Modelling for a Class-II Sedimentation-Part II : Alternative Modelling Based on the Data of Other Authors and Part III : Modelling Utilizing the Polynominal approach

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For a class-II sedimentation, the design parameters, such as the overflow rate, detention time, etc., are at present evaluated from the results obtained from the column tests. To evaluate the effect of the initial suspended solids concentration and the nature of the suspended materials to be removed, column settling tests were conducted for the different initial concentrations of the several suspended materials, such as in the sugar mill waste and domestic wastewater (both containing the settleable organic solids), and the flocs of the aluminium hydroxide and the ferric hydroxide (both representing the chemical flocs). Using the column test data, a general predictive model has been developed to determine the overall percentage removals in relation to the depth of the basin, initial suspended solids concentration and overflow rate for the above said suspended materials. The settling material characteristics of the organic wastes and chemical flocs expressed through the sludge volume index (SVI) has been correlated with some of the model coefficients. Such predictive models can be used to evaluate the interrelationships between clarifier design parameters. The paper is presented in 3 parts, respectively dealing with : (I) Preliminaries, experimentation and modelling, (II) alternate modelling based on the data of other authors and (III) modelling utilizing the polynominal approach. This paper is dealing with alternative modelling based on the data of other authors and modelling utilizing the polynominal approach. Part 1-Preliminaries, experimentation and modelling has already been published in April 2011 issue of this journal.

Kinetics of Biological Nutrient Removal in a Batch Fed Reactor

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In this present work, biological nutrient removal (BNR) from synthetic wastewater was carried out in a lab-scale batch fed reactor. The study include the preparation of acclimatized seeds for COD removal, ammonia oxidation and finally an investigation was carried out for the simultaneous COD and ammonia oxidation in a batch fed reactor using the mixed culture and subsequently estimated the biokinetic coefficient, such as k, K_s, k_d ,Y using the batch experimental data. Various input combinations were tried on the basis of different proportion of initial substrate concentration (COD and TKN) alongwith different mixed sludge

concentration (MLSS). It is observed that simultaneous removal of organic carbon and nitrogen are feasible by mixed bacterial culture condition. Removal of about 98% of COD after a contact period of 24 hr and 90% of TKN after a contact period of 72 hr for an initial concentration of COD 1046.52 mg/L and TKN 215.24 mg/L are achieved in bi-substrate condition under aerobic environment. The values of biokinetic coefficient, such as k, K_s, k_d ,Y were obtained 9.7/day, 61.14 mg/L, 0.074/day, 0.75 for carbon oxidation and 1.01/day, 48.78 mg/L, 0.049/day, 0.29 for nitrification, respectively.

Adsorption of Basic Dyes Onto Activated Carbon Prepared From Teak Leaf

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Activated carbon prepared from teak leaf (TLC) was used to study adsorption of crystal violet (CV) and rhodamine-B (RB) under various experimental conditions. Effect of various experimental parameters, such as initial concentration of dye, adsorbent dosage, contact time and pH of solution was studied. The percentage removal increases with decrease in initial concentration of dye and the percentage removal increases with increase in contact time and dose of adsorbent. Batch adsorption studies were carried out at room temperature (30±1^{O}C). Adsorption parameters were modeled by Freundlich and Langmuir isotherm models. Adsorption data were fitted with the Natarajan and Khalaf and Lagergren and Bhattacharya and Venkobachar equations. The adsorption process follows first order kinetics, with intraparticle diffusion as one of the rate limiting steps.

Suitability of *Rhizopus Stolonifer* for Removal and Recovery of Cr (T) From Dilute Tannery Effluent

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Contamination of aquatic resources by a variety of heavy metals is of growing concern because of health risk posed by the exposure to flora and fauna as well as human being. The vast majority of toxic metals are the waste products/byproducts of industrial and metallurgical processes. Other possible sources include the effluent from electroplating, storage battery manufacturing industries, tanneries, municipal sludges, extractive metallurgy processes, and metal finishing operations contains high amount of dissolved metals and the

concentration reaches to a significant range. The value is very high in relation to water quality standards, as prescribed by the various regulatory authorities at national and international levels. The conventional decontamination methods are chemical precipitation, solvent extraction, electrodialysis, electrolytic extraction, application of ion exchange resins, activated charcoal adsorption, etc., which involves high operation and maintenance costs, which has stimulated a search of new decontamination technologies for effective- and economic removal of such priority pollutants. Microorganisms, like bacteria, yeast and fungi, as well as algae can accumulate large amounts of heavy metal ions. Biosorption is considered to be a fast physical or chemical process. The biosorption rate depends on the type of the process. Microbial removal of heavy metals offers the advantages of low operating cost, minimizing secondary problems with metal-bearing sludge and high efficiency in detoxifying very dilute effluents. To assess the said qualities, the composite sample was collected from a tannery to study the metal removal efficiency of the promising isolate *Rhizopus stolonifer* in the laboratory. The chemical analyses of the effluent have shown the significantly high Cr (T) concentration ((705 mg/L). Various batch experiments were performed with dilute effluent. The mycelial mass of the isolate was tested under various physical treatment conditions, like formalin treated, alkali treated and untreated mycelia. The results of formalin treated biomass have shown improvement in the sorption efficiency of the isolate (98%) than the native culture (87%). However, the alkali treatments of the biomass have substantially reduced the efficiency (57%). Further optimizations in the experimental variables have shown improvement of removal of target metal. The performances of EDTA and NTA were found satisfactory upto 4th cycle of sorption/desorption. This paper describes the findings in detail.

