

BOOK OF ABSTRACTS



*International
Conference on Waste
Treatment and
Valorization*

26-27 November 2019 Constantine Algeria



UNIVERSITY OF SALAH BOUBNIDER
CONSTANTINE 3
FACULTY OF PROCESS ENGINEERING

Environmental Process Engineering Laboratory



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BOOK OF ABSTRACTS

International Conference on Waste Treatment and Valorization (ICWTV2019) Constantine Algeria

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International Conference on Waste Treatment and Valorization

26-27 November 2019, Constantine - Algeria

Backg round-objectives

The Conference on Waste Treatment and valorization is organized by the Environment Process Engineering Laboratory of University Constantine 3 Salah Boubnider with the contribution of the faculty of process engineering with its research laboratory: Laboratory of Engineering and Environmental Processes (LIPE), in collaboration with the GIZ (Gesellschaft für Internationale Zusammenarbeit) organism.

The main objective of the conference is to present the advances achieved in this challenging field and to provide an opportunity for researchers to meet and to discuss the different technologies dealing with this topic, exchanging their ideas, considering its various aspects be they environmental, economical, social, etc.

Plenary lectures are given by eminent Professors from different countries followed by oral or poster presentations still around this topic. These are supported by selected local exhibition stands



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ORAL PRESENTATIONS



Effet du pH sur la production de l'enzyme alpha-amylase des champignons entomopathogènes sur milieu à base de déchets de bananes

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Abstract

La production de l'enzyme alpha-amylase a été réussie par certaines bactéries, levure et certains genres de moisissures. L'isolement des souches fongiques, à partir des *Ectomyelois ceratoniae*, a permis de répertorier 14 isolats représentant 3 genres : *Aspergillus*, *Fusarium*, *Cladosporium*. L'effet de pH sur la production d'alpha- amylase a été étudié par réalisation des fermentations en erlenmeyers de 250 ml, contient 4g de déchets de banane/100ml eau distillée. Les milieux ont été ajustés à différent pH (4,7 et 10), ces cultures ont été incubées pendant trois jours à 28°C. L'analyse des résultat sa révélé que les meilleures activités amyliques a obtenue par la souche *Fusarium sp.*(284,64 U) à pH=10.

Keywords : Champignons entomopathogènes, *Ectomyelois ceratoniae*, alpha amylase, déchets de banane, pH



Separation of non ferrous particle from waste by new single disk eddy current separation

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Abstract

The single disk eddy current separator is used for sorting non ferrous particles from wastes by using a strong variable magnetic field. This separator is characterized by horizontal single disk covered with an alternating neodymium permanent magnet of 1.4 Tesla. The aim of separator realization permitted to sorting aluminum particles with different size by considerable ejection force with important rate of separation in this paper. These results help to increase the separation force and the recovery rate of recycling materials with high purity.

Keywords: separator, eddy current, non ferrous, magnetic field, waste particle, single disk



Application of thin layers of zinc oxide and iron-doped zinc oxide for the photocatalytic degradation of an organic pollutant; kinetic study

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Abstract

The present work focuses on methyl green (MG) dyes degradation as recalcitrant pollutants model in synthetic industrial water. In order to overcome the cost of recovering a photocatalyst powder, the suspensions are replaced by zinc oxide thin layers (ZnO and ZnO: Fe) deposited on glass substrates by simple technique of " Pyrolysis Spray ". Free sunlight replaces too expensive artificial light sources. Iron doping zinc oxide (ZnO: Fe) allows to move spectrum absorption towards longer wavelengths, thus allowing to larger part spectrum exploitation. Semiconductor optical characteristics determination (transmittance, energy gap) as well as photocatalytic degradation were made using a UV-visible spectrophotometer. The catalyst was characterized by X-ray diffraction (XRD). Dye degradation followed the pseudo-first-order kinetics. Catalysis reaction showed high dependency on medium pH. Alkalinization accelerates degradation kinetics, while its acidification slowed them down. Alcohol (Isobutanol) use confirms that photocatalysis mechanism passes largely by hydroxyl radicals. Iron (5%) doping ZnO made it possible to improve photocatalytic degradation efficiency. Degradation rate range from 35% to 88%, when the UV lamp is replaced by sunlight irradiation, for 90 minutes.

Keywords: Methyl green; Pyrolysis Spray; ZnO; doping; Photo-catalyze; solar irradiation.



Optimization of carotenoids extraction from the industrial by-product of chili puree

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Abstract

Hot chili puree takes a strategic place in our diet due to its innumerable culinary, nutritional and medicinal properties. This investigation aims to optimize the extraction of carotenoids from the industrial by-product rejected during the production of chili puree (Harissa). The first step consisted of studying the extraction kinetics by solvents characterized by variable polarities (5 alcohols, 4 polar aprotics, 4 hydrocarbons, chloroform, and water); thereafter a mixture design (simplex lattice type) was realized in order to find the optimal combination of the three best solvents. The results show that acetone, hexane and petroleum ether were the most efficient solvents for the recovery of carotenoids. The mixture design applied by using the last three solvents indicated that the established model was efficient (the coefficient of determination was 0.89 and the Fisher test indicates a very highly significant of the model with $p < 0.0001$). The validation of the developed model manifests close results between the calculated optimal value and the experimental ones, which indicated its validation. The best combination of solvents was acetone/petroleum ether/hexane of 60%/40%/0%. The solvents mixture allows extracting an optimum carotenoids content of 42mg kg⁻¹ DM. The obtained results can be used for the extraction of carotenoids and allow a better valuation of the by-product removed during the production of chili puree.

Keywords: By-product, Carotenoids, Chili puree, Extraction, Optimization.



Valorization of poultry feathers by production of bacterial keratinases

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Abstract

Worldwide, poultry processing plants produce thousands of tons of feathers per year as waste. Their β -keratin content is largely responsible for their high degree of resistance to degradation processes. In several countries, poultry feathers and other waste are disposed of by incineration. The degradation of keratin uses drastic chemical methods and softer enzymatic methods, the use of keratinases is the current alternative. These enzymes are proteases that are mainly synthesized by a diverse group of microorganisms that account for 60% of total enzyme sales in the global market.

The main objective of this study is to this end and is organized on the experimental part, the latter concerns the application of the complete factorial plan in order to optimize the production of keratinases by the strain *Bacillus atropheus* BN2, it is isolated from a hen house in Bejaia in 2017. the proteolytic activity of the strain *Bacillus atropheus* BN2 is tested on a agar medium based on skimmed milk and the keratenolytic activity is measured on a liquid medium based on feather meal (FBML), the optimization of enzymatic production is achieved by a first-degree experimental design by selecting four factors: incubation temperature, inoculum rate, pH and the concentration of the feather meal.

The results obtained confirmed that the strain is producing keratinase (26.22 U/ml), it also exhibits proteolytic activity on a agar medium, keratinase production is maximal at an incubation temperature of 34°C to 34.66°C, at an inoculum rate of 4%, at a pH of 8, and at a feather meal concentration of 15 to 16.1 g/l.

This study shows that the strain *Bacillus atropheus* BN2 has the maximum keratinolytic activity on feather flour, the latter could prove to be a potential candidate for exploitation and industrial application of the enzymes it produces.

Keywords: *Bacillus atropheus* BN2, keratinases, optimization, poultry feathers, valorisation.



Bio coagulation process for dye and COD removal using carob from aqueous solution: Optimization through response surface methodology

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Abstract

In this study, performance of a new bio coagulant (the carob) and a bio flocculent (cactus) for the removal of methylene blue dye and chemical oxygen demand from aqueous solutions were investigated. For this purpose, response surface methodology (RSM) was applied to optimize four operating variables of coagulation/flocculation process including coagulant dosage, flocculent dose, initial pH and initial dye concentration. The results showed that the decrease of initial pH was always beneficial for enhancing dye and COD removal. The optimum carob dosage, cactus dosage, initial pH and initial dye concentration were found to be 775mgL^{-1} , 50mgL^{-1} , 2 and 10mgL^{-1} , respectively. Dye removal of 98.34% and COD reduction of 75% were observed which confirms close to RSM results. Therefore, it can be concluded that using the carob as a low-cost material into the coagulation/flocculation process in the dye removal can offer some advantages such as high efficiency for methylene blue dye removal and economic savings on overall treatment plant operation costs.

Keywords: bio coagulation, bio flocculation, dye removal, RSM



Chemical Extraction of a Biopolymer Chitosan from Shrimp Shell Waste

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Abstract

Sea food, a delicacy for many are seen in market in a wide variety of products. The sea food industries during the processing, the meat is only taken, while the head and shells are generated as waste. This results in generation of large amount of shell waste globally. Even though the wastes are biodegradable, the dumping of large quantities makes degradation process slow resulting in accumulation of waste overtime which is a major environmental concern [1].

For this reason shrimp shells waste was recycled and used for the extraction of chitosan as a commercially valuable product used in different fields (corrosion inhibitor, food industries, body care product, agriculture...). Chitosan is distinguished by the degree of deacetylation we talk about chitosane when this degree is greater than 50%.

In this present study we were interested firstly in the chemical extraction of chitosan from shrimp shell waste by demineralization, deproteinization, decolorization and deacetylation processes and secondly in the physicochemical characterization of the obtained product with different methods such as XRD, FTIR, moisture content, residue on ignition, degree of deacetylation and solubility was also analyzed. The chitosan yield was found to be 84.46%. Chitosan obtained had 10% moisture content, and 73.45% degree of deacetylation. Residue on ignition was only 2.75% and was soluble in 1% acetic acid solution. The FT-IR, and XRD data confirm the structure of chitosan and show a similarity between our product and the commercial one.

Keywords: extraction, chitosan, waste, shrimp shell



Abatement of organic load from landfill leachate by adsorption onto raw and chemically modified olive stones

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Abstract

In this paper, the batch adsorption efficiency of raw and chemically treated olive stones (OS and TOS) were investigated, as low-cost agricultural by-product, towards chemical oxygen demand (COD) removal from real landfill leachate (initial COD concentration=8000 mg L⁻¹ and initial pH=8.2). Adsorbent mass, contact time and initial pH value were studied to evaluate their effect on COD abatement. The kinetic study showed that adsorption of COD from landfill leachate onto OS and TOS was described by a pseudo-second-order model. At equilibrium, the results obtained are adjusted to the model of Langmuir ($R^2 \geq 0.99$), with a maximum adsorption capacity for COD of 90.91 mg g⁻¹ for TOS, and 31.25 mg g⁻¹ for OS at 50 °C and pH=11. The negative Gibbs free energy value and the positive enthalpy change showed that adsorption process was spontaneous and endothermic. These results obviously show that TOS may be successfully used as biomaterial for elimination of organic pollutants from wastewater.

Keywords: adsorption, chemical oxygen demand, landfill leachate, lignocellulosic waste.



Contribution of olive pomace to Household waste for the Production of natural compost in Algeria

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Abstract

The management of household waste in Algeria is one of the major and topical environmental Problems, in addition to this ,in the Mediterranean region, the olive industry products mainly olive oil; but also large quantities of waste (olive pomace, margins) that are harmful to the environment. However, their chemical composition is very rich in organic matter; they are unexploited and not valued in our country. Their valorization is therefore necessary. Thus, mechanization is one of the technologies based on the degradation of organic waste by microorganisms and in the absence of oxygen and production of a wet product rich in organic matter called digestate and a biogas composed mainly of methane (mixture of CO₂ and CH₄).

This natural transformation is carried out in confined spaces called 'digesters, we are interested in this experimentation to the addition of the olive pomace to the household waste for a better natural fertilizer of poor soils 'compost', we experimented with two identical experimental biodigesters HWD and HWOD under the same conditions but different in the nature of the substrate (HWD: household waste and HWOD: mixture of household waste / olive pomace). The HWD and HWOD composts obtained from the anaerobic degradation are considered as mature, Indeed, the pH (7,9), the %H (56,5 and 40,0 %H), the %MS (43,53 and 60.19 %MS), %Nt (1.8 and 1.4 %Nt) respectively for HWD HWOD, have

physicochemical characteristics similar to compost obtained by composting, so the addition of olive pomace does not seem to influence these characteristics. On the other hand, they have relatively high contents in TOC% (11.4 and 33.3%), MO% (19.68 and 57.42%) and HWOD has a C / N ratio 3 times higher than HWD (23.30 and 6.80). Thus, the olive pomace contributes to increase the organic carbon content and the organic matter and thus promotes a better maturation (C / N) and produces a mature compost of quality.

Keywords: Organic wastes, Compost, anaerobic degradation, valorization, biodigesters



Effet des conditions opératoires sur la réduction du métronidazole d'une solution aqueuse par coagulation-floculation

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Abstract

La protection de l'environnement est un problème majeur pour l'humanité. Un volet important et vital concerne la préservation des ressources en eaux, en effet ces dernières sont menacées par une pollution diffuse et multiforme aggravée par le progrès dans le bien être de l'homme, une industrialisation sauvage et une démographie galopante.

La présence de résidus d'antibiotiques dans les eaux usées a un impact néfaste sur la qualité et le fonctionnement des écosystèmes aquatiques. Par ailleurs, cette présence pourrait contribuer à l'apparition de souches bactériennes antibio-résistantes et de ce fait représenter un risque pour la santé publique. Une technique de traitement adéquate est nécessaire pour assurer une bonne efficacité de l'élimination des antibiotiques dans l'eau.

Dans ce travail nous avons eu recours à la technique conventionnelle: coagulation-floculation en mode batch pour l'élimination du métronidazole en solution aqueuse. Une série d'essais a été menée pour déterminer les conditions optimales du traitement, à savoir, le type du coagulant, dose du coagulants, l'ajout de sel et pH.

Les résultats obtenus indiquent que les taux de rendement est meilleur avec le sulfate d'alumine $Al_2(SO_4)_3$, néanmoins le pH du milieu semble être aussi un paramètre déterminant.

Keywords : Métronidazole, Coagulation-floculation, Sulfate d'alumine, pH.



Lean management as a method of improvement for reducing construction waste in Algeria

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Abstract

The waste is any step or action in a process that is not required to complete a process (called “Non Value-Adding”) successfully. When Waste is removed, only the steps that are required (called “Value-Adding”) to deliver a satisfactory product or service to the customer remain in the process. The 8 Wastes of Lean are Defects, Overproduction, Waiting, Non-Utilized Talent, Transportation, Inventory, Motion, and Extra-Processing. Wastes usually result from poorly managed systems and process that result in excessive time and cost. The level of waste associated with construction projects has been reported to be as much as 50 percent, and is attributed to inefficiencies through design, mobilization, construction and maintenance activities in Algeria. The main criterion for success of any construction projects is to deliver the project without time or cost overrun. Lean management is a new management technique that has been successfully implemented in many countries to increase the probability of a project success and it became crucial in construction sector to achieve the maximum value with minimum waste, time, and cost. This research examines the effectiveness of implementing lean thinking on the performance of Algerian construction projects. For the purpose of achieving the goal of this article, mixed methods were adopted by combining qualitative and quantitative research approaches. A questionnaire survey was conducted as the primary data collection method, it was designed and administered in one of the leading construction companies in Algeria. This questionnaire was used to investigate the main factors impacting the construction projects performance and to identify the employees’ understanding regarding the lean thinking/techniques in the Algerian construction projects. The questionnaire is classified into 3 main sections as follows:

Section (A): is structured to investigate general information and background about the respondents’ experience.

Section (B): is structured to identify the factors affecting the overall performance of the project in current practice and the methods adopted to reduce these negative impacts.

Section (C): is structured to examine the respondents’ awareness about lean techniques and their applications in the Algerian construction projects.

Keywords: construction projects, lean management, waste, Algeria



Algal biotechnology and mass culture for biofuel prospective in Algeria

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Abstract

Microalgae are the main pillars of scientific researches. Realistic assessment of algal biomass as potential feedstock of biofuel was estimated. Algae transform light energy to chemical energy through photosynthesis. The chemical energy is mostly stored in oils and carbohydrates which are the feedstock of biodiesel and bioethanol industries.

