flat bottomed HUASB reactor of 4.7 L capacity was fabricated. The performance of HUASB reactor is evaluated under different organic loading rates. Sago wastewater is having high biogas generation potential if properly treated in HUASB reactor. The optimum HRT for the HUASB reactor was found to be 8 hr for treating wastewater. The optimum OLR was found to be 9 kg COD / m$^3$ d for maximum gas production and COD removal. The maximum COD removal percentage for the wastewater treating using HUASB reactor is 84 %. HUASB reactor is having a good potential to withstand pH variation of the reactor.

KEYWORD

Sago wastewater treatment, HUASBR, Biogas production.
Accumulation of Crystal Violet Using Chlorella vulgaris

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Bioaccumulation of the crystal violet (CV) dye using live alga Chlorella vulgaris was established in batch mode. Growth profile of the Chlorella vulgaris alga was demonstrated with presence of dye solution and compared with absence of dye in the medium. Bioaccumulation parameters, such as algal cell concentration and dye concentrations were studied. The maximum percentage colour removal was obtained for CV dye at algal cells concentrations of $9 \times 10^6$ cells/mL. The maximum percentage colour removal was observed at 100 mg/L of dye concentration. UV-spectral analysis was performed to confirm the bioaccumulation of dye on to the living algal cells.

KEYWORD

Biological treatment, Bioaccumulation, Crystal violet, Chlorella vulgaris.
Aerobic Biodegradation of Cresol Using *Candida tropi- calis* in Three Phase Fluidized-Bed Reactor

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The cresol is one of the most toxic pollutant in wastewaters and has a significant negative impact on the environment and human health. The aerobic biodegradation of cresol in presence of sodium salicylate as substrate using yeast *Candida tropicalis* was studied in 3 phase fluidized-bed reactor. The optimum operating parameters are: HRT, 6 hr; pH of feed, 7; temperature of feed, 55 ºC; oxygen flow rate, 0.4 L/min ; feed flow rate, 10 L / min and sodium salicylate concentration 4 g/L. Maximum cresol biodegradation was 85.49 % (w/w) at optimum conditions with yeast *Candida tropicalis*. The optimization of these bioprocess parameters enabled a stable functioning of the reactor, allowed the application of high loading and biodegradation rates. The presence of a small amount of sodium salicylate could significantly enhance the biodegradation of cresol and retard the biodegradation of cresol, especially at higher total substrate levels. The sp growth rate (\( \mu \)) was 3.56/s and maximum sp. growth rate (\( \mu_{\text{max}} \)) was 7.12/s. The yeast *Candida tropicalis* yield coefficient (Y) was determined as (0.919) at optimum parameters. The yeast can grow reasonably well in cresol environment in 3 phase fluidized-bed reactor. The first order rate constant (k) was 0.148/s for aerobic biodegradation of the cresol in 3 phase fluidized-bed reactor. The mathematical modeling was analyzed for hydrodynamic pressure (\( \Delta p \)) vs feed velocity (u) in 3 phase fluidized-bed reactor for biodegradation of cresol with yeast *Candida tropicalis*.

KEYWORD

Aerobic, Biodegradation, Cresol, Fluidized-bed reactor, Modeling.
Removal of Acid Yellow 17 From Aqueous Solution by Elephant Dung Activated Carbon

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An attempt has been made to utilize elephant dung activated carbon (EDAC) prepared by acid treatment, as an eco-friendly adsorbent for the removal of a textile dye, acid yellow 17 (AY17) from an aqueous solution. The kinetic and thermodynamic parameters of the dye adsorption were investigated with a batch system by changing various experimental conditions, like dye concentration, contact time and temperature with optimum dosage of the adsorbent (100 mg). The equilibrium time was found to be 300 min for 40 mg/L, 270 min for 30 mg/L, 240 min for 20 mg/L and 210 min for 10 mg/L dye solutions. The adsorption kinetics was found to be best represented by Pseudo second order kinetic model. The mechanism of adsorption process was determined from intraparticle diffusion model. The percentage removal of the dye was increased with increase in temperature. The thermodynamic parameters, like Gibb free energy change (ΔG), entropy change (ΔS) and enthalpy change (ΔH) were calculated which indicated that the adsorption process was endothermic and spontaneous. The mechanism of adsorption process was determined by calculating the activation energy using Arrhenius equation.

