Removal of Heavy Metals From Synthesis Industrial Wastewater Using Local Isolated *Candida utilis and Aspergillus niger* as Biofilter

Safaa Abd Alrasool Ali

University of Baghdad, Institute of Genetic Engineering and Biotechnology for Post Studies, Baghdad, Iraq

In this study biomass filter of *Candida utilis* which isolated from food sample in Baghdad local market and *Aspergillus niger* which isolated from Baghdad soil used to biosorption heavy metals from synthesis industrial wastewater. Two biofilters were designed as cylindrical Perspex with height 10 cm, diameter 3 cm as a shell and inside their are layers of sponge were prepared as the size of diameter of the cylindrical filter with thickness of 2 cm arrange inside it, biomass production were 6 g of *Aspergillus niger and* 5.6 g of *Candida utilis* spreads between sponges. The pH, residence time, flow rate were tested as parameters, optimum removal efficiency of chromium, lead and nickel were 89%, 90% and 91% for *Aspergillus niger* biofilter, while it was 81%, 83%, 80% for *Candida utilis* biofilter at pH 6, residence time 10 min, flow rate 9 mL/min.

KEYWORD

Candida utilis, Aspergillus niger, Bios-orption, Heavy metals, Synthesis industrial wastewater.

Effect of Electro-Coagulation of J.K. Paper Mill Effluent

Gargi Biswas and A.P. Bhattacharya

GIET, Gunupur, Rayagada - 765 022

In an attempt to treat the paper mill effluent heavily loaded with inorganic, organic compounds, of the order of COD 900 to 1200 mg/L, it was felt necessary to stimulate the entire experimental procedure for weakly loaded COD to bring it down to permissible limits as laid down by EPA (Environmental Protection Agency). The samples were treated for a period of 10 min to 45 min and energy density between 0.475 Kwhr/m^3 to 7.625 Kwhr/m^3. The pH was maintained between 7.0 to 10.0, the suspended solids (SS) and colloids precipitated out to the extent of 85% to 90%. Electro coagulation was used for COD reduction and colour composites. It was successfully executed for J.K. Paper Mill effluent. Electro coagulation uses electrical energy and is an energy intensive process and costs higher than other conventional methods. We have reviewed the process and present work is an extension of previous work.

KEYWORD

Paper mill effluent, Electro-coagulation, Energy density, COD, pH, Optical density.

Effective Role of Areca Nut Shell Carbon and Cashew Nut Shell Carbon in the Removal of Congo Red Dye for the Application Towards Effluent Treatment

M. Meenakshi Sundaram and S. Sivakumar

Ayya Nadar Janaki Ammal College (Autonomous), Centre for Research and Post Graduate Studies in Chemistry, Sivakasi - 626 124

The present study investigate the successful use of eco-friendly adsorbents areca nut shell carbon (ASC) and cashew nut shell carbon (CSC) to remove congo red (CR) dye. In the batch experiments, various parameters, such as effect of initial concentration, contact time, dose, pH and particle size has been studied. The amount of dye removal increased with decrease in the initial concentration, decrease in particle size, decrease in pH, increase in contact time and dosage. The experimental results were analysed by using Freundlich and Langmuir isotherm models and first order kinetic equations. The intra particle diffusion study shown that the process favour first order kinetics. Surface morphology of the adsorbents ASC and CSC before and after adsorption is studied by scanning electron microscopy (SEM). The result indicate that the low cost adsorbents cashewnut shell carbon (CSC) and Areca nut shell carbon (ASC) can be used as an effective adsorbents alternative to commercial activated carbon (CAC) in wastewater treatment for the removal of congo red (CR).

Adsorption of Cadmium Onto Activated Coconut Oil Cake Carbon in Continuous Stirred Batch Reactor

Sk,Masud Hossain

Muslim Association College of Engineering, Centre for Advanced Studies and Research Venjaramoodu, Trivandrum-695 607

The adsorption of cadmium (Cd^{+2}) using activated spherical porous carbon prepared from coconut oil cake as adsorbent was studied in continuous stirred batch reactor (CSBR). Optimum parameters were : Contact time, 80 min; adsorbent dosage, 20 g/L; adsorbent size, 8×10^{-3} m; pH, 5.5 and stirring speed, 50 rpm. Maximum Cd^{+2} adsorption from 500 ppm solutions was observed as 91.87 % (w/w) at optimum parameters. The Langmuir and Freundlich, adsorption isotherms had been analyzed for the studies. The correlation coefficient (R^2) of Langmuir model was 0.997 for Cd^{+2} adsorption. The correlation coefficient (R^2) values indicated that the Langmuir isotherm model was fitted reasonably well with the experimental data. The values of K_L, was found to be 0.00032 mg/g and q_m was found to be 149.28, respectively, for Cd^{+2} adsorption with activated coconut oil cake carbon. The constant (K_f) in Freundlich isotherm model was found to be 60.767 mg/g and constant (n) was calculated 1.306 L/mg for Cd^{+2} adsorptions, respectively. The values of K_f and n, (1<n<10) showed easy separation of Cd^{+2} from the aqueous solution and indicated a favourable adsorption in Freundlich isotherm model. Freundlich isotherm was fitted well with the correlation coefficient, (R^2), was calculated 0.996 for Cd^{+2} adsorption. The 2 models were fitted reasonably well with experimental data for adsorption of Cd^{+2} onto activated coconut oil cake porous carbon in CSBR.