Simultaneously, they allow to fix certain toxic compounds of the wastewater and to supply the O₂ to the bacteria which will be in charge of the degradation of the organic matter. The effectiveness of this biotechnology increase when it is applied in petroleum refineries by the production of micro-algae using the CO₂ from the flue gases, and treat discharged wastewater loaded with nutrients.

Keywords: Biofuel, Environment, Microalgae, wastewater



Biological treatment and valorization of poultry feathers waste in Bejaia region

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Abstract

The application of biotechnological means in the treatment and valorization of poultry feathers generated by the poultry farming industry in Algeria is very interesting because of the large quantities produced each year.

The work objectives are research and identification of indigenous bacterial strains of the Bejaia region capable of producing high performance thermostable keratinases to meet the requirements of industrial applications.

The poultry feathers and feather co-products samplings are carry out from four different sites in the Bejaia region. Isolations after pretreatments and purifications are performed on media based on poultry feather meal locally recovered.

The obtained isolates screening is achieved by using buffered keratin substrate solutions prepared from locally recovered poultry feather meal. Physiological characterization by study including tolerance to temperature and pH.

This search allowed us to select three news Actinomycetales strains : ES 41, ES 31 and EP 41 endowed with keratinolytic capacities and characterized by using poultry feather meal locally recovered as inexpensive waste.

The wide temperature and alkaline pH tolerance of keratinase (s) isolated strains makes them ideal candidates for further research for potential applications in industrial settings.

Keywords: Actinomycetes, alkalotolerance, keratinases, keratinolytic activity, thermotolerance



Valorization of tea waste as low-cost biosorbent for acetic acid removal from aqueous solutions

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Abstract

In this study, tea wastes were evaluated for the preparation of a low-cost biosorbent for use as a natural carrier for the removal of acetic acid from aqueous solutions. In order to clarify the adsorption process, batch experiments were carried out to study the effect of the operating parameters on the adsorption process such as: the initial concentration of acetic acid (0.01-0.1 mol L⁻¹), the time contact (5-60 min) and temperature (15-35 °C) were studied. To describe the adsorption equilibrium, the experimental data were analyzed by Langmuir isotherm and Freundlich isotherm. The equilibrium is perfectly described by the Langmuir model whose correlation coefficient is greater than 0.99 with a maximum adsorption capacity of 3.36 mmol g⁻¹. The results of the present study show that tea waste can be advantageously used as a low cost biosorbent for the removal of an acid from aqueous solutions.

Keywords : Tea wastes, Valorization, Biosorbent, Adsorption, Acetic a



Architecture and Circular Economy ; Reusing Building Waste in Sustainable Architectural and Landscape Projects

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Abstract

Our current economic model in buildings and public works sector relies on a perfect linear outline – Extraction >Transportation >Processing >Construction >Demolition. This model has actually led to large material profits but still finds its limits in the face of a double environmental crisis; on the one hand, the depletion of natural resources and grey energy, and on the other, a growing production of waste with all the risks of pollution on the environment and public health. The circular economy realizes in this sense, the objective of moving to a model of positive value creation, where the materials used remain ideally resources rather than become waste through the notion of 3R; Reuse, Recovery and Recycling. In Algeria, the building is an expanding sector and represents one of the most important generators of waste resulting from demolition and deconstruction, unsuited to the mode of treatment that suits them, which puts their management in question. This work consists of a bibliographical synthesis that highlights the steps taken to characterize and identify the potential of waste reuse in Algeria. The main aim is to highlight their technical and performance characteristics and their possibilities for use in an eco-built architecture. Feedback from experiments will be presented with new uses opportunities, in rehabilitation, facade treatment, urban planning, etc. They will accompany us in the development of a repertoire of architectural design techniques and assemblies that use waste recovered on one side, and in the proposal of a methodology that is conducive to promoting the circularity of its new materials by reasoning in a temporality and a local territory.

Keywords: Reuse, Demolition Waste, Circular Economy, 4R, Eco construction.



Lean construction for elimination waste of projects in construction companies in Algeria

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Abstract

Lean construction is a new way of approaching the site by eliminating all forms of waste, this philosophy is widely spread on construction sites following multiple failures that have caused a dysfunction at the project level and the waste of different resources

Lean construction offers a high flexibility of products and processes, without having to use major technological means. Especially with the continuous evolution of the construction market and competition between different companies, it is therefore important to get an update on its current status in order to be able to set achievable objectives at the level of Algerian construction companies to eliminate the causes of waste.

The aim of this paper to propose a model for evaluating the quality of construction based on the different elements of lean construction by means of a questionnaire sent to two Algerian companies specializing in the construction sector, one of the companies specializing in HVAC works and the other in construction work . As the level of performance of these companies in relation to the use of Lean Construction has been obtained, to verify how it has been understood and how its principles have been applied through the use of different indicators to measure the gap.

. After this step, the results were evaluated and suggestions were made for companies to help them implement Lean Thinking in order to apply the different lean construction practices and see the possibility of implementing lean in the two companies analyzed.

Keywords: Lean construction, waste, performance, Algerian companies



Implementation of a Capacity Tester under Android for Recycling by Recuperation of Lithium-Ion 18650 Batteries

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Abstract

The objective of this article is to propose a prototype implanted under android allowing recycling and recovering lithium-ion 18650 rechargeable cells of damaged laptops in order to manufacture new batteries for other uses and to reduce environmental pollution. For these reasons, we used a mini embedded system based on an arduino board carrying in its core an algorithm for testing capacity of the lithium-ion 18650 cells. Minimization of the realized device has permitted to facilitate communication and to display results in a smartphone in which an android application has been developed in order to show the various parameters identifying state of the cells.

Effectiveness of the tester is proven according to a table including percentages of deteriorated cells recovered and recycled. Thus, these cells will participate as new elementary units in design of other specific batteries and contribute to minimize environmental pollution.

Keywords: Recycling; Lithium-Ion 18650; Capacity tester; Selection; Arduino; Android



Anaerobic Digestion of Orange Peel Waste: Preliminary Batch Results

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Abstract

Citrus waste presents more than 50% of the whole fruit when processed for juice extraction. A large amount of this waste is still dumped every year causing environmental problems due to the accumulation of high organic content materials. Among valorization possibilities, anaerobic digestion AD for methane generation appears to be the most technically feasible and environmentally friendly alternative. However, citrus essential oils (90% limonene) present in the peels can inhibit this biological process. In this paper, The aim of the work was to investigate the possible use of orange peel waste (OPW) for biogas production in an anaerobic digestion process and investigating the effect of limonene on AD by keeping the limonene concentration low during the digestion process using a suitable treatment of OPW prior to the digestion. Batch AD was carried out using two experimental setups that were operated simultaneously using raw OPW and de-oiled OPW treated with steam distillation for limonene removal, the biochemical methane potential test was carried out in two different thermal conditions: the thermophilic (T= 55°C) and the mesophilic one (T= 37°C) to evaluate the effect of temperature on biogas production. The obtained results of biogas production showed a remarkable increase comparing with the untreated samples: 45% (T=37°C) and 75% (55°C) improvement after SD showing clearly the treatment efficiency, The highest recorded cumulative methane production of pretreated orange peel waste was 390 mL.gTvs-1 and 210 mL.gTvs-1 for mesophilic and thermophilic phases respectively.

Keywords: Anaerobic digestion, biogas, orange peels waste, steam distillation



Valorization of polyethylene terephthalate (PET) waste into carbon. Modeling of isotherms and adsorption kinetics

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Abstract

The polyethylene terephthalate (PET) from bottle waste has been valued as a precursor for the preparation of carbon by carbonisation under flow of nitrogen used for the removal of lead (II) ions from an aqueous solution. The effect of initial lead (II) ion concentrations on lead(II) removal has been observed. . Measurements of the equilibrium concentrations for different initial concentrations of Pb^{2+} made it possible to plot the adsorption isotherms. The application of the Langmuir, Freundlich, Sips and Redlich-Peterson models and the generalized model revealed that the Langmuir, Sips, Redlich-Peterson and Generalized models are those which describe in a very satisfactory manner the adsorption of Pb^{2+} ions. For adsorption kinetics, the pseudo-first order models, the second-order model and the intraparticle diffusion model as well as the diffusion chemisorption model were tested.

Keywords: valorization, PET, isotherms, kinetics



Thermophilic anaerobic co-digestion of spent coffee grounds and broad bean in batch digester: Focussing on mixing ratios

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Abstract

The severe environmental pollution in many countries is caused by indiscriminate discharge of large quantities of food waste, and sewage sludge to the environment. There are many possible treatment routes, but anaerobic digestion (AD) is now well accepted for treating several kinds of organic wastes. Recently the interest in using this technology has gone rapidly growing thanks to the boost impressed by new and stricter regulations on organic waste disposal as well as by the need of finding new sources of energy alternative to the fossil fuels. An interesting option for improving yields of AD of solid wastes is co-digestion (AnCoD). That is, the use of a co-substrate, that in most cases improves the biogas yields due to positive synergisms established in the digestion medium and the supply of missing nutrients by the co-substrates. In addition, economic advantages derived from the fact of sharing equipment are quite significant. The key to successful anaerobic co-digestion is the substrate, especially its composition and the proportion of each substrate in the feed mixture. Thus, the aim of this study is to investigate the optimal operational conditions in terms of percentages of spent coffee grounds (SCG) and broad bean (BB) as co-substrates by assessing biogas production under thermophilic conditions.

Keywords: Anaerobic codigestion, Biogas, Broad bean



Valorization of Algerian secondary date cultivars wastes by hydrothermal treatment of date pastes

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Abstract

Several Algerian date cultivars are marginalized and therefore they are considered as wastes. In this contest, the current study was conducted to valorize this agrobiodiversity. Six date pastes were prepared and their ethanolic (65%) and aqueous (thermally treated) extracts were analysed for their sensory characteristics, physico-chemical composition (GC), phenolic content, phenolic profile (HPLC) and their in vitro antioxidant and antimicrobial activities. The prepared date pastes were appreciated by the panellists; with a preference to date paste prepared from tamjouhert variety. They were tasty, consistent, spreadable and sliceable; they had acceptable smell and colour. Samples were characterized by high amounts of sugar, mainly glucose and arabinose, followed by water and ash contents and low proteins and fats contents. The PCA test allowed visualizing significant ($P < 0.05$) correlation between physicochemical parameters and sensorial ones. An increase of total phenolic content in the hydrothermal extracts was observed compared to organic extracts. The pastes shared quietly the same phenolic patterns with a dominance of gallic acid. Regardless the extraction solvent, the samples exhibited potent biological activities. They displayed a strong microbial growth inhibition against all the test microorganisms. The chelating capacity and H₂O₂ free radical scavenging capacities were compared to commercial standards (BHT). The correlation study showed clearly that the total phenolic content was significantly correlated with these activities. Relying upon the obtained results, Secondary date wastes have nutraceutical effects and several potentialities. Hence, this could contribute to the promotion of the local economy by turning the surplus of date to several date by-products, including date pastes.

Key words: Agro-biodiversity; Phoenix dactylifera L; Waste; Date Paste; hydrothermal treatment; Bioactivities.



Valorisation of *Thomson* orange peels (*Citrus sinensis* L.) by extraction and incorporation of their phenolic compounds in yoghurt

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Abstract

This work was a contribution to the valorisation of Thomson orange peels. The objectives of this work were to determine the optimal conditions of the phenolic compounds extraction from orange peels, and to incorporate the obtained extract in yoghurt. The effects of solvent concentration (30-100%), extraction time (15-120 min), particle size (125-710 μ m), and sample to solvent ratio (0.1/20-0.5/20 g/ml) on the extraction of total phenolic compounds and antiradical activity of the extracts from orange peels were significant ($p < 0.05$). Sequential methodology was followed to study the influence of each factor independently. The best extraction conditions were: 70% acetone, 30 min, 250 μ m, and 0.2 g/20 mL for solvent concentration, extraction time, particle size, and sample to solvent ratio, respectively. The total phenolic content and antiradical activity of the obtained extract were 6.26 g GAE/100g DM, and 33.64 g AAE/100g DM. The results also showed that antiradical activities (DPPH) of extracts were positively correlated with the total phenolic contents results. The incorporated extract in yoghurt had demonstrated an antioxidant quality (895.39 g AAE/100g of yoghurt), and total phenolics, total flavonoids, total flavonols, and total ortho-diphenols were obtained in yoghurt with a respective contents of 258.60 mg GAE/100 g of yoghurt, 106.86 mg QE/100 g of yoghurt, 17.74 mg RE/100 g of yoghurt, and 52.43 mg CAE/100 g of yoghurt. Orange peels waste had a potential source of phenolic compounds, which could replace synthetic antioxidants in food industries and play a major role in human health.

Keywords: antioxidant activity, extraction conditions, orange peels



Elaboration of biodegradable materials for food packaging application

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Abstract

The actual context is putting the environmental considerations as a key element to make into account while the elaboration of new process or material, in this regard our work carry on the elaboration of bio plastic which could be a ecological alternative for the plastic package which is the root cause of plastic pollution.

The main task to fight against solid pollution and to better manage our wastes is to reduce their generation and their impact on the environment by using biodegradable materials and eco-friendly process instead of polluted materials which make us in a dilemma regarding the treatment phase in the end life cycle of such materials.

We are working on the elaboration of bio plastic films based on thermoplastic starch (TPS) reinforced with natural fibers (linen fibers) or PLA to enhance the mechanical characteristics and render this biofilm appropriated for food package uses; we are trying to get the best film by changing the following parameters the percentage of incorporated fibers or PLA , fiber type, PLA percentage, plasticizer agents' type and percentage.

The results will show us the best percentage to be used for getting the best film in term of mechanical characteristics (tensile strength and elongation at the break, thermal stability, morphology, water absorption.

Fourier transform infrared spectroscopy was used to investigate the chemical structure of the samples.

The elaboration of bio plastics releases us from treatment fees and technical difficulties which could appear while handling resistant material and synthetic polymers.

Our work is in the hearth of sustainable development and waste valorisation since that the elaborated material is not only biodegradable but also it replace the plastic films issued from fossil energy which are largely spread in the food packaging applications.

Key words: biodegradable materials, biofilms, starch, natural fibers.



Treatment of a colored water by biocoagulation-microfiltration processes

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Abstract

Dyes are widely used in several fields particularly in the textile industry, wastewater from these industries is one of the most important sources of pollution of surface water, which constitutes a source of environmental degradation, so we need to limit these pollutants as much as possible by putting in place a suitable means of treatment. Numerous processes for treating colored effluents are currently used, these techniques use biological, chemical and physicochemical processes. The choice of a treatment technique is based on two essential criterias: the cost and the effectiveness of treatment. This study was carried out to investigate the effect of acorn leaves as a natural coagulant in the removal of dye from water. In order to determine the best conditions for the removal of a disperse dye, many coagulation-microfiltration tests were performed using the red terasil as dye, the objectif of coagulant was the destabilization of colored suspended matters to improve the efficiency of membrane filtration. The main paramters studied are optimal dose of the bio-coagulant, the optimum pH, filtration time and transmembrane pressure (TMP). The obtained experimental results showed that optimal dose of the bio-coagulant was 10 mL, the permeate concentrations and turbidities are lower than those of the the concentrate. From these results, it can be concluded that the dye is removed by microfiltration and that the use of acorn leaves as a natural coagulant increase the filtration efficiency.

Keywords: Acorn, coagulation, dyes, microfiltration



Intensification of biodiesel production from waste cooking oil via microwave-assisted process

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Abstract

In a context where energy has become essential to the economy, society's preoccupation with the depletion of fossil energy resources has led to a renewed interest in the search for alternative fuels. One of the most promising alternatives is vegetable oil and its derivatives. Every year, a large amount of waste oils and fats that are unsuitable for human consumption or that cannot be processed further are produced around the world. One potential way to use this raw material at low cost is its conversion to biodiesel. In this work, we studied the effect of microwave radiation on the transesterification of waste cooking oil obtained from the restaurant of the university Constantine 3 to recycle it and turn it into biodiesel. From this work it is concluded that the microwave-assisted technique reduces the reaction time with suitable conversion.