KEYWORD
Elephant dung, Acid yellow 17, Adsorption, Kinetics, Thermodynamics, Activation energy.
Defluoridation is the process of moderating high level fluoride content in drinking water to a concentration within the prescribed limit. The study performed here includes preparation of activated carbon from the biomass of groundnut hull, characterization and evaluation of its defluoridation characteristics. The defluoridation characteristics are observed to be pH, dose, initial fluoride concentration and bicarbonate dependent. The optimum contact time is found to be about 45 min. Defluoridation capacity mostly falls in the range 1500 to 1650 mg/kg of carbon.

KEYWORD

Defluoridation, Adsorption, Activated carbon, Groundnut hull carbon.
Assessment of Heavy Metal in Summer and Winter Season in Kottakudi Estuary and Sethukarai Costal Water, Thiruppullani, Ramanathapuram District

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In the present investigations, monitoring of seasonal variations in the concentrations of heavy metals (Cu, Cd, Pb, Fe and Zn) in the Kottkudi river, Kottakudi estuary and Sethukarai coastal waters, Thiruppullani, Ramanathapuram district, Tamil Nadu, have been carried out during the year 2012. For this study, sampling was done from 3 selected sites during 2 seasons, that is summer (April) and winter (January). To determine the concentration of heavy metals in the water samples in the both seasons, the technique of inductively coupled plasma-mass spectroscopy (ICP-MS) was used. The results of this study shown wide variations in the heavy metal levels varying from high concentration during winter and low concentration during summer season. The high levels of heavy metal during winter at these sites can be related to untreated shrimp forming waste, port activities, brine discharge, fish processing, fishing activities, entry of polluted sea water into river and surface run-off from contaminated areas.

KEYWORD

Heavy metal, Inductively coupled plasma-mass spectroscopy, Seasonal variation.
Environment Problem of Water and Fishes of the Hirakud Reservoir and Fish Kingdom due to Toxic Element of Upper Mahanadi Basin

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The river Mahanadi, one of the largest rivers of India, originated from Bastar area of Chhatisgarh, enters Odisha and ends in Bay of Bengal near Paradip delta area about more than 800 km of journey. After 346 km approximately, the great Hirakud dam is constructed near Sambalpur on it. The total area covered by water is 74000 km² of water. Some important tributaries, like Ib, Bheden, Kharun, Seonath, Hamp, Mand, Hasdeo and more than 300 small nallas and springs originated from Sundargarh, Sambalpur, Jharsuguda, Raigarh, Bastar areas of Chhatisgarh and Odisha are flowing from deep forest and hill areas to the Mahanadi. There are 7 large open cast coal mines and 20 underground mines of MCL are near and around river Ib valley and Basundhara area, in which 24 hr mining activities are going on. There are approximately 67 mini steel and power plants around it. One large scale steel industry (Jindal Steel and Power, Raigarh) and Bhusan Steel and Power, Jharsuguda, 2 large scale aluminum industries, like Vedanta and Aditya Aluminum and Ultratech cement plant, TRL refractory plant, large power sector OPGC and about 300 rice and oil mills from Raigarh to Sambalpur are attached to this area. Due to their leaching and damage of ash pond from power plant, coal dust of mines and different effluents of all the above industries, pollute all the rivers including Hirakud reservoir. Some research studies have done by expert scientist that the heavy and toxic elements, like Cd, Ar, Hg, Mn, Cr, Pb, B, Be, Ba, V, Zn and traces of radioactive elements are found in the water, which can cause various occupational diseases for people and even poisonous for the fishes of the water. It is desirable to prepare proper environmental plans and strict law to check the emission and effluent properly by the industries, state and central governments, even public awareness; otherwise it will be a serious problem for present and future. This research paper includes the detailed study of the total Mahanadi upper basin including various activities and solutions.
Evaluation of Heavy Metal Contamination in River Water Through Assessment, Mobility and Bioavailability of Metals in Sediment - A Review

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Sediments are an essential, integral and dynamic part of river and acts as source of pollution when eroded and transported to downstream. Transportation, dilution and redistribution of sediment-associated contaminants occur along the course of the river to the sea which has adverse impacts. Investigation of pollutants in river bed sediments has got importance worldwide because sediment reflects the current quality of surface water and also provides vital information on the transportation and fates of pollutants after get discharged in riverine ecosystem. In this review, influence of sediment on water pollution, analysis of river sediments, correlation between pollutants in river and sediment and indices used for sediment pollution are discussed.

**KEYWORD**

River water quality, River bed sediment, Sequential extraction, Metal speciation, Heavy metals.