KEYWORD

Activated carbon, Adsorbent, Batch reactor, Isotherm, Modeling, Coconut oil cake.

Study on Efficiency of Effluent Treatment Plant of Mohan Meakin Ltd., Mohan Nagar at Ghaziabad (U.P.)

Sadhana Chaurasia, Raj Karan and Radhe Shyam

Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya, Department of Energy and Environment, Chitrakoot - 485 780, Satna

Water is one of essential requirements of all life supporting activities. It is the master solvent and all metabolic reaction of living beings depends mainly on its presence. It is also essential for agriculture, industries, drinking and many other domestic purposes. One of the most important environmental problems faced by the world is management of waste- water. Industrial processes create a variety of wastewater pollutants; which are difficult and costly to treat. Wastewater characteristics and levels of pollutants vary significantly from industry to industry. Now-a-days emphasis is laid on waste minimization and revenue generation. Pollution prevention focuses on preventing the generation of wastes, while waste minimization refers to reducing the volume or toxicity of hazardous wastes by water recycling and reuse and process modifications and the byproduct recovery as a fall out of manufacturing process creates ample scope for revenue generation. The aqueous distillery effluent stream known as spent wash is a dark brown highly organic effluent and strongest organic industrial effluents, having extremely high COD and BOD values because of the high concentration of organic load, distillery spent wash is a potential source of renewable energy. The paper reviews the status and appropriate treatment alternatives for disposal of the distillery wastewater.

KEYWORD

Effluent, BOD, COD, TDS, Treatment.

Bioremediation of Textile Dyes Using Terrestrial and Aquatic Plants - A Review

Parthasarathy Saranya, Paneerselvam Saravanan, N. Nagendra Gandhi and S. Renganathan

Anna University, Department of Chemical Engineering, Alagappa College of Technology, Chennai-600 025

A review paper on bioremediation using various plants which gives an overall view about the phytoremediation techniques with particular importance to the textile effluents which contain synthetic dyes. These compounds can be bioremediated using plants which have been found to take up the dyes. Most of the remediation techniques are much expensive and affect the ecological system negatively. Phytoremediation, a cost effective, eco-friendly and more efficient method, is apt for developing countries. The response of the plants towards the textile dyes through phytoaccumulation, phytosorption and phytodegradation has been extensively studied. Non edible, disease resistant plants with high biomass were selected to prevent the passage of contaminants into the food chain which have the capability of transforming the contaminants into renewable bioenergy.

Comparitive Study of Water Quality Index of Synthetic and Natural Dyeing Industry Effluent and its Irrigation Standard

S. David Noel, M.R. Rajan and P.Sivakumar

Gandhigram Rural Institute-Deemed University, Department of Biology, Gandhigram - 624 302, Dindigul

An investigation was made to calculate the water quality index of synthetic and natural dyeing industry effluent to assess its suitability for surface irrigation. Samples of both synthetic and natural dyeing industry effluent were collected from Chinnalapatty, Dindigul district, Tamil Nadu at periodical intervals from September 2012 to January 2013 for study. Physico-chemical parameters of synthetic dyeing industry effluent, such as pH (7.39), electrical conductivity (2900), total dissolved solid (3745), total hardness (66.46), chloride (3158), sulphate (0.322), calcium (14.96), magnesium (13.04), potassium (0.21) and sodium (12.33) and natural dyeing industry effluent, such as pH (6.54), electrical conductivity (2250), total dissolved solid (7700), total hardness (2.3), chloride (2520.5), sulphate (0.22), calcium (1.60), magnesium (1.37), potassium (4.99) and sodium (14.99) were studied. WQI was calculated to assess its suitability for irrigation. Results showed that WQI of the untreated synthetic and natural dyeing industry effluent is between slight and moderate. The pH, calcium, total hardness, sulphate, potassium and sodium of synthetic dyeing industry effluent and pH, calcium, total hardness, sulphate and sodium and magnesium of natural dyeing industry effluents were within the permissible limit for surface irrigation.