Keywords: Biodiesel, microwave radiation, recycle, transesterification, waste cooking oil.



Comparative study on the elimination of organic and inorganic pollutants from domestic wastewater using *Typha latifolia* and sand filter

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Abstract

This study consists of testing the efficiency of a vertical-flow constructed wetland planted with *Typha latifolia* to purify domestic wastewater. The experiment is conducted under pilot-scale composed of beds. Two trays of 22 L capacity are filled with gravel and sand. The first tray is planted with young roots of *Typha latifolia*. In contrast the second unplanted tray is used as control. Each one was retained a treatment period of 14 days. The supplies of systems are exclusively occurred through the release of wastewaters of Souk Ahras city. Presence of plants reduces more important removal of COD (92.22%), TSS (90.64%) and Cd (92.22%). Based on the results found, it is concluded that the treatment of domestic wastewater by the planted system (*Typha latifolia*) allows a significant elimination of organic and inorganic load.

Keywords: inorganic, organic, Souk Ahras, *Typha latifolia*, wastewater.



Pomegranate as an adsorbent for the removal of Rhodamine B from aqueous solution: Kinetic, mechanistic and thermodynamique studies

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Abstract

The adsorption of Rhodamine B dye (RB) was carried out using naturally pomegranate peels powder. The synthetic wastewater was produced in the laboratory to conduct the experiments. The pomegranate peels were gathered and dried in an oven at 105°C for 24h. Maximum removal efficiency was 95.48%. Results have to be analyzed using adsorption isotherm such as Freundlich, Langmuir and Temkin equations to fit the experimental data. Several kinetic models have been investigated to recognize the RB adsorption mechanism onto pomegranate peels. In addition, the thermodynamic parameters, ΔH , ΔS , ΔG , and E_a were also calculated for RB adsorption onto pomegranate adsorbent. This study convinced that the natural pomegranate peels powder proved to be an effective and environmentally adsorbent for basic dyes removal from wastewater.

Keywords: Biosorption, Pomegranate Peels, Rhodamine B, Equilibrium modeling, Thermodynamique



**POSTERS
PRESENTATIONS**



Photochemical oxidation of pharmaceutical product (ibuprofen) in aqueous medium by photo-like-fenton process

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Abstract

The aim of this study is to test the efficiency of the advanced oxidation technics on the process of degradation of pharmaceutical product « ibuprofen » (IBP) in aqueous medium. That is the system Photo-like-fenton (Fe^{3+} -malonate complex / H_2O_2 / UV at 365 nm). The obtained results showed that the fastest degradation was obtained for the ratio $[\text{H}_2\text{O}_2]_0 / [\text{Fe}^{3+}]_0 = 1/3$, at pH = 2.8 and for a concentration of $5 \cdot 10^{-5}$ M of the pharmaceutical product (IBP) . It corresponds to a reaction time of 250 minutes, this is due on one hand to the $\text{CH}_2\text{COOH}^{\cdot}$ [1-2] and OH^{\cdot} [3] radicals generated by the reaction between Fe^{3+} and H_2O_2 which would come from the equilibrium Free malonate / Fe (III) complex , described by some authors Dong xue Xiao, Yaoguang Guo , Lou Xiaoyi, Changling Fang, Zhaohui Wang, Jianshe Liu. We noticed also that the ibuprofen ($5 \cdot 10^{-5}$ M) was not sensitive a well as with the peroxide of hydrogen as with the Fe^{3+} . Tests in natural irradiation have shown a faster degradation of this pollutant under excitation by sunlight highlighting the effectiveness of the Fe (III) -Malonate system in the water depollution. The COD measurement tracked the mineralization of ibuprofen by advanced photochemical oxidation processes. From this work, We conclude that the process Photo-like-Fenton is very effective process to degrade the pharmaceutical product ibuprofen (IBP).

Keywords : Organic complex, Fe (III) -Malonate, ibuprofen, photo-fenton, hydrogen peroxide.



Valorization of molasses as a bacterial culture medium

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Abstract

The agri-food industry generates a wide variety of potentially recoverable waste, which gives it a co-product dimension. They represent an excellent source of clean energy and give them a high value. The recovery of industrial waste makes it possible to reconcile economic benefits with environmental protection.

In this case molasses, which is a sugar cane refining co-product of *Saccharum officinarum* sugar cane, it represents an excellent source of clean energy and a high benefit both nutritional and functional.

The objective of this work is to optimize a molasses culture medium, which has been used as a source of Carbon and a few minerals for the production of a Haloarchaeae strain by the experimental design method. At the end of our study, it appears that molasses has an interest in adequacy with its nutritional value.

Indeed, physico-chemical and HPLC analyses of molasses have revealed a high sugar content, which allows it to be considered an important carbon source for the growth of various microorganisms.

The test to valorise molasses as a culture medium for the production of haloarchaeae, which are known for their various industrial interests, namely the production of biosurfactants, enzymes and other metabolites, found that NH_4Cl is a more adequate source of nitrogen for growth.

Crops with good growth have produced pigments that may be of economic interest. However, none of them gave antibiotic substances.

In addition, the optimization test by fractional screening design made it possible to construct a regression equation - validated by the Analysis of Variance - for the growth of strain S1 as a function of molasses Concentrations, NaCl, NH_4Cl , MgSO_4 , and Tris/HCl.

From the results obtained, it seems obvious that molasses is a culture medium favourable to haloarchaea provided that the necessary salts and a buffer are added to bring the molasses to an adequate pH and fight against the acidification of the medium during growth.

Our work has led to the perspectives:

Reduce the number of factors studied.

Optimize growth by opting for a plan based on a response surface methodology.

Extend the study to other haloarchaeae strains for antibiotic research.

Keywords: fractional screening plan, growth, haloarchaeae, Molasses, optimization, , pigments



Activation of persulfate using Dawson-type heteropolyanions as catalysts to degrade a toxic dye in aqueous solution

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Abstract

Catalytic degradation of Methyl Blue (MB), a widely used industrial dye has been studied utilizing $P_2W_{12}Mo_5CrO_{62} \cdot 18H_2O$ as catalyst. $P_2W_{12}Mo_5CrO_{62} \cdot 18H_2O$ is a recyclable DAWSON-type heteropolyanion. This manuscript discusses the optimizing conditions for efficient oxidation of Methyl Blue such as the effect of variation of pH, dye concentration, catalyst loading and effect of addition of oxidants such as $K_2S_2O_8$. The optimum conditions had been determined, and it was found that efficiency of degradation obtained was about 100 %. The stability and reuse of catalyst and their performance is confirmed.

Keywords : Heteropolyanions, Wells-Dawson type, Methyl Blue, Advanced oxidation process, Degradation.



The efficient remediation of pharmaceuticals pollutant by solar photocatalytic degradation process

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Abstract

The production and consumption of pharmaceuticals drugs are know an increase this recent year and theirs discharge into rivers and lakes increase and several pharmaceuticals are detected in the environment originally from both human and veterinary use. In this context the heterogonous photocatalysis can be considered more promising for the removal of this kind of pollutants.

In this work, we report the obtained results of high efficiency removal of pharmaceutical pollutant by a simple, efficient and environment friendly solar photocatalytic degradation using the TiO₂ and ZnO semiconductors. The structural and physicochemical proprieties of the photocatalysts were analyzed by XRD, FTIR and BET. The photocatalytic removal behavior of MNZ on the synthesized photocatalysts using solar irradiation is investigated as function of photocatalyst dose, pollutant concentration. The results showed that the TiO₂ and ZnO semiconductors can significantly improve remediation of pharmaceuticals.

Keywords: Solar photocatalysis, degradation, pharmaceutical, metronidazole



Solution of two-component aggregation population balance equation by Adomian decomposition method

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Abstract

Many separation processes were modelled mathematically using population balance equation such as liquid-liquid extraction and crystallization. In the literature, a large number of papers related to the resolution of this equation which is considered as a highly nonlinear integral-partial differential equation and hence various numerical methods have been developed for solving it. In this work we used the Adomian Decomposition Method for solving two-dimensional aggregation population balance equation with assuming that the aggregation kernel is constant, we got the moments of particle size distribution by method of moments and compared them with existing exact solution. The results obtained are very approximate to the analytical solution for all moments, the Adomian decomposition Method is convenient for solving the PBE.

Keywords: Population balance equations, aggregation, Adomian decomposition method



Collection and sorting of household goods for sustainable urban development

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Abstract

Nowadays, household waste has become a double-edged sword. On the one side it harms the environment of the other; it is used in the production of energy (domestic heating). Waste should be seen as a source of pollution to be reduced, but also as a potential resource to exploit. As a result of the industrial and technological development and demographic growth that the world has experienced today, and their concentration in the city waste is growing day by day and the need to manage them is a priority or even a necessity. The agendas 21 from the Rio de Janeiro 1992 Conference, and the integration of local Agenda 21s into the SNAT 2025 national spatial planning scheme, through PAT territorial action plans that recommend waste management to through appropriate policies and tools in order to respect the three fundamental pillars of sustainable development (environment, economy and social). The proper treatment of waste according to their nature (recycling, recovery, incineration or landfill) requires above all their sorting upstream and classification according to their degree of biodegradability. In order to reduce the ecological impact of the treatment of waste while meeting a requirement of economic viability and by calling on circuits of social and solidarity economy. Thus the creation of a broad program of household waste management based on innovative techniques, in order to fight against environmental pollution, diseases and all types of contamination due to negligence and mismanagement of waste and non-synchronization in pick up times.

Keywords Waste sorting, ecological impact, sustainable development, household waste management, economic viability.



Photocatalytic degradation of 2,6-dimethylphenol in aqueous solution by TiO_2/UV , Fe^{3+}/UV , and $\text{TiO}_2/\text{Fe}^{3+}/\text{UV}$

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Abstract

Photocatalytic degradation of 2,6-dimethylphenol (2,6-DMP) has been studied by TiO_2/UV , Fe^{3+}/UV and $\text{TiO}_2/\text{Fe}^{3+}/\text{UV}$. The irradiation of 2,6-DMP (5×10^{-4} M) solution in presence of TiO_2 (1 g L^{-1}), Fe(III) and $\text{TiO}_2/\text{Fe(III)}$ systems at 365 nm leads to a complex mixture of photoproducts. Photodegradation of the 2,6-DMP has been explained by pseudo-first order kinetic model in presence of TiO_2 . The addition of hydrogen peroxide in the suspension of TiO_2 improves the rate of degradation of the 2,6-DMP. Hydroxyl radicals and Fe^{2+} can be generated by the irradiation of iron (III) solution. The most active species in term of production of radicals hydroxyl are Fe(OH)^{2+} complex. In combined system (2,6-DMP-iron(III)- TiO_2) the percentage of degradation of the 2,6-DMP is definitely higher compared to the system 2,6-DMP-iron(III)/UV. At low concentration of TiO_2 (30 mg L^{-1}), an important positive effect due to the iron addition has been shown. The mechanism of degradation of the 2,6-DMP did not involve only radicals HO^\bullet an interaction of Fe(III) in the excited state with 2,6-DMP occurred.

Keywords: Photodegradation; 2,6-dimethylphenol; hydroxyl radical; Titanium dioxide; iron(III)



Photochemistry of Iron Complex with Lactic Acid: The First Evidence of Photochemical Process Involving this Complex for Elimination of an Antibiotic in Aqueous Solution.

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Abstract

The objective of the present work was to study the photochemical properties of Fe(III)-Lactate complex (Fe(III)-Lact) and its impact on the photodegradation of the antibiotic Metronidazole (MET) in aqueous solution. Fe(III)-Lact complex was investigated as proxy of ferric-carboxylic acids complexes that could be expected to be present in the aquatic environment. In the first part, the properties of Fe(III)-Lact was characterized using UV-Visible absorption. The results showed that Fe(III)-Lact was a stable complex ($\log \beta = 6.1$) which was formed by the Fe(III) and Lactic acid with the molar ratio 1:2. Afterwards, To better understand the photochemical behavior of the Fe(III)-Lact complex, we have to study the photolysis of the complex under polychromatic irradiation with main emission at 365 nm. Moreover, the effect of operational parameters such as initial pH of the solution and the irradiation wavelength on the photolysis was also examined. Obtained results suggest that the disappearance kinetics of the Fe(III)-lact complex is very fast and after about 5 min of irradiation at 365 nm, about 28% of the complex disappeared. Finally, we used MET as a target pollutant to investigate the photocatalytic activity of Fe(III)-Lact. It was found that the presence of Fe(III)-Lact complex enhanced the photodegradation rate of MET as a result of hydroxyl radical ($\cdot\text{OH}$) attack. Moreover, the effect of operational parameters such as the concentration of Fe(III)-Lact and solution pH was demonstrated. These results are very useful for the use and optimization of such iron complexes in water treatment processes.

Keywords: Fe(III)-Lactate, hydroxyl radical, photodegradation Metronidazole.



Removal of chromium III from wastewater using a membrane process

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Abstract

Membrane separation techniques have undergone significant development over the years because they represent many energy and economic advantages with high selectivities. In this field, microfiltration has seen its field of application increase, as it is considered to be a molecular filter well suited to the separation of large molecules. But it remains ineffective in separating free cations because of their small size. For this reason, the solution considered to overcome this difficulty was to implement a precipitation reaction in order to trap the cations and have them retained by the membrane. The experimental precipitation study "by NaOH, Ca(OH)₂, MgO, FeCl₃ and the combination of NaOH+Ca(OH)₂" was based on the determination of non-precipitated Cr(III) concentrations by the UV-visible absorption method. This study shows that the removal will be very significant for the cation Cr(III) at a pH range of 9.5 and 10.9, and the agent "NaOH+Ca(OH)₂" gave us the best performance R compared to other precipitating agents. Microfiltration of a solution containing the chromium III precipitate on the microfiltration pilot, using the optimal conditions of the precipitation reaction of the different precipitating agents of trivalent chromium shows that the water flow increases with pressure, according to Darcy's law, the variation of the permeate flow over time for the same transmembrane pressure decreases quite rapidly during the first minutes and that it tends to stabilize towards a limit value. The combination of NaOH+Ca (OH)₂ also gave us the best yield (R= 99.54%), which implies a significant elimination of Chrome III.

Keywords: Chemical precipitation, Microfiltration, Membrane, Chromium (III), Precipitation agents.



Photochemistry of Fe (III) complex with Salicylic acid in aqueous solutions under natural and artificial light

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Abstract

The photolysis of Fe(III) complex (1:1) with salicylic acid (SA) in aqueous solution have been studied under natural and artificial irradiation that yields Fe (II) and hydroxyl radicals ($\bullet\text{OH}$) by oxidation of water molecules in the coordination sphere of the metal center. The Fe (III)-SA complex structures were established by spectrometry were the stability constant of this complex has been found equal $\text{Log}\beta=15.5$.

Up on irradiation at 365nm, the photolysis of Fe (III)-SA complex lead to Fe (II) and H_2O_2 formation and the process is influenced by the irradiation wavelength, the initial concentration of the complex and the pH of solution. Under natural irradiation, the results showed a more efficiency of complex photolysis where a total consumption of this complex was observed under excitation by sunlight after 3h.

Keywords : Fe (III)-Salicylate (Fe (III)-SA), Hydroxyls radicals ($\bullet\text{OH}$), Organic complex, Photolysis, Salicylic acid (SA)



Experimental study of some properties of nano-enhanced phase change materials

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Abstract

The use of phase change materials (PCMs) is a very innovative technique for energy storage due to their significant latent heat during phase change. However, these PCMs have low values of thermal conductivity. The improvement of these properties and consequently the improvement of the heat transfer is done by the addition of a small quantity of nanoparticles to the pure PCM, which leads to the development of the so-called Nano-PCM. In this work, a new innovation of nano-enhanced PCM is developed. The thermo-physical properties such as melting point and latent heat of PCM are determined by the differential scanning calorimetry technique (DSC). The heat capacity is determined by the contribution method "Joback". The addition of alumina Al_2O_3 nanoparticles to these PCMs gives good results by comparing to the literature.