Adsorption of Malachite Green Using a Low-Cost Activated Carbon Prepared From *Cassia fistual*

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In the present study the efficiency of the carbon adsorbent prepared from the *Cassia fistula* seeds was tested for the removal of malachite green dye from aqueous solution. The parameters, such as pH, adsorbent dosage and initial dye concentration were systematically evaluated. It is an N- methylated diaminotriphenyl methane dye widely used for colouring purpose and highly cytotoxic to mammalian cells. The percentage removal of malachite green increased with concentration of the dye solution. Nearly 40% adsorption was noted at pH 10 in 180 min of contact time at initial concentration of 400 mg/L with 300 mg of the low-cost adsorbent. Removal of malachite green increased from 24.05 to 28.23% with increasing adsorbent dosage from 300 to 600 mg in 180 min of agitation time, using 100 mL of dye

solution of initial concentration of 400 mg/L. Langmiur adsorption isotherm plots and Freundlich adsorption isotherm plots were linear showing the applicability of the isotherms for malachite green adsorption.

Environmental Impact on Water Quality of Nearby Sources due to Sewage Treatment Units at Trichirappalli Municipal Corporation

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Under the environmental impact studies of the sewerage scheme, assessment of the seasonal water quality of the sources around the oxidation ponds and few pumping stations were monitored in Trichirappalli Sewerage Scheme, Tamil Nadu. Physical,chemical and biological characterstics of 4 water supply sources around the oxidation ponds and one source each around the 3 pumping stations were observed during May 2010 and November 2010.Results indicated that the values of total dissolved solids,total hardness,nitrate,chloride and coliform were exceeding the standards of cause for rejection in most of the sources. Neccessary steps should be taken to avoid intrusion of pollutant loadings.

Removal of Mixture of Textile Basic Dyes Using Low Cost Artocarpus Heterophyllus Seed Carbon - A Batch Adsorption Study

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Batch adsorption study was investigated for the removal of single and binary mixture of basic dyes (bismark brown (BB) and safranine (SF)) using artocarpus heterophyllus seed carbon (AHSC) in the aqueous solution. The effect of various experimental parameters has been investigated using a batch adsorption technique to obtain information on treating effluents from the dye industry. The extent of dye removal increased with increase in amount of adsorbent used and the initial pH of the dye solution. Adsorption data were modeled using the Freundlich, Langmuir, Tempkin and Redlich-Paterson adsorption isotherms and pseudo first and second order kinetic equations. The adsorption model shows the formation of monolayer coverage of the dye molecule, at the outer surface of the adsorbent. The results indicate that jack fruit seed carbon can be used in wastewater treatment for the removal of colours and dyes.

Studies on the Removal of Reactive Orange 16 From Aqueous Solution Using Cocoa Shell Carbon as an Adsorbent

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The objective of this study was to investigate the removal of reactive orange 16 (RO16) dye from synthetic wastewater by the adsorption on cocoa *(Theobrama cacao)* shell activated carbon (CSAC). The operation parameters investigated included initial concentration and contact time, initial pH and adsorbent dose. Experimental tests were conducted in a batch process. Equilibrium isotherms were analyzed using Langmuir, Freundlich and Tempkin adsorption models. It was found that Langmuir isotherm model is an appropriate model to explain the adsorption isotherm. The maximum monolayer adsorption capacity of CSAC was found to be 27.02 mg/g by using Langmuir model equation. Pseudo-first order, pseudo-second order and intraparticle diffusion models were used to examine the experimental data of different initial concentrations. It was found that the pseudo-second order kinetic equation described the data of dye adsorption on the adsorbent very well.

Activated Charcoal (Neem Oil Cake) Treatment of Spent Sulphite Liquor Wastewaters in Three-Phase Fluidized- bed Reactor

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The aerobic pollution load (COD and BOD) removal of spent sulphite liquor using activated porous spherical charcoal prepared from neem oil cake both as adsorbent and fluidizing particle was studied in a fluidized- bed reactor. Optimum operating parameters were: Operating time, 8 hr; adsorbent dosage, 35 g; adsorbent size, $8\acute{}10^{"3}$ m; pH, 5.5; temperature, 50ºC and feed flow, 10 L / min. Maximum COD and BOD reduction from spent sulphite liquor wastewaters were observed as 85.76 % (w/w) and 88.39 % (w/w) at optimum parameters.

Treatment of Black Liquor with Activated Neem Oil Cake Carbon in Continuous Stirred Batch Reactor

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The pollution loads (COD and BOD) and colour removal of black liquor using activated spherical carbon prepared from neem oil cake as adsorbent was studied in continuous stirred batch reactor. Optimum parameters were : Contact time, 80 min; adsorbent dosage, 20 g/L; adsorbent size, $8x10^{-3}$ m; pH, 5.5 and stirring speed, 50 rpm. Maximum COD and BOD reduction from black liquor wastewaters were observed as 91.35 % (w/w) and 93.56 % (w/w) at optimum parameters. Maximum colour removal from black liquor was 89.62 % (OD at 465 nm) at optimum conditions. The Langmuir and Freundlich, isotherms had been applied for the study. The adsorption models were fitted reasonably well with experimental data for treatment of black liquor with activated spherical carbon prepared from neem oil cake.