KEYWORD

Dyeing industry effluent, Water quality index, BIS, Physico-chemical parameter.

Photo Decolouration of Brilliant Green Dye Using β-CD Modified TiO$_2$

P. Velusamy, S. Rajalakshmi, S. Pitchaimuthu and N. Kannan

Ayya Nadar Janaki Ammal College (Autonomous), Centre for Research and Post-graduate Department of Chemistry, Sivakasi–626 124

Photo decolouration of brilliant green (BG) dye on the surface of semiconductors β-CD modified TiO$_2$ has been studied under visible light. After the β-CD molecules almost 100% of decolouration of BG dye has been achieved. It confirms enhancement of the photo decolouration of the BG by β-CD. The effect of various process parameters, like effect of initial concentration, irradiation time, addition of catalyst and pH variation on photo decolocration of BG was studied. The COD measurement confirms the mineralization of BG. The rate of photo decolouration follows pseudo first order kinetics. The present study open new horizon for the mineralization of BG for the application of wastewater treatment.

KEYWORD

Brilliant Green dye, Photo decouloration, TiO$_2$, β-CD.

Absorption of Chromium (VI) on Rice Husk Dust Column

U. Parida, A.Swain, P. Das Mohapatra and B.B. Kar

KIIT University, Bhubaneswar - 751 024

The present investigates the ratio of absorption of chromium (VI) on rice husk dust. In the process, 5 different columns have been prepared using rice husk dust at different column length. Cr(VI) solution is prepared and subjected to absorption study. It has been observed that Cr(VI) absorption on rice husk dust depends on 2 parameters, that is of retention time and size of the column. The best result is obtained with a column of 30 inch length with 10 cm diameter. The percentage absorption of Cr(VI) have been plotted against time and the optimum condition is obtained when absorption is carried out with a containing solution of 1000 ppm is treated with a rice husk dust column of 30 inch length with a retention time of 2 hr.

KEYWORD

Chromium (VI), Absorption column, Rice husk dust, Retention time.

Phytoaccumulation of Basic Red 23 Dye Using Fresh Water Submerged Live *Ceratophyllum demersum* Plant

M. Divyamahalakshmi, P. Saravanan, P. Saranya, N. Nagendra Gandhi and S. Renganathan

Anna University, Department of Chemical Engineering, Alagappa College of Technology, Chennai- 600 025

In the present investigation bioaccumulation studies were performed for the removal of basic red 23 dye from an aqueous solution using live *Ceratophyllum demersum*. The influence of various parameters, such as biosorbent dosage, pH and initial dye concentration were studied at batch mode for obtained maximum dye uptake capacity. Maximum uptake capacity of the basic red 23 using *C. demersum* was found to be 14.5 mg/g. The surface morphology was analyzed using scanning electron micrograph (SEM) to examine the micro and macro pores present on the surface of plant and the functional groups present on the biosorbent were analyzed using Fourier transform infrared analyzer (FTIR). Equilibrium data were analyzed by Langmuir and Freundlich adsorption isotherm models. The equilibrium data was fitted very well with Freundlich isotherm when compared Langmuir isotherm. The effect of initial dye concentration on the growth of the plant was studied by measuring the chlorophyll content.

KEYWORD

Phytoaccumulation, *Ceratophyllum deme-rsum,* Basic red 23, Chlorophyll content, Isotherm.

Activated Carbon From Plant Material as an Adsorbent for the Removal of Congo Red From Aqueous Solution - A Comparative Study

N. Kannan and R. Pagutharivalan

Ayya Nadar Janaki Ammal College (Autonomous), Centre for Research and Post-Graduate Studies in Chemistry, Sivakasi – 626 124

Studies on the removal of congo red (CR) by adsorption on various adsorbents such as C*aussia auriculata* bark carbon (CABC), *Emblica officinalis* bark carbon (EOBC), have been made and the results have been compared with that of commercial activated carbon (CAC). Effect of various experimental parameters has been investigated using batch adsorption techniques at room temperature (30±1°C). The percentage removal of CR increases with decrease in the initial concentration of CR, initial pH and particle size of adsorbent and increases with increase in the contact time and dose of adsorbent. Adsorption data were modeled with the Freundlich and Langmuir adsorption isotherms and various first order kinetic equations at 30±1°C. The kinetic of adsorption is found to be first order with intra-particle diffusion as one of the rate determining steps. The mechanism of adsorption for CR onto various carbons were investigated by using the experimental results and confirmed by FI-IR and SEM images. The adsorbent materials CABC, EOBC could be employed as low cost adsorbents as alternative materials to CAC for the removal of CR.

KEYWORD