Keywords: energy storage, latent heat, nanoparticles, phase change materials.



Treatment of high alcohol concentration wastewater by solvent extraction ; experimental and modeling

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Abstract

Short chain alcohols such as methanol, ethanol, propanol and butanol are the major organic ingredient in wastewater of refining and petrochemical manufacture. The removal of these alcohols from wastewater has been of great environmental interest. Solvent extraction is a very efficient method to treat alcohol wastewater .In this work, the objective is to determine MEK as the solvent to remove alcohol from wastewater at 298.15 K. The experimental LLE data were compared with those predicted using NRTL and UNIQUAC models. The qualities of measured data were verified by the Othmer-Tobias Hand and equations.

Keywords: wastewater, alcohol, solvent extraction, NRTL, UNIQUAC.



The effect of the use of activated metakaolin in a cement matrix on the stabilization / solidification of heavy metals

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Abstract

Portland cement has been widely used for stabilisation/solidification (S/S) treatment of waste and for the immobilisation of heavy metal ions before their disposal in landfills.

The objective of this study is to use metakaolin as a pozzolanic addition in substitution of cement to reduce the consumption of cement on one side, on the other side the study of the effect of chemical activation of metakaolin in the cementitious matrix by sodium sulphate (Na_2SO_4) on different properties mechanical resistance, retention of heavy metals).

In this paper we tested the stabilization of contaminated sludge, leachate from the landfill site of Sidi-Bouderham in Algeria, the rate of substitutuin cement metakaolin (MK) was fixed at 20% for all formulation, and the percentage of the addition of the activator is 4% relative to the mass of binder. The leachate contaminated, used as a substitute for mixing water, for the stabilization of the sludge was made by the partial substitution of metakaolin by the sludge. La pâte lisse est obtenue à partir d'un test standardisé des éprouvettes sur lequel la mesure et la résistance mécanique sont effectuées après 7 et 28 jours de durcissement. It appears from this study that the formulations F1P (80% Cement + 18% MK+ 2% Sludge), F4P (80% Cement + 18 %MK+ 2% Sludge +4% Na_2SO_4), F1L (18% Cement + 18 %MK+ leachate) and F2L (18% Cement + 18 %MK+ leachate +4% Na_2SO_4) to give satisfactory results from the point of view of mechanical strength, and from the point of view of retention of metals.

Keywords : Leachates, Sludge, solidification/stabilization, hydraulic binder, heavy metals, metakaolin, activator, leaching tests.



Effect of pre-treatment of luffa cylindrica fibers on the removal of dye from aqueous solution

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Abstract

In recent years, the polymers have been evaluated as a potential adsorbent for the removal of dyes from aqueous solution. In this study, an adsorbent composed of luffa cylindrica fibers (LC) coated by the polyaniline (PANI) was successfully prepared via in situ polymerization. Structure and morphology of the adsorbent were characterized by scanning electron microscope (SEM), Fourier transform infrared spectroscopy (FTIR) and X-ray diffraction (XRD). The prepared polyaniline/ luffa cylindrica (PANI/LC) was tested for its capacity to remove méthylène blue (MB) from the aqueous solutions in batch processes. The influence of different parameters on the removal of méthylène blue including, contact time, pH, dosage, and temperature were studied. Langmuir and Freundlich isotherm models were selected to evaluate the adsorption of méthylène blue on PANI/LC. The kinetics of adsorption has been studied in terms of pseudo-first- and -second-order model. FTIR study showed various functionalities, such as N–H, C–O and C = N, which were responsible for MB adsorption on the PANI/LC. XRD analysis revealed that the synthesized PANI/LC adsorbent exhibited characteristic peaks, reflecting a crystalline structure. The surface morphology of the PANI/LC adsorbent became very rough and thin PANI layer can be easily detected surrounding the luffa fibres. The experimental results show that the equilibrium was reached rapidly within a half hour. PANI/LC adsorption capacity increases with an increase in the biosorbent dose, used biosorbent gave the highest adsorption capacity in basic medium, the adsorption capacity increases with an increase in the temperature; this may indicate that the adsorption of MB is endothermic. Freundlich was the most suitable adsorption model for describing the biosorption of méthylène blue. The results of kinetics data were best described by the pseudo second model with high correlation coefficient. This study demonstrated that the PANI/LC could be used as a biosorbent for removal of méthylène blue from aqueous solution.

Keywords: biosorbent, dyes, luffa cylindrica, polyaniline.



Improved photocatalytic degradation of Methyl Green; kinetic study.

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Abstract

Photocatalytic study of (4- {[4- (dimethylamino)phenyl][4- (trimethylazaniumyl) phenyl] methylidene}cyclohexa- 2,5- dien- 1- ylidene)(dimethyl) ammonium bromidchlorid called Methyl Green (MG) taken as model dye in order to minimize water treatment blows of polluted by photocatalysis. Zinc oxide is the photocatalyst used. It is supported on glass by a simple and cheap method of *Spray Pyrolysis*. Catalyst fixing on glass eliminates its blow recovery of from suspensions after treatment. Aqueous solution MG concentration was 10^{-4} M. Zinc oxide doping with aluminum (5%) improve significantly MG photocatalytic degradation. When irradiation was essentially in the visible degradation apparent rate constant was 10^{-2} min^{-1} and $3.3 \times 10^{-2} \text{ min}^{-1}$ for ZnO and ZnO: Al (5%) respectively. Photocatalysis result during the use of free solar irradiation is very satisfactory with an apparent constant of $2.7 \times 10^{-2} \text{ min}^{-1}$ for ZnO: Al layers (5%).

Keywords: Methyl Green; Photocatalytic degradation; Zinc oxide supported; Doping; depollution.



Optimization of cutting oil treatment by electrocoagulation with iron electrodes using response surface methodology

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Abstract

The objective of this research is to optimize the treatment of a cutting oil emulsion by electrocoagulation (EC) method using a response surface methodology (RSM). These effluents are considered poorly biodegradable or even toxic for the environment. The electrocoagulation tests were carried out in a batch reactor, using two rectangular flat iron electrodes, placed vertically in parallel in the reactor. Each electrode had an active area of 52.8 cm². These electrodes have been connected to an electric power generator. In order to determine the optimal number of experiments and the optimal values of the independent parameters (initial pH, current density, electrodes spacing and electrolysis time), a response surface method (RSM) was used. A central composite design (CCD) was constructed with 29 experiments, where the reduction of COD and turbidity are considered responses to be measured. All statistical analyses were performed using the MINITAB software (version 16). The optimal current density, initial pH, electrodes spacing and electrolysis time determined by this experimental design, were obtained respectively for 287 A/m², 7, 2 cm and 44 min. Under these optimal conditions, Turbidity and COD reductions were respectively (99.63%) and (96.70%). The individual and interaction effects of the independent variables on the responses were studied using a plot of three dimensional response surfaces. It was found that the most determining factors in the removal of cutting oil by EC, are the electrolysis time and current density. The predicted values of the treatment efficacy according to RSM were in very good agreement with the experimental values, ($R^2 > 0.98$) and adjusted R^2 ($AdjR^2 > 0.96$) for COD and turbidity removal efficiency. The response surface methodology based on the central composite design has proved to be a powerful tool because of its impact on the economy and to optimize the operating conditions and maximize the efficiency removal of COD and turbidity by electrocoagulation.

Keywords: Central Composite Design, Cutting oil emulsion, Electrocoagulation, Response Surface Methodology



Treatment of water contaminated with Methylene blue(MB) by nanopowders of pure TiO₂ and doped with Ag prepared by sol-gel

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Abstract

TiO₂ is the most widely used semiconductor in heterogeneous photocatalysis because of its stability, low cost and high efficiency in mineralizing organic pollutants. Several authors have found a higher photocatalytic efficiency in the presence of TiO₂.

This work has been devoted to the synthesis and characterization of nanopowders of titanium dioxide (TiO₂) pure and silver-doped (Ag) with concentrations: 0.1%, 5%, and 10%.

The objective of this work was the improvement of the photocatalytic efficiency of TiO₂, for this we studied the degradation of methylene blue (MB) by the powders that we synthesized.

The main results obtained are: The elaboration method is the sol-gel technique. We found that color of the powders goes from white for the pure TiO₂ to the more or less dark gray for the doped TiO₂, a very important result since the black TiO₂ is very interesting because of its capacity to absorb in the visible. Obtain the analysis by infrared spectrophotometry. In addition to the TiO₂-bound peak, given by the Ti-O-Ti bond, the spectra indicate the appearance of conventional molecule-related vibrations with peak intensities almost the same for all samples. However, it is important to note the fact that no links were found involving the Ag indicates that this element does not introduce any new phase from which it is the source. We found X-ray diffraction. The structure of the powders is anatase with some traces of brookite for pure TiO₂ and doped at 5%. Decrease of the grain size as a function of Ag content up to 5%. These samples can be used to treat solutions contaminated with toxic dyes, such as of methylene blue (MB), by photocatalysis. The greatest photocatalytic degradation was observed for the TiO₂ powder doped with 10% Ag. In a very short time it is 35 minutes.

Keywords: Photocatalysis, TiO₂; Sol-gel; Silver doping; Nanopowders



Effect of the chemical heterogeneity of a porous medium consisting of activated carbon on the dispersion of phenol

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Abstract

Considering the nonlinear and favorable adsorption of phenol into granular activated carbon fixed beds, effect of medium chemical heterogeneity on phenol dispersion have been studied experimentally. Heterogeneous media were prepared by alternating layers of two types of granular activated carbon having similar physical properties. The first variety consisted of non-active (non-adsorbent) grains. The second consisted of grains of active grains. Thus, chemical heterogeneity was considered at column scale and the distribution. A variety of heterogeneity distributions has been experimented for the same capacity; the different configurations have been reproduced at different capacities. The active grains mass proportion to the total medium mass and the ratio of the active layer thickness to the bed length were considered as parameters quantifying chemical heterogeneous. The phenol breakthrough curve reduced variation with chemical heterogeneity was observed. Obtained results showed an increase in dispersion with chemical heterogeneity. The increase becomes more significant as the thickness of the active layer becomes larger. The effect of bed length for the same distribution at different scales of chemical heterogeneity showed a linear increase of the dispersion with the inverse of the bed length.

Keywords: Breakthrough curve, chemical heterogeneity, fixed bed, phenol, porous medium, solute dispersion.



Study of removal of synthetic dye from water by Fe(II)/chlorine system

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Abstract

The objectives of this study were the application of Fe(II)/ chlorine process for the degradation of several synthetic organic dyes, demonstrating that Fe(II)/chlorine is a better system than chlorine alone for the degradation of organic pollutants and identifying the impact of the various operating conditions on the process efficiency; Experiments were performed in a Pyrex cylindrical cell, equipped with a water jacket to control the temperature. Stock solutions of dyes (1 g/L, pH 5), chlorine (10 mM, pH 5) and iron (5 mM, pH 3) Oxidative trials were conducted using a 200 mL of air-equilibrated solutions. The medium was magnetically stirred at fixed rate (400 rpm). The best performance was achieved at pH 5 and 6, although higher degradation degrees were also obtained at pH 3 and 4. At pH 5 and 6, hydroxyl radicals contributed to about 11–22% in the overall removal process, whereas negligible contribution was noticed at pH 3. The degradation efficiency increased with the increase in Fe(II) and chlorine dosages up to an optimal level and detrimental effects were recorded at high dosages.

Keywords: Synthetic dye, Fe(II)/chlorine, process, dosage.



Synthesis of α -Fe₂O₃-CuS nanocomposite as an efficient heterogenous Fenton-like catalyst for organic pollutants degradation

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Abstract

Pharmaceutical products are dumped into the environment, disrupting ecosystems and generating significant water pollution due to their accumulation with surrounding constituents. Cetirizine dihydrochloride (CTZ) belongs to the class of piperazine second generation antihistamines used in the treatment of allergies. CTZ must be eliminated by advanced oxidation processes (AOP). Nanostructured materials have become essential elements and have attracted considerable interest as a promising solution for environmental problems. Hematite (α -Fe₂O₃) and Copper sulphide (CuS) are the most ecological semiconductors with excellent chemical stability. α -Fe₂O₃ nanoparticles were synthesized and coupled with the CuS by the hydrothermal method to be used as a catalyst for the degradation of CTZ in aqueous solution. The degradation efficiency of the CTZ in different reaction systems shows that elimination of CTZ reached 100% after 60 min by α -Fe₂O₃-CuS-H₂O₂. The implication of •OH radicals in CTZ degradation was determined by the use of 1% and 2% of isopropanol as a scavenger. Several parameters that affect this process have been optimized as pH, α -Fe₂O₃-CuS dosage and H₂O₂ concentration. The optimum conditions process (pH = 2,7 , 1g.L⁻¹ α -Fe₂O₃-CuS, 10⁻³ mol.L⁻¹ H₂O₂) gave 100% degradation efficiency of solution containing 4.10⁻⁵ mol.L⁻¹ of CTZ in only 60 min.

Keywords: Hematite nanoparticles, Copper sulphide, Cetirizine dihydrochloride, hydrothermal method, degradation



Effect of operating parameters on degradation of rhodamine b(a basic dye) in aqueous phase using fenton process

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Abstract

Advanced oxidation processes (AOPS) are new methods for water treatment. They are widely used in the case of substances recalcitrant to conventional processes. These oxidation processes generate free hydroxyl radicals HO^\bullet which are very effective in the degradation of organic pollutants due to their great oxidant power. In recent years different combinations of these methods were used to obtain the complete mineralization of pollutants. Among these AOPS, Fenton's reagent is particularly interesting due to its low price, low toxicity of its reagents (Fe (II) and H_2O_2), and the simplicity of its technology. Several studies already conducted have shown that the reaction of Fenton's reagent is effective in the degradation of organic compounds.

In this study, advanced oxidation process utilizing Fenton's reagent was investigated for degradation of Rhodamine B (RhB). The effects of different reaction parameters such as the initial RhB concentration, ionic strength and the reaction temperature on the oxidative degradation of RhB have been investigated. Under optimal conditions, 83.96 % degradation efficiency of dye in aqueous solution was achieved after 20 min of reaction.

Keywords: Fenton's reagent, Rhodamine B, Oxidation Advanced, chemical oxidation, Hydrogen peroxide



Evaluation of chemically treated okoume sawdust as potential biosorbent for treatment of methyl violet 2b contaminated waters: kinetic, isotherm and thermodynamic studies

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Abstract

The ability of chemically treated okoume sawdust (OST) to biosorb a hazardous triphenylmethane dye, methyl violet2B (MV2B), from aqueous solutions has been studied in batch mode. Batch experiments were performed to examine the effect of operating parameters such as temperature (20-40°C), initial solution pH (2–9), ionic strength (0-2g/50 mL), stirring speed (0–400 rpm), biosorbent dose (0.1–0.5), biosorbent particle size (0.18–1.5 mm), contact time (0-120 min) and initial concentration (5-30 mg/L) of the removal of MV. Lagergren Pseudo-first-order, Blanchard pseudo-second-order, Elovich and Weber-Morris models were used to fit the experimental data. The obtained results indicate that the biosorption system of MV on OST obeyed a pseudo-second-order kinetics model ($0.999 \leq r \leq 1$). Equilibrium biosorption data at different temperatures were analyzed using Langmuir, Freundlich and Harkins-Jura isotherm models. Equilibrium data can be well described by the Langmuir model showing maximum monolayer biosorption capacity (q_m) of 102.04 mg/g at 25°C. Thermodynamic parameters such as ΔG° , ΔS° and ΔH° were calculated, and the results suggest that the biosorption is spontaneous, a physical process and endothermic.

Keywords: Evaluation, chemically treated okoume sawdust, batch study, methyl violet dye, Modeling



Treatment of Phenolic Waters by Adsorption Process

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Abstract

The aim of this study is the dynamic modeling of phenol adsorption process on activated carbon in a fixed bed reactor operating in closed circuit. On the basis of surface diffusion model, a simplified model has been successfully applied to the simulation of this process.

The evolution of simulated concentrations in adsorbed phase and in a liquid phase along the bed and into the reservoir are compared to those obtained experimentally based on various operating conditions, such as the flow rate (from 0.67 to 1.34ml/s), the temperature of the phenol solution (from 25 to 35°C), the height of the bed (from 8 to 14cm) or initial phenol concentration (from 35 to 85mg/L). Adjustment errors are all less than 1%.

The estimated values of the overall mass transfer coefficient K_g vary between 0.21 and 0.48 cm/min. The overall coefficient always increases with the flow rate, whatever the temperature or the operating conditions, which is a very clear indication that turbulence promotes adsorption by eliminating the film resistance on the activated carbon surface.

Keywords: Adsorption, fixed bed, Mass transfer, Modeling, Simulation.



Influence of operating parameters on the process for preparing an adsorbent from animal bones

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Abstract

The objective of this study is to prepare an adsorbent from animal bones using pyrolysis methods by chemical activation with phosphoric acid, , The study was started by optimizing the factors influencing the process as a function of mass yield and the specific surface area of the prepared adsorbent. the results of the processes show that the specific surface area of the adsorbent prepared reaches a value of 171.948 m² / g, for a maximum mass yield of 60% to 57% with an acid surface of pH = 4.8. This adsorbent capable of removing medium-sized aromatic organic molecules ,heavy metals.

Keywords : Activated carbon, pyrolysis, chemical activation, specific surface aera, animal bone



The impact of environmental matrices on the degradation of chlorazol black by photoactivated acetone

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Abstract

In this study we investigate the effect of acetone on the batch photolytic degradation at 253.7 nm of chlorazol black (CB) azo dye in different matrices basically deionized water and seawater with relation to various operating parameters. It was found that acetone (50 mM) assisted-UV treatment of CB (20 mg/L) resulted in 5.6-fold increase in the initial degradation rate, as compared with UV alone for both systems. Radical scavenger tests using sodium nitrite and oxygen saturation have showed that methyl radical was probably the main species responsible for the efficient degradation of CB in UV/acetone system. The experimental result indicate that the rate of CB degradation kinetics was rapid in deionized water than seawater where 98% of CB was removed after 30min with deionized water face to 86% after 30 min for seawater. This inhibition in the degradation of CB in seawater due to the composition of it.

Keywords: Advanced oxidation; acetone; Ultraviolet irradiation UV/acetone process; Chlorazol black (CB); methyl radical.



Degradation uv of the green methyl dye on a photocatalytic carrier of zno prepared by ultrasonic spray pyrolysis

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Abstract

Usually semiconductors providing promising solutions for environmental pollution problems and solar energy crisis are selected as photocatalysts. Semiconductor photocatalysts such as ZnO has attracted much attention due to their various applications for the degradation of organic pollutants in water. In the present work, ZnO thin films were deposited by ultrasonic spray pyrolysis, on glass substrates with a temperature set at 350°C, in order to investigate their photocatalytic activity. The structural properties of the films were studied by mean of X-ray diffraction measurements (XRD) and their optical properties were studied by mean of UV- Visible spectrophotometry. The Fourier transform infrared (FTIR) spectroscopy data have shown the modes related to the presence of ZnO. The prepared films were tested for the degradation of the Green methyl dye, largely used in textile industry. As a result we have found that ZnO thin films has a high catalytic efficiency.

Keywords: Photocatalytic activity, Ultrasonic Spray Pyrolysis, Thin films, Structural characterization, Optical characterization.



Extraction of antioxidants from a rejection of the food industry « orange peel».

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Abstract

This work is a contribution to the study of the total polyphenol content and the antioxidant activity of a rejection of the food industry Orange Bark. The methods used are the Folin-Ciocalteu test to quantify the total polyphenols and the DPPH test method for the measurement of the antioxidant activity; the results obtained were very significant. Correlation between antioxidant activity and total phenol content was also investigated such as flavonols; flavonoids and tannins. This combination allowed us to make a quantitative and qualitative evaluation of the phenolic compounds extracted from the studied samples. A parametric study of several factors (solid / liquid ratio, temperature, stirring speed and others) was carried out followed by optimization of parameters by two-level experimental design. The treatment chosen concluded that the orange bark rich in phenolic compounds with a content equal to 115.52 milligram Equivalent AG in one gram of solid and a significant anti-radical activity with an elimination rate of DPPH equal to 90%.

Keywords: 2, 2-Diphenyl-1-picrylhydrazyl, Extraction, Inhibitory concentration, Orange peel, Total phenol content.



Kinetic and equilibrium studies of adsorption process of 2,4-Dinitrophenol on activated carbon prepared from date stones

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Abstract

In this present study, a lignocellulosic material, namely, date stones, have been used as precursor for the preparation of an activated carbon (AC), using the zinc chloride ($ZnCl_2$) as activating agent that produce a large development of porosity.

The surface characteristics of the activated carbon prepared were also studied using the Scanning Electron

Microscopy (SEM) and liquid displacement method. The ability of the AC to adsorb the 2,4-Dinitrophenol (2,4-DNP) from aqueous solution was also investigated. Batch studies were performed to evaluate the influence of initial 2,4-DNP concentration, equilibrium time, and AC dose. The experimental data were analysed using Langmuir, Freundlich and Temkin isotherm models. The equilibrium data fitted well with the Langmuir isotherm model with a better correlation coefficient ($R^2 = 0.998$), and the maximum adsorbed amount was found to be $196,078 \text{ mg g}^{-1}$ at room temperature ($25 \pm 2^\circ\text{C}$). The kinetic data were evaluated by pseudo-first order, pseudo-second order and intra-particle diffusion kinetic models. The results of the latter indicated the adsorption kinetic of 2,4-DNP obeys the pseudo-second-order kinetic model.

keywords: Adsorption, activated carbon, date stones, 2,4-Dinitrophenol, isotherm, kinetic.



Valorization of a new biomaterial based on Cactus in the adsorption of turquoise blue dye

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Abstract

Today drinking water resources are greatly reduced due to population increase accompanied by high industrialization and intensive agricultural development. Releases of varying micro pollutants (pesticides, dyes, phenols ...) in the environment are increasing. These pollutants, toxic and poorly degradable, are usually the source of many harmful health effects. They also directly affect the balance of ecosystems following the deterioration of the quality of various environmental medium (soil, water, air). Hence the concern to develop methods that work to preserve water resources against pollution by treating polluted sources. The application of natural and abundant adsorbents in the water treatment is a legitimate way to preserve the water capital. This research work has focused on the valorization of a new biomaterial based on Cactus in the adsorption of turquoise blue dye. Various parameters influencing the adsorption (the effects of particle size, mass of the adsorbent, initial concentration of the solution and contact time) were studied, all the results obtained show that the dye studied was well retained by the natural adsorbent. Experimental data on the adsorption isotherm were analyzed using Langmuir and Freundlich models. The adsorption of Turquoise Blue on Cactus followed the Langmuir isotherm.

Keywords: Adsorption, biomaterial, Cactus, Turquoise blue, Valorization.



The impact of CardosineHydrolysis on the Techno-functional Properties of wheyProteins

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Abstract

Whey is a co-product of cheese technology that is very rich in organic matter and especially in proteins of very high biological value. These proteins possess, in addition to their nutritional value, interesting functional properties (emulsifier, foaming and gelling agent), which can be incorporated into a wide range of food products. In contrast, these proteins are of the globular type with high resistance to proteolysis by digestive enzymes. This greatly reduces their digestibility and increases their allergenicity.

Whey proteins are also converted into bioactive peptides by enzymatic processes (hydrolysates) to improve their techno-functional and nutritional properties.

For this purpose, whey proteins are increasingly recognized and accepted as functional ingredients. The dairy industry uses a wide variety of whey products such as whey powder, whey protein concentrates (WPC), whey protein isolates (WPI) and protein hydrolysates in the production of yogurt and fermented beverages. of whey (HPL).

The objective of our work is the hydrolysis of whey proteins by the crude extract of cardoon flowers (*Cynara cardunculus*) whose purpose is to study their impact on the techno-functional properties of protein hydrolysates including solubility, emulsifying and foaming properties

For a high hydrolysis at pH = 8 the solubility, the emulsifying and foaming power reach these maximum values, which are respectively 97.5%, 279.29 g/cm², 90%

These results show that hydrolysis of serum proteins by cardosin has a great potential for improving their techno-functional properties. It is possible to become one of the most frequently used tools in the context of food protein processing.

Keywords: Hydrolysis, Whey proteins, Cardosin, Techno-functional



Application of mathematical empirical models to dynamic removal of Cephalosporin C on resin in a fixed bed column

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Abstract

Adsorptive breakthrough modelling is essential for design of a sorption packed bed. In this work we examined the applicability of the mathematical empirical models by Thomas and Yoon-Nelson on Cephalosporin C from aqueous solutions on fixed bed of Amberlite-XAD-2 resin. Applicability of these models has been evaluated by fitting the experimental breakthrough curves with the curves obtained from the applied model. The results show that the Yoon-Nelson was found to be the most suitable for simulation of the breakthrough curve, therefore this model has been used for simulation of breakthrough curves for different bed depths, flow rate and particle diameter. While the Thomas model well not represented the experimental data points under all experimental conditions.

Keywords: Adsorption, Breakthrough curves, Thomas model, Yoon-Nelson model



Amoxicillin removal from aqueous solution by prepared activated carbon, regeneration in-situ

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Abstract

This paper deals with the use of prepared activated carbon (PAC) as potential adsorbent for the removal of amoxicillin (AMX) from aqueous solution. Microporous activated carbon were prepared from pyrolyzed coffee grounds using potassium hydroxides (2 g of KOH / 1 g of biomass). The effect of operating conditions such as pH, temperature, ionic strength and initial concentration was investigated. The adsorption isotherm was analyzed by different isotherm models. The experimental data fitted well with the Langmuir and Sips isotherms ($R^2 \sim 0.999$). The maximum Langmuir adsorption capacity were found to be 370 mg g⁻¹. The adsorption capacity of PAC were compared to a commercial activated carbon (CAC). The effect of the chemical nature of the electrolyte was obtained for non-buffered aqueous AMX solutions at different concentrations of NaCl. Experimental data indicated that the adsorption capacity of activated carbon was found to be extremely favorable at pH greater than 10.0, and further indicated that the removal of AMX may not be influenced with the ionic strength of solution. The adsorption of AMX on our AC was found to be spontaneous in the studied conditions. Also it was found exothermic in nature.

Keywords : Adsorption ; Amoxicillin ; water treatment ; Kinetic ; activated carbon.



Removal of Lead from polluted waters Using Ion Exchange Resin With $\text{Ca}(\text{NO}_3)_2$ for elution

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Abstract

The aim of this study was to selectively remove Pb^{++} from polluted waters. The combination of a Ca^{++} form cation exchange resin (Ca – CEX) with a $\text{Ca}(\text{NO}_3)_2$ regeneration, main research strength and novelty, and, finally, Pb^{++} precipitation by $\text{Ca}(\text{OH})_2$ were the research hypotheses. Unlike the largely used H^+ form cation exchange resin, the Ca – CEX presented obvious strong advantages: selectivity towards Pb^{++} , low cost, acid free and safe regeneration as well as Pb^{++} purification for reuse. Indeed, Ca – CEX removed only Pb^{++} according to this well-established cation exchange affinity order: $\text{Pb}^{++} \succ \text{Ca}^{++} \succ \text{Cu}^{++} \succ \text{Mg}^{++} \succ \text{K}^+ \succ \text{Na}^+ \succ \text{H}^+$. Then, this affinity order highlighted the Pb^{++} singularity among divalent cations which had lower affinity than Ca^{++} . This high selectivity towards Pb^{++} , at low concentrations, allowed a long IX cycle before saturation and regeneration. The regeneration solution contained a concentrated mixture, $\text{Ca}(\text{NO}_3)_2$ and $\text{Pb}(\text{NO}_3)_2$, which was treated by $\text{Ca}(\text{OH})_2$. Pb^{++} precipitated and separated into $\text{Pb}(\text{OH})_2$ and allowed a total chemical regeneration of $\text{Ca}(\text{NO}_3)_2$ now ready for reuse. $\text{Ca}(\text{NO}_3)_2$ has never been studied as regeneration solution of CEX resins. This regeneration approach is indeed quite novel. This research work is motivated by the environmental issues raised by the lead-acid battery industry, its wastewaters and their impact on water resources.

Keywords : • Lead removal • Lead-acid battery • Cation exchange resin • Wastewater treatment • $\text{Ca}(\text{NO}_3)_2$ resin • regeneration.



The effect of EDTA on the adsorption efficiency of xanthate KEX on pyrite

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Abstract

The EDTA is a complexing agent that is powerful in extracting oxides and hydroxides from the mineral surface. The adsorption of xanthate KEX (Potassium Ethyl Xanthate) on the copper activated pyrite, is affected by the presence of this species, (oxides and hydroxides) on the mineral surface and becomes less efficient. In this study, we used the EDTA (ethylene diamine tetra acetic) 10^{-1} M during the conditioning time in a pulp containing water and ore with a concentration of, and different concentrations of xanthate KEX (10^{-1} , 10^{-2}), the effect was positive in improving the adsorption efficiency, the gain in efficiency helps in decreasing the concentration of xanthate.

Keywords: EDTA, Adsorption, Xanthate (KEX), Pyrite



An efficient heterogeneous Fenton-like process enhanced by UV and microwave irradiation for the degradation of sulfamethoxazole in aqueous solution

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Abstract

This work aim to study the degradation of an antibiotic sulfamethoxazole in water, by the application of the heterogeneous Fenton assisted by UV and microwave irradiation, all the reactions were carried out with the use of solid catalyst containing mixed oxide of iron derived from layered double hydroxide MgFeAl-CO₃.

The synthesis of the catalyst was carried out by classical method named co-precipitation, its characterization was done by isoelectric point, X-ray diffraction (XRD), thermogravimetric analysis (TGA), and infrared spectroscopy (IRTF).

The influence of different parameters on the SMX degradation was studied; such as pH, the amount of catalyst, the concentration of the oxidant (H₂O₂) and the MW power to obtain optimum operating conditions in the two systems studied UV/H₂O₂/LDH500 and MW/H₂O₂/LDH500. The proposed mechanism of the oxidation reaction in the heterogeneous Fenton enhanced by UV and MW was explained to highlight the difference between the two processes. The stability of the catalyst was demonstrated by monitoring the dissolution of the active species, the iron in the solution during the reaction, and also by the reuse of the catalyst for several successive cycles.

All these results confirm the effectiveness of heterogeneous Fenton process enhanced by UV and MW on the rate of the SMX degradation in the aqueous medium.

Keywords: Sulfamethoxazole, heterogeneous Fenton, degradation, layered double hydroxide.



**Design of experiments approach for modeling
and formulation of humic substances adsorption onto activated carbon**

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Abstract

This work presents the results of the study concerning the finding of the optimum conditions for Humic substances Adsorption using activated carbon. The experimental results collected were successfully fitted to a second order polynomial mathematical model to express the correlation between process performance and the independent variables influencing the adsorption process, i.e. temperature, agitation time, phosphate concentration and vibrational intensity. Based on this polynomial model, optimal conditions of the adsorption process have been estimated. The most favorable operating conditions for the treatment were; a temperature, 32.5°C, 10 hours aeration period and phosphate concentration of 16.8 mg/L. On using the optimum conditions a mathematical model simulating the operation for the treatment was obtained.

Keywords: water treatment, Adsorption, Humic substances, activated carbon, design of experiments.



Methylamine as corrosion inhibitor for carbon steel in sulphuric acid solution

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Abstract

The inhibiting effect of methylamine on the corrosion of carbon steel in sulphuric acid solution was studied by weight loss method. The results showed that the inhibition efficiency increases with increasing the inhibitor concentration, while it decreases with increasing the temperature. The values of free energy of adsorption indicated that adsorption of methylamine molecules on the carbon steel surface is a spontaneous process and they are adsorbed chemically as well as physically following Temkin adsorption isotherm and inhibited the corrosion of mild steel by blocking the active site of the metal. Some thermodynamic parameters were calculated and discussed. The results obtained from chemical techniques are in good agreement.

Keywords: Mild Steel, Corrosion inhibition, Methylamine, Adsorption, Acidic media



Wall effects and means of controlling vortex Breakdown of cell culture bioreactor

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Abstract

In the complex geometries, the bubble type vortex breakdown phenomenon has been evidenced numerically in the case of open rotating flows, of a viscous, axisymmetric and incompressible fluid. A cylindrical cavity of spherical bottom is adopted, to simulate and analyze the vortex structure under free surface conditions.

Assuming a stress less free plat surface model, vortex breakdown has been evidenced, beyond threshold value of the lower disk rotation rate. Unlike the case of a rigid surface model, results revealed the attachment of the recirculation zones to the free surface where, such structures could not be observed in the closed case because of the no-slip condition imposed on the top wall. An interest particular is focused in this work on effective kinematical control of recirculation zones (detached or attachment bubble type) attached at free surface. In fact, the study showed that the differential rotation of the sidewall cause either the suppression or the enhancement of the vortex structure ; depending the rate and direction of rotation.

Keywords : vortex breakdown /spherical gap spaces / means of control/rotating disks/ Kinematical control.



Photocatalytic, structural and optical properties of zno and cu-doped-zno thin films prepared by ultrasonic spray pyrolysis

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Abstract

ZnO and Cu-doped-ZnO thin films have been deposited on glass substrates at temperature of 350°C by ultrasonic spray pyrolysis technique. The application to photocatalysis was used to show the doping effect on photocatalytic degradation of methyl green. The structural and optical properties were also studied in order to explain the performance of our thin films, X-ray diffraction patterns showed that all the films are polycrystalline with hexagonal würtzite type with a (101) preferential orientation. Transmittance spectra showed that the obtained films are transparent in the visible region, so the grains size, the band-gap energy, the Urbach parameter; the films thickness and the refractive index were determined

Keywords : Photocatalysis, Spray pyrolysis, Thin film, ZnO.



Production of industrial enzymes (Lipase, Protease and Amylase) by a new isolate *Aspergillus oryzae*18HG80 using submerged and solid state fermentations : a comparative study

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Abstract

Enzymes are proteins that catalyze a biochemical reaction. Nowadays, they are being used in different divisions of industry approved than chemical catalysts because of their improvement. The aim of this work was to compare the production of the industrial enzymes lipase, protease and amylase using submerged fermentation (SmF), and solid-state fermentation (SSF) using wheat bran as substrate. *Aspergillus oryzae* 18HG80, isolated from saline soil, was evaluated using a plate assay for enzymes production, the results illustrated the capacity of the fungus in the three enzymes production. The comparative study of the enzymes yield by the two fermentation processes showed 2-8 fold more enzymes production in SSF than in SmF. Solid state fermentation has advantages for enzymes production over SmF, because of its good yield, simple technique, low energy requirement and less water output.

Keywords : Amylase, *A. oryzae*. Lipase, Protease, Fermentation.



Chromium and other cations extraction and recovery from electrodeposition sludge

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Abstract

This present paper reports chromium and other metallic cations recovery from electroplating sludge. alkaline leaching was performed to extract hexavalent chromium while acid leaching was used to remove trivalent chromium. For this purpose, Sulfuric acid, perchloric acid and hydrochloric acid were tested in order to achieve the most efficient extraction rate. Leachate solutions were analyzed using a flame atomic absorption spectrometer. It was found little amounts of Cr(VI) in the sludge while acids efficiency decreases from HClO₄, HCl to H₂SO₄ to extract Cr(III). Fe, Cu, and Zn were also recovered in the leachate solutions with a proportional amounts to Cr.

Trivalent chromium was used to deposit chromium onto bare copper plates using a two electrodes system. The mass of the electrodeposited chromium onto copper plates was weighted and compared to that obtained with a reference bath.

It was found that the mass of chromium deposits using sludge leachate is almost the same than that obtained using trivalent chromium reference bath. However, the obtained deposits were matt. The results suggest that extraction and recovery of Cr, Fe, Cu, and Zn is possible and efficient. Furthermore, solutions could be actually used for trivalent chromium electrodeposition after optimizing deposit conditions.

Keywords: Chromium, Leaching, Recovery, Sludge.



Optimizing agricultural valorization of wwtp treated effluent. Case of wwtp of boumerdes algeria, applied to local agriculture

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Abstract

This study was conducted in Boumerdes, a wilaya in northern Algeria where the scarcity, the poor distribution of annual rainfall and the imbalance between needs and available resources, contribute to justify the agricultural use of treated wastewater. Our study has one hand on the physicochemical characterization, microbiological safety of these waters and also on optimizing reuse in irrigation quantification in population equivalent of inputs and outputs of nitrogen and phosphorus in compartments (soil and water), taking into account all the needs of these crops fertilizers, why the comprehensive quantification of inputs and outputs of these elements in the effluent of the WWTP Boumerdes will be addressed in our study. The results of physicochemical and microbiological analyzes carried out on a six-month period of the effluent from the station show that the wastewater has a pH = 7.40 relatively stable around neutrality and average concentrations of 23.13 mg/l total nitrogen and 2.94 mg/l of phosphate. Indicators for pollution parameters MES, BOD5 and COD values are respectively 15.26 mg/l, 4.80 mg/l and 26.69 mg/l. The concentrations of heavy metals in treated wastewater are: Copper (Cu) (2.7 g/l), Nickel (Ni) (0.02 mg/l), zinc (Z) (0.09 mg/l), Selenium (Se) (0 mg/l), Arsenic (As) (0.56 mg/l), Cobalt (Co) (<0.2 mg/l), Iron (Fe) (< 0.2mg/l), Manganese (Ma) (0.2 mg/l), Lead (Pb) (0.2 mg/l), Cadmium (Cd) (0.8 mg/l) and Chromium (Cr) (4.4 mg/l). Concentrations are lower to the required standards and have no limit or nuisance for agricultural reuse. The experimental results show that treated wastewater are less than the values guide AFNOR NFT 90-110, and has a quality that allows it to be easily used in agriculture. The global contribution of the WWTP in nutrient can satisfy the needs in nitrogen of 1254 ha of citrus culture, of 1649 ha of viticulture and / or 710 ha of cultures herbaceous. For phosphorus, the WWTP can answer the demand for 1143 hectares of citrus, 632 ha of viticulture and 446 ha of cultures herbaceous. These values obtained are interesting for agricultural valorization.

Keywords : Agricultural valorization, Irrigation, Nutrients, Wastewater, Water Balance.



Techno-economic study of the production of biodiesel from frying oil

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ABSTRACT

Every year, the use of biodiesel as a source of renewable energy is increasing and many producers are interested in obtaining it from vegetable oils. The use of waste oils in place of virgin oils to produce so-called second-generation biodiesel is an effective way to reduce the cost of process raw materials. In this context, a techno-economic study was carried out for the synthesis of biodiesel from frying oils collected in one of the restaurants of the university residences of our campus. Firstly, an experimental work aimed at optimizing the operating conditions was carried out and the results obtained were exploited on a semi-industrial scale in an economic study using the SuperPro Designer V9 software. In this work, we investigated the effect of varying the amount of used oil to convert to biodiesel on the results of the cost analysis. The objective is to estimate the quantity from which the production process will be profitable. The collected oils were first characterized before proceeding with an experimental study using the Surface Response Methodology (RSM) to determine the optimal conditions for their transformation into biodiesel. A transesterification process with methanol and potassium hydroxide catalyst was used.

The results of the RSM design showed that the optimal conditions were 45 ° C, 1.4% by weight of KOH, a methanol / oil molar ratio of 6: 1 and a reaction time of 30 minutes. These optimum values are in good agreement with literature values for transesterification of soybean oil.

In the modeling part, the experimental protocol followed with all its stages is transformed to a set of operations of a semi-industrial process. This flowsheet is represented under SuperPro Designer and material and energy balances as well as economic calculations were then made.

The results of the study showed that the process becomes profitable from an amount to be treated greater than 200kg / batch. The results of the variation in the quantities of waste oil and its influence on the key parameters of the economic study are presented.

KEYWORDS: Transesterification, waste oil valorization, biodiesel, SuperproDesigner, economy study.



Impact of mineral salts on the efficiency of $\text{H}_2\text{O}_2/\text{IO}_4^-$ AOP

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Abstract

This study demonstrated, for the first time, that the $\text{H}_2\text{O}_2/\text{IO}_4^-$ system could be an efficient advanced oxidation process (AOP) for wastewater treatment. Batch experiments conducted at ambient conditions with Toluidine blue (TB), as a model pollutant, showed that 98% of TB and 73% of the initial total organic carbon were removed after only 1 min of treatment when using $\text{H}_2\text{O}_2/\text{IO}_4^-$. Herein, we show the first report on the impact of salts, on the performance of this emerging AOP. It was observed that the presence of salts decreased the degradation efficiency of the process. The one exception is that of bicarbonate which accelerated notably the TB degradation rate but only at low HCO_3^- concentration.

Keywords : Advanced oxidation process (AOP); $\text{H}_2\text{O}_2/\text{IO}_4^-$ process; Toluidine blue (TB); Salts; decreased; accelerated.



SEM and FTIR study of adsorption characteristics using xanthate (PIPX) synthesised collectors on sulphide

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Abstract

In this study, we suggest proceeding to an experimental study concerning the synthesis of new organo-metallic product xanthate (PIPX) by intermittent method and their use in the processes of sulphides flotation. Flotation of sulphide minerals and their activation and modification have been investigated for many years. In this work the influence of sulphite on xanthate-induced flotation of copper-activated galena has been studied. The adsorption of potassium isopropyl xanthate (PIPX $3 \cdot 10^{-3} M$) on galena has been also studied using electrochemical potential, FTIR spectra and SEM. Galena activated with copper sulfate ($10^{-4} M$) have been investigated at $pH = 9$. Surface species have been identified and correlated with SEM. After copper sulfate activation, copper xanthate exists on all of the minerals studied. Basic pH is most favorable for potassium isopropyl xanthate adsorption on activated minerals

Keywords: Xanthate (PIPX), Galena, Activation, Adsorption.



Changes in the recovery of polyphenol content and *in vitro* antioxidant capacity of date *Phoenix dactylifera* by-product as influenced by extraction conditions and assessment of its potential health benefits

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Abstract

Phoenix dactylifera fruit is well known for its nutritional value and numerous health properties. The beneficial effects of dates are not limited to the edible part only but also to the date seeds or pits, which are a by-product of many industries. In order to value this waste and to benefit from its bioactive compounds, an efficient extraction is essential. In this context, the present investigation aimed at the first to optimize extraction conditions of polyphenols and evaluation of antioxidant capacity and at the second to test the date by-product extracts potential on the enzymatic inhibition. The effects of solvent nature (acetone, ethanol, methanol and water), solvent concentration (25-100%), solid-to-solvent ratio (10/20 to 60/20 mg/ml) and extraction time (15-90 min) were studied. Polyphenol content (PC) was used to evaluate antioxidant content of the Ourous date seed cultivar, whereas the antioxidant capacity (AC) was assessed by measuring the radical scavenging activity against stable radical (ABTS and DPPH) and the ferric-reducing power (FRP). The statistical optimization revealed that extraction that best extraction conditions were 75% acetone, 10 mg/20 ml and 45 min with values of 117.22 mg GAE/g dw, 252.71 mg TE/g dw, 54.56 mg GAE/g dw and 60.29 mg GAE/g dw for the total polyphenol content, the ABTS and DPPH radical scavenging activity and the FRP, respectively. The date seed extract showed inhibitory effects on the enzymes, showing substantial potential as neuroprotective and anti-hyperglycemic agents; the inhibitory potential was tested using tyrosinase (TYR), acetylcholinesterase (AChE) butyrylcholinesterase (BChE), α -glucosidase (α -GLU) and α -amylase. Overall, the results obtained validate the usefulness of the studied waste as valuable sources of natural agents beneficial for alleviating symptoms associated with Alzheimer disease and other neurodegenerative ailments as well as diabetes.

Keywords: Antioxidant capacity, enzyme inhibitory potentials, optimization, phenolic components extraction, Phoenixdactylifera see



Characterization of the use of Fe-Ca adsorbent in water treatment–Removal of phosphate and Cr(VI)

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Abstract

The objective of the present study is the use of Fe-Ca adsorbent for the removal of phosphate and Cr(VI) from water. The adsorbent is prepared by coprecipitation method at pH: 10, calcined at 500 ° C and characterized by XRD. The performance of the prepared adsorbent in Cr(VI) and phosphate removal is evaluated in batch experiments. The obtained results show that Cr(VI) removal is favorable at acidic pH. The pH increase implies a decrease in chromium removal. However phosphate can be adsorbed in a large pH range. Phosphate removal by the prepared adsorbent is more rapid than Cr(VI). The adsorption kinetics is controlled by intra particle diffusion in the case of Cr(VI) and surface complexation in the case of phosphate. The maximal adsorption capacity calculated by Langmuir equation is 47mg/g for phosphate ions and 5mg/g for chromium ions.

Keywords: Adsorption, water treatment, phosphate, chromate.



Soil contamination (industrial waste sludge) from wastewater treatment plant with heat treatment, characterization and valorization

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Abstract

Sludge treatment is a difficult phase for the fight against pollution. The main objective of this study is to heat treat oily sludge from the oil industry at the RA1 / Z refinery and then characterize this sludge by: x-ray fluorescence (XRF) to determine the mineralogical composition in percentages in the form of oxides for example (% SiO₂, % CaO, % Fe₂O₃, % K₂O, etc.). We are interested in identifying the different sectors of valorization other than the agricultural spreading with the use of material a very abundant and inexpensive natural aluminosilicate adsorbent material as a catalyst support called diatomite which is a rock formed mainly by the accumulation of diatomaceous frustules called "Kieselgüher" in the Sig deposit of western Algeria presenting the advantage of being locally available and less expensive. The crude diatomite of Sig "DB" that will be modified by ferrihydrite "the deposit of ferrihydrite on crude diatomite DB by ferric chloride tetrahydrate FeCl₂.4H₂O with the different concentrations and surface modification by treatment with sodium hydroxide (NaOH) to increase the surface area specified. The resulting products are named (DMF3). The results of analyzes which are: x-ray fluorescence (XRF), X-ray diffraction (XRD), infrared spectroscopy to transform Fourier in attenuated total reflection mode (IRTF-RTA) for: Ferrihydrite-modified diatomites (DMF3) contain ferric oxides in different phases which are: ferrihydrite, maghemite, lepidocrocite,, goethite, schwertmannite, ferroxhyte, akaganeite, ferroxide, and magnetite. Scanning electron microscopy (SEM) observation shows that DMF3 core particles have diameters of approximately 3-6 µm, and pinnate particles of DMF3 have lengths of approximately 4-9 µm.

Keywords: Sludge, agricultural spreading , diatomite, ferrihydrite



Metallic characterization of pollution from the wild dump of BOULIMAT (BEJAIA)

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Abstract

Following the great development of technology over the last centuries. Nature, as a result, has become a large dump that can receiving all sorts of discharges (hazardous and uncontrolled waste) engendered by the human being.

Our study will focus on the chemical characterization of a wild dump on the side of the BEJAIA city and more precisely the region of BOULIMAT, where we find all kinds of waste (domestic, hospital or industrial). The study was identified by a superficial sampling of soils from the site in question (4 samples), which are subjected to several types of analyzes and physicochemical characterizations coming from a strong contamination in (Ni) around 80mg / kg exceeding widely the standard of (Ni) in soils and that is 50mg / kg.

As a result, the discharge of high concentration of metallic trace elements, for our case the metal element of Nickel is dominant, which are derived from the percolation of waste with acid rain causing contamination of the soil site.

Keywords: Contamination, Hydraulic Binders, Soil Remediation, Stabilization/Solidification, Heavy Metals.



Comparison between Coagulation and Electrocoagulation for landfill leachate effluent Treatment

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Abstract

The present study provides comparative evaluation of chemical coagulation and electrocoagulation process treating a landfill leachate effluent from Constantine CET.

A treatment of 500ml of landfill leachate effluent using Jar test and Aluminium sulphate ($Al_2(SO_4)_3 \cdot 10 H_2O$) as a coagulant for chemical coagulation, and aluminum electrodes for electrocoagulation after optimisation a comparison of Experimental results to assess which method is better to treat landfill leachate effluent, the removal efficiencies of different pollutants such chemical oxygen demand (COD), total organic carbon (TOC) and turbidity has been checked for each method.

Under optimal conditions, chemical coagulation (CC) showed a potential to reduce leachate pollution, the removal efficiency of COD, TOC and turbidity are: 48,75%, 46,67%, and 90% respectively.

furthermore, principal independent factors (current density, initial pH, electrolysis time, and distance between electrodes), on chemical oxygen demand (COD) removal efficiency response, were studied using Response Surface Methodology (RSM).

After optimization of electrocoagulation, the leachate depollution efficiencies obtained are : 79,8% for the COD, 78% for the COT, 99,9% for turbidity.

Keywords : chemical coagulation, electrocoagulation, leachate treatment, chemical oxygen demand (COD), Response Surface Methodology (RSM).



Ozonation pretreatment of tannery wastewater to enhance the production of biogas

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Abstract

Anaerobic digestion has a great future among biological waste treatment technologies, through Bioenergy production and massive solid reduction, however, the overall low efficiency of waste biodegradation and long retention times (20-30 days) allow obtaining a moderate efficiency. To solve this problem of the way how to increase the efficiency of AD, researchers have opted for the pretreatment of wastes.

The aim of the present study was to improve the anaerobic biodegradability of tannery wastewater (TWW) by using ozonation. The effect of different ozone doses was assessed in terms of SCOD concentration, chromium removal, biogas production, and maximum biogas production rate.

The TWW was ozonized in batches in a bubble column. The reactor volume was 500 ml; the ozone doses transferred were O1: 0.05, O2: 0.1 and O3: 0.15 gO₃ / g TS. These doses increased the solubility of COD by 12, 22 and 27% respectively.

Wherein biogas generation was compared with and without pretreatment substrate, after a 48-day incubation period, the cumulative biogas production of the unpretreated substrate was 391 mL / g TVS while a substrate treated with the lowest ozone dose gave a volume of 791 mL / g TVS (+102%), with a percentage of methane up to 81% comparing with that of the unpretreated one which is 52%.

in the end, the pretreatment also has an effect on the general removal of the pollution, with an ozone dose of 0.05 gO₃ / gTS the percentage of elimination of the COD was 67% compared to that of the non-pre-treated which gave just 34% removal of the COD.

Keywords: Anaerobic digestion, ozone, pretreatment, soluble COD, biogas



New photo-Fenton like process via copper(II)-organic acid complex induced the cresol red decolorization

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Abstract

The decolorization of dyes photoinduced by copper-carboxylate complexes was known to be a photo-Fenton-like process. In this work, The combination of light and Cu(II) organic complexes (Cu(II)-Iminodiacetic acid complex (Cu(II)-IDA)) employed in the decolorization of cresol red (CR) was investigated in homogeneous phase in aqueous solution. Preliminary, the study of mixture CR-Cu(II)-IDA, in dark and at ambient temperature show no interaction. The second part, dedicated to the study of the photodegradation of CR by this system under irradiation at 254 nm, revealed the disappearance of the pollutant. The results showed that the percentage of decolorization of CR by Cu(II)-IDA /UV_{254 nm} system was 66 %. The effect of various factors, such as pH, and concentrations of copper and iminodiacetic acid on the photodegradation of CR was examined. The rate of CR decolorization increased in this order of pH: 4.2 ≈ 2.8 > 6.2. The speciation of the complex as a function of the pH is at the origin of this difference. The Cu(II) and acid concentrations are optimized to the 5×10⁻³M and 10⁻⁴ M respectively. These results provide some knowledge about the behavior of dyes in the aquatic environment and on the photocatalytic treatment in the presence of copper(II)-acid organic complex.

Keywords : Complex, Cresol red, Cu(II)-Iminodiacetic acid, Decolorization, Irradiation.



Decolorization of cresol red by a new photo-Fenton like process using copper(II)-organic acid complex

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Abstract

The decolorization of dyes induced by copper-carboxylate complexes was known to be a photo-Fenton-like process. In this work, The combination of light and organic complexes of Cu(II) (Cu(II)-Iminodiacetic acid complex (Cu(II)-IDA)) on the decolorization of cresol red (CR) was investigated in homogeneous phase in aqueous solution. A preliminary study, in the absence of light and at ambient temperature of the mixture CR-Cu(II)-IDA, confirmed the absence of interaction. The second part, dedicated to the study of the degradation of CR by this system under irradiation at 254 nm, revealed the disappearance of the pollutant. The results showed that the percentages of decolorization of CR by Cu(II)-IDA /UV_{254 nm} system was 66 %. The effect of various factors, such as pH, and concentrations of copper and iminodiacetic acid on the photodegradation of CR was examined. The rate of CR decolorization increased in this order of pH: 4.2 \approx 2.8 > 6.2. The speciation of the complex as a function of the pH is at the origin of this difference. The concentration of acid and Cu(II) are optimized to the 5×10^{-3} M and 10^{-4} M respectively. These results provide some knowledge about the behavior of dyes in the aquatic environment and on the photocatalytic treatment in the presence of copper(II)-acid organic complex.

Keywords : Complex, Cresol red, Cu(II)-Iminodiacetic acid, Decolorization, Irradiation



Photodegradation of Naproxen induced by iron oxide (III) (Goethite) in particular and nanoparticular form

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Abstract

Goethitenanoparticles (nGO) have been successfully synthesized by a hydrothermal process using ferric aqueous solution.

The as-prepared nGO phase was characterized by X-ray diffraction (XRD), Scanning electron microscopy (SEM), Transmission electron microscopy (TEM) and Brunauer–Emmett–Teller (BET) surface area, the results showed crystalline phases. The as-obtained goethite nanoparticles exhibited a BET surface area of 17.99 m²/g.

The photodegradation of NPX (Naproxen a non-steroidal anti-inflammatory drug) was also investigated in heterogeneous photocatalysis with nGO, in the presence of hydrogen peroxide and oxalic acid, at different experimental conditions. The behavior of NPX-nGO system in the presence of irradiation has shown that NPX disappear when the medium became acid.

the degradation of NPX by nGO was undertaken in a similar way comparing with GO. It appeared in the systems nGO-H₂O₂-UV and nGO-AOx-UV are more efficient than the corresponding simple system. The photodegradation of NPX in the mixture NPX-nGO under solar light was slowly accelerated in comparison with artificial irradiation at 365nm.

Keywords: hydrothermal, iron oxide nanoparticle, naproxen, photocatalysi



Extraction of propionic acid from waste water using rosmar

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Abstract

Experimental liquid–liquid equilibrium (LLE) data for the extraction of propionic acid from water by rosmar at 291.15 K and at ambient pressure were investigated. Data for the binodal curve have been determined by cloud-point titration method and conjugate points on tie-line were obtained by correlating the refractive index of the binodal curves as a function of composition. The reliability of the tie lines generated from the composition data was tested and verified by two correlation models: Hand and Othmer, which were found to fit the data very well, producing high values of correlation coefficient (R^2). In addition, these experimental tie line data were also correlated with NRTL model and the binary interaction parameters of the model have been obtained by regression with experimental data. Finally, the distribution coefficients and the selectivity factor of the solvent used were calculated and presented.

Keywords: Environnement, liquid-liquid extraction, NRTL, propionic acid, rosmar.



Air purification of polyvinyl chloride insulating particles by HV cyclone filter

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Abstract

The electrostatics cyclone is used for purification of powder and small particles of non conductive materials from air, by using high voltage excitation electrode. The aim of numeric simulation of electrostatics cyclone in2D with finite element method permitted the evaluation of electric field and charge in small insulating particles characteristics of separation. The results show the electric field distribution in cyclone and polyvinyl chloride circular particles with different voltage is presented in this paper. These results help to increase the separation force and the recovery rate of recycling materials with high purity.

Keywords : Electrostatic , electric field, waste particle, powder.



Use of a hybridbiological process in the treatment of industrial wastewater.Case of the industrial zone of El-Fedjoudj, in Guelma province

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Abstract

The phytoremediation based on the purifying power of aquatic plants and purifying bacteria has demonstrated these performances in the treatment of wastewater with multiple advantages. The present work is devoted to the study of the efficiency of a hybrid system based on macrophytes in the treatment of industrial wastewater, recovered from the industrial zone of the municipality of El-Fedjoudj, in Guelma Province.

For this, we have set up a filter-type marsh-type process consisting of two tanks in which two plant species with a purifying potentiality have been planted, one emerging *Phragmites australis* and the other floating *Lemna minor*. This system proved effective in particular with regard to the removal efficiencies of suspended solids and turbidity with the respective percentages of 88.63% and 99.16%. Also, a net improvement was recorded for Biochemical Oxygen Demand (BOD₅) and Chemical Oxygen Demand (COD) with yields of 83.3 and 73.89%, respectively. A significant reduction has been recorded for heavy metal contents, notably iron (Fe) and zinc (Zn) with removal rates exceeding 50%. On the other hand, a total reduction of the bacterial load was recorded after the purification concerning: total coliforms, fecal coliforms and fecal streptococci. Also, we noticed the disappearance of most pathogenic germs after the two purifications. The comparison of the physicochemical and microbiological characteristics of the water purified by our system to the Algerian standards has demonstrated that they comply for a spill in the receiving environment and especially for reuse for agricultural irrigation purposes.

Keywords : Hybrid process, industrial wastewater, *Lemna minor*, *Phragmites australis*, reuse.



Impact de l'épandage des boues de la station d'épuration Ibn Ziad de la ville de Constantine sur la qualité physico-chimique des sols agricoles

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Abstract

Des échantillons de sols agricoles épandis par des boues de la station d'épuration Ibn Ziad comme fertilisants ont été prélevés et caractérisés par des analyses physico-chimique. En comparaison avec un sol témoin, les résultats obtenus montrent que ces sols se caractérisent par une augmentation de l'alcalinité, une diminution de la minéralisation, un enrichissement en éléments nutritifs et des teneurs faibles en métaux lourds.

Keywords : Boues, Compostage, Déchets verts, Station d'épuration, Valorisation.



Experimental and numerical study of green procion adsorption for water treatment

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Abstract

In this work we applied the adsorption process to remove the green procion dye ((GP)) using orange peel ((OP)) as an adsorbent, and also the study of kinetics and isotherms.

A computer code could be used to calculate the mass transfer Kf and the intra (and extra) granular diffusion DS, Dm, in the case of (GP) adsorption onto the three different solid supports.

The results shown that we have found the optimal parameters for better retention, and that the application of the kinetic model follows a second order kinetics, and obeys the BET isotherm.

Key words: adsorption, procion green, orange peelings, adsorption parameters, diffusion.



Physicochemical evaluation of El Haria landfill leachate their impact on the environment

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Abstract

The EL HARIA Technical Landfill TL (location: 40 kms North of Constantine, Algeria) is operated from 2010 until 2015 (the official site closure date), after the wastes was evacuated to another uncontrolled landfill (Next to TL), which causes another source of contamination. The leachate produced by the controlled and uncontrolled landfills, constitute a real source of important biological and chemical contamination, which degrades the quality of the superficial and underground waters.

The main objective of this work is to study the evolution of physicochemical parameters of the two leachates. Other sampling points were studied (surface and groundwater) to study the impact of these leachates. Annual samples were taken from 2010 to 2016. The leachate has maximum temperatures up to 20. The pH is between 7.7 and 8.9, Conductivity ranges from 16.88 to 31.3 ms/cm, la DCO entre 923.3 et 10260mg d'O₂/l, la DBO₅ oscillates between 800 and 400 mg d'O₂/l. For the leachate of 2016, results showed that 1237.5 mg/l of suspended matter, 0.00816 mg/l of orthophosphate, 13277 mg/l of chloride, and 733.8 mg/l of sulfate are registered.

The physicochemical analysis of the leachates showed that they exceed the limits of the Algerian Ministry of environmental values.

Keywords : Pollution, leachate, physico-chemical parameters, landfill.



Water treatment by sono-ozonolysis: a numerical approach

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Abstract

Ozone sonolysis is a combination of acoustic cavitation (sonolysis, i.e. ultrasound) with ozonation. Use of ultrasound for wastewater treatment is a relatively new technology that is mainly applied for treatment of wastewater from textile industry. Sound waves just above the audible level produce cavitation bubbles whose internal high temperatures and pressures lead to their collapse. The chemical destruction of compounds has been demonstrated either inside the cavitation bubble or on its interfacial sheath due to direct pyrolysis, hydroxylation or radicals reactions resulting from the gas-phase pyrolysis of H₂O. Radicals escaping the cavitation bubble diffuse into solution and react near the cavity boundary. Secondary reactions also occur in the bulk aqueous phase. It has been demonstrated that sonolytic systems combined with ozone increased the net transformation rates of a wide range of chemical pollutants. In this work, based on theoretical model of acoustic cavitation, the production of free radicals from one acoustic bubble was predicted for mixture of ozone and oxygen. The influence of several sonochemical parameters, such as liquid temperature, frequency of ultrasound and acoustic intensity on the production rate of hydroxyl radical HO[•] was clarified. The obtained results showed that HO[•] is the main oxidizing species generated during the bubble collapse. The production rate of HO[•] increased with increasing acoustic intensity and decreased with increasing frequency and liquid temperature. The fraction of ozone inside the bubble has also a notable effect on increasing or decreasing the yield of hydroxyl radicals.

keywords: Sono-ozonolysis, Ozonation, Ultrasound, Cavitations bubbles, hydroxyle radical (HO[•]).



Elimination of basic yellow 28 by photocatalytic degradation in suntest in aqueous suspension of TiO_2 , ZnO and Fe_2O_3

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Abstract

This study aims to evaluate the effectiveness and applicability of a new advanced oxidation process (*UV / semiconductor*) for the treatment of waste water. Photocatalysis is a very robust technology that is capable of destroying a wide range of recalcitrant organic contaminants and is equally effective on highly reduced contaminants such as basic yellow 28 (*BYE28*) cationic dyes. In Suntest CPS+, an attempt has been made to optimize the process parameters. The efficiency degradation of Basic yellow 28 (*BYE28*) dye in aqueous suspensions of TiO_2 , ZnO and Fe_2O_3 is strongly depends on the operating conditions. The rate of photodegradation increases with the increasing of the quantity of catalysts to know (TiO_2 , ZnO and Fe_2O_3) from 0.5 to 3g/L and after that rate decreases in the case of the three catalysts, the optimum quantity was found to be 1g/L. The photodegradation rate increases with the increasing of the initial concentration of Basic yellow 28 (*BYE28*) dye in aqueous suspensions of TiO_2 , ZnO and Fe_2O_3 from 10^{-3} to 50×10^{-3} g/L after that it decreases in the rage from 50 to 150 mg/L . The better degradation of Basic yellow 28 (*BYE28*) dye was found at basic pH range for the three catalysts. The degradation rate of Basic yellow 28 increases with increasing temperature in the range studied is to know from 15 to 55 °C in the case of the three catalysts. The photodegradation rate of Basic yellow 28 (*BYE28*) dye in aqueous suspension of TiO_2 P25 increases with the of radiation intensity from 250 to 500 W/m^2 after that, it remained constant from 500 to 750 W/m^2 .

Keywords : photocatalysis, Basic yellow 28, TiO_2 P25, Fe_2O_3 , ZnO , Suntest.



La contamination métallique des boues prélevées de la station d'épuration de la ville mila

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Abstract

La valorisation agricole des boues semble être la solution la plus propre et la plus rentable et c'est l'un des axes de la politique environnementale de l'office national de l'assainissement en Algérie. De ce fait, leur épandage peut être une source de contamination du milieu récepteur, en surface et en profondeur.

Notre étude portée sur l'estimation de la contamination métallique des boues prélevées de la station d'épuration de la ville de Mila.

L'analyse des boues par la fluorescence X indique la présence des éléments métalliques tels que : Cu, Pb, Cr, Ni avec des teneurs acceptables. Par ailleurs, on a remarqué que la concentration du Zn dans les boues est de 2.57 mg/g et la valeur limitée de flux inférieur à 45 Kg/ha sur dix ans, donc cet élément est un facteur qui peut créer un risque pendant leur épandage, à cause de l'insuffisance de la quantité de boue produite par la station. Il faut donc épandre une quantité de boue au moins de 25 tonnes/ha pour bien être aux normes de l'épandage. Par contre la station de Mila produit des boues qui ne peut être utilisée qu'avec une quantité inférieure à 17,54 tonnes/ha sur dix ans. Cependant, cette quantité est insuffisante pour l'amélioration de la qualité du sol.

Keywords : Boue, Station d'épuration, Epandage, fluorescence X, Métaux de traces.



Photodegradation of orange G by heterogeneous photo-Fenton-like using a natural mineral powder

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Abstract

The elimination of azoique dye, orange G (OG) by heterogeneous photo-Fenton like process using local natural mineral powder (NM) is described. The NM powder was characterized by SEM-EDS, UV-vis diffuse reflectance spectroscopy, and XRD analysis. The specific BET surface area of the catalyst was $79 \text{ m}^2 \cdot \text{g}^{-1}$. Operational parameters relevant for the process have optimized: amount of catalyst, initial orange G concentration, concentration of hydrogen peroxide H_2O_2 and pH. Heterogeneous suspensions of $1 \text{ g} \cdot \text{L}^{-1}$ of NM allowed removal of ca.100 % of $5 \times 10^{-5} \text{ mol} \cdot \text{L}^{-1}$ of solution of OG in the presence of H_2O_2 $5 \times 10^{-3} \text{ mol} \cdot \text{L}^{-1}$ at pH = 3 within 120 min. No degradation was observed in basic medium due to the precipitation of iron.

The second part of the work has demonstrated the significant impact that could have sunlight on the activation of mineral natural-oxalic acid complexes in the degradation of OG. The presence of oxalic acid significantly enhanced OG photodegradation. The use of 2.0% of isopropanol as a scavenger confirmed the intervention of hydroxyl radicals HO^\cdot in the photodegradation of OG. Furthermore, this method is effective only at acidic conditions and the disappearance of OG is strongly dependent on the concentration of oxalic acid and amount of catalyst.

Our work shows that the activation of natural mineral by oxalic acid and hydrogen peroxide could have a considerable impact on the fate of organic pollutants in aquatic environment.

Keywords : Hydroxyl radical, Natural mineral, Orange G, Photocatalysis, Solar radiation.



Removal of Metoprolol by activated carbon prepared from food by-product

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Abstract

In this study, a food by-product is valued to produce low-cost activated carbon ACBH, to treat pharmaceutical wastewater. Metoprolol is considered as an example of a study. ACBH was prepared by chemical impregnation of bean peel with phosphoric acid at 450 °C. The adsorbent is characterized by surface pH, pHPzc and IR spectrum, the physical properties of the batch adsorption capacity for metoprolol were examined at 20°C. The results show that the retention process is fast (after 20 min), the optimal solid-liquid ratio is 2 g/l for which the efficiency of retention is 98.50%, the maximum adsorption capacity is 97.7 mg of metoprolol /g of activated carbon for an r equal to 1g/l .

Keywords: Adsorption, by-product, IR, Metoprolol,



Modeling solubility of fatty acids in supercritical carbon dioxide

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Abstract

A great number of processes, particularly, in pharmaceutical and food industries do operate at high pressure and involve the solubility of a given solute in a given solvent. One major application at these high pressure conditions is the one using supercritical fluids, mainly carbon dioxide.

The present work deals with the modeling of the solubilities of lauric, myristic, palmitic, stearic and behenic in supercritical CO₂ by means of equations of state (EOS) - mixing rules (MR) combinations. However the choice of the most appropriate combination is a crucial matter, hence the need for reliable thermodynamic models.

In the present study 10 different combinations EOS-MR were tested and the Peng Robinson (EOS) -Van DerWalls (MR) combination showed the best results for the solubility of Fatty acids tested in supercritical carbon dioxide. Consequently it is necessary to develop rules which assist in making the best combination choice EOS-MR. Also great effort remains to be made to ultimately relate the nature or the chemical structure of the involved compounds to the choice of the best EOS-MR combination

Keywords : Supercritical Fluid / Van Der Walls/ Panagiotopoulos-Reid (P-R) Mixing Rule / Equation of state/ phase equilibrium / High pressure



**To integrate the management of waste managers in the concept of economy
circular case of the town of Oum El Bouaghi**

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Abstract

Today the town of Oum El Bouaghi knows a double growth; growth urban and demographic growth. the results of this increase and this urbanization result in a production of the consumer goods, and also a strong production of waste, which involves a dysfunction this sector. This last is far from being managed in an effective way to obtain positive results, although the commune of Oum El Bouaghi has a wild discharge (Guelif) but now. It shaven and was arranged. During the 8 last years, the common one profited from some urban projects such as the technical center of hiding, new refuse vats, and even of the underground containers... but certain projects were far from being durable.

However, the town of Oum El Bouaghi always suffers from this problem: dustbins filled, dirtiness, of the nonsuitable containers and far from being useful, of the refuse thrown everywhere, in the pavements, the adventure playgrounds, spaces public... the city thus no criterion of a durable city in similar answered situation.

The objective of our research is to analyze the situation and to stress the system of management of domestic waste in the town of Oum El Bouaghi and the behavior of the users of this town of a side to be able to evaluate the results towards a real management of domestic waste, and in addition, the fact of knowing how to reverse the harmful problem and effects of this waste in favour of the environment, the economy, and the company, in other words tow

Keywords: Development durable, circular economy, management of waste, the town of Oum El Bouaghi, the waste disposal, the valorization of waste.ards one durable development of this sector.



Study of the adsorption of methyl red-by-red bean pod

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Abstract

Water pollution from industrial discharges is a serious problem in the world. This pollution can cause harmful effects on the environment. To reduce the harmful effects of these pollutants, several wastewater treatment processes, including physicochemical processes, are used, in particular the adsorption technique. using a biodegradable natural adsorbent at the base of the red scarf gusset in a physicochemical adsorption process, to treat industrial colored rejects. The tests were carried out on Methyl Red which is an anionic dye. Several experiments were conducted to study the effect of chemical activation of the adsorbent by sulfuric acid (H_2SO_4) and phosphoric acid (H_3PO_4), the contact time. The experimental results showed that the adsorption of the dye is Methyl Red on the red bean pod reached 62.43% at pH = 6.7 and at room temperature (25 ° C).

Key words: Adsorption, red bean pod, Methyl red



**Comparative study between two natural coagulants,
Aloe vera and acorn**

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Abstract

This work consists in studying the coagulation process flocculation and decantation, in order to determine the optimal conditions allowing to reduce the parameters of pollution of water intended for the consumption, we used two Algerian plants (Aloe Vera and the Acorn) like coagulants for the reduction of turbidity, and the improvement of some water parameters such as pH, organic matter, alkalinity, conductivity and salinity, these plants have been chosen Algeria also to replace synthetic products that represent a danger to human health. Both coagulants were used after cleaning, drying, grinding and sieving to have the powder form.

In this study the jar test was used as an experimental technique, to determine the pH and optimal dose of the coagulant;

The results obtained were very important for example the percentage of elimination of turbidity was 82.04% and 76.31% when using Aloe Vera and Acorn respectively.

Keywords : Aloe Vera, Acorn, turbidity, coagulation-flocculation, characterization.



Valorization of an organic waste (artichoke leaves) by using it as a bio-adsorbent of aquatic dyes: Experimental and Modeling Study

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Abstract

The present study consists to use a new natural adsorbent which is powder of artichoke leaves (PAL) to treat colored waste water with dyes such as methylene blue (MB) and Bengal pink (BP). The prepared biomaterial was firstly characterized by several analyzes such as (IRTF, DRX, Iodine number (IN), methylene blue number (MBN), phenolic number (PhN), total of porous volum (TPV), specific surface (Ss), pH_{pZC} , equilibrium pH and moisture content).

The influence of various experimental parameters such as (initial concentration, adsorbent mass and pH) was studied. The experimental results showed that the adsorption of the BM and RB dyes on the PFA reached 95% and 88% successively. Numerous models of isotherms have been applied Langmuir, Freundlich, Elovich, Tamkin and BET. The study of adsorption isotherms has shown that the BET model better describes the adsorption of MB and the Tamkin model for BP. It is also shown that the adsorption process on the PAL followed pseudo 2nd order kinetics for the two dyes.

Through this study, we confirmed that powder of artichoke leaves have a high absorption capacity, and less expensive to eliminate various dyes from waste water.

Keywords: Biosorbants, characterization, dyes, powder of artichoke leaves, waste water.



Wastewater treatment (effluents containing dyes)

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Abstract

This study describes the adsorption of dye (Rose Bengal (RB)) on the eggshell at the raw state (EGRS) from aqueous solutions. The adsorbent EGRS were characterized by FTIR spectroscopy. A series of experiments were undertaken in a batch adsorption technique to assess the effect of the process variables i.e. contact time, isotherm analyses. The equilibrium in the solution was observed within (60 min) which was indicated by UV-visible absorption spectroscopy technique. The equilibrium data for adsorption were fitted to the Freundlich.

Keywords: dye, adsorbent, adsorption



Use of efficient agricultural waste for the removal of a cationic dye from water ; kinetic and thermodynamic study

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Abstract

Adsorption can be efficiently employed for the removal of various toxic dyes from water and wastewater. The objective of this study is to assess the adsorption potential of pine cone (natural adsorbent agricultural waste) for removal of malachite green (MG) a cationic dye from an aqueous waste.

Several important parameters such as initial dye concentration, contact time, adsorbent dosage, temperature as well as kinetics were well studied and optimized using a batch adsorption method.

Adsorption tests showed that the equilibrium time is a function of the initial concentration of dye. The equilibrium is established after 10, 45 and 60 minutes for the concentration of MG solutions at 10, 30 and 60 ppm, respectively. The adsorption of malachite green dye on the pine cone is perfectly described by a pseudo-second-order kinetic model. In addition, kinetic and thermodynamic parameters were calculated. The positive value of ΔH° indicated that the dye adsorption process was spontaneous and endothermic in nature.

It is inferred from the results that pine cone is very effective and economically viable adsorbent for removal of malachite green from aqueous solution.

Keywords: Malachite green, Pine cone, Adsorption, Kinetics, Wastewater.



Bioconversion énergétique des déchets générés par l'industrie agroalimentaire

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Abstract

Les activités agricoles et agro-industrielles génèrent quotidiennement des quantités considérables de déchets qui constituent une nuisance certaine pour l'environnement et la santé humaine. Ces déchets sont riches en matière organique, leur valorisation énergétique constitue actuellement la solution la plus viable. En effet, leur valorisation par les procédés biotechnologiques contribue efficacement d'une part, à l'élimination de la pollution que subit l'environnement, et d'autre part, à produire des substances à forte valeur ajoutée et de la bioénergie qui reste une alternative prometteuse à l'épuisement des ressources fossiles, et par conséquent, la lutte contre les conséquences du changement climatique.

Par ailleurs, la matière première est disponible sous différentes formes à savoir : les résidus agricoles, les déchets forestiers, etc. Souvent, cette matière première contient essentiellement de la cellulose, l'hémicellulose et de la lignine dans des proportions variées. Contrairement au bioéthanol de première génération produit généralement à partir de plantes sucrières et amylacées, ce qui pose un sérieux problème quant à l'utilisation de produits alimentaires, c'est pourquoi, la production de bioéthanol de seconde génération ne concerne que l'utilisation des parties les moins nobles des plantes et ne présente, de ce fait, aucune compétition directe avec la production alimentaire.

Le but de ce travail consiste à présenter une filière de production de biocarburant liquide via l'utilisation des déchets et des sous-produits générés par l'industrie agroalimentaire. Pour cela, la voie biologique est présentée dans ce travail. En effet, l'utilisation de la levure *Saccharomyces cerevisiae* pour l'étape de fermentation repose sur sa capacité à hydrolyser le saccharose et à libérer à la fois le glucose et le fructose.

keywords : Bioconversion, biocarburants, fermentation, rejets agroalimentaires, bioéthanol.



Comparative study of photocatalytic decolorization of two azoic dyes (methyl orange and carmoisine) in aqueous solution by TiO_2 pc500 in presence of H_2O_2

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Abstract

A comparative study of the decolorization of two azoic dyes (Methyl Orange and Carmoisine) has released, under artificial UV light irradiation in the presence of UV medium pressure mercury lamp (UV-A light at $\lambda_{\text{max}} = 365 \text{ nm}$), using TiO_2 PC500 as semi conductor and a different concentrations of H_2O_2 (as an electron acceptor).

Before testing the photocatalytic effect, a study of the stability of the two dyes was carried out. Both dyes are stable in the dark for several months. This shows that the **decolorization** does not result from the self-decomposition of the two compounds. Photolysis of the two substrates is ineffective for the degradation of the two dyes, and the addition of hydrogen peroxide (H_2O_2) does not improve photodegradation. So their decolorization in the TiO_2/UV system is the principal way of their elimination.

The adsorption on TiO_2 shows a strong dependence on medium constitution, and it plays a role in the photocatalytic reaction. The decolorization was strongly enhanced in the presence of hydrogen peroxide. The evolution of apparent rate constant (k_{app}) as a function of H_2O_2 concentration, indicates that it plays an important role on the kinetics of degradation of Methyl Orange and Carmoisine. A different behavior of the two dyes degradation screwing the addition of H_2O_2 to the TiO_2/UV system was observed. The efficiency of degradation of Carmoisine was compared with that of Methyl orange. The phototransformation rates were found to be strongly influenced by adsorption and pH. These results are directly correlated with the ionization state of the catalyst surface and the charge of the molecule studied.

Keywords: Aqueous media, H_2O_2 , photocatalysis, TiO_2/UV .



Kinetics of hexylpyridinium bromide degradation in aqueous solution by Fenton oxidation

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Abstract

The aim of this study is to test Fenton process for to obtain total degradation of an ionic liquid in aqueous solution: the hexylpyridinium bromide (HPyBr). In this work, the effect of several operating conditions, including iron concentration ($1,3 \times 10^{-5} - 1,3 \times 10^{-3} \text{ mol L}^{-1} \text{ Fe}^{2+}$), hydrogen peroxide dose ($1,3 \times 10^{-4} - 5 \times 10^{-3} \text{ mol L}^{-1}$) and the presence of light on HPyBr oxidation has been investigated. Under the optimum operating conditions ($T = 20 \text{ }^\circ\text{C}$; $[\text{Fe}^{2+}]_0 = 1,3 \times 10^{-3} \text{ mol L}^{-1}$; $[\text{H}_2\text{O}_2]_0 = 1,3 \times 10^{-3} \text{ mol L}^{-1}$) and in absence of light (Fenton only), the complete removal of HPyBr ($10^{-4} \text{ mol L}^{-1}$) was achieved at 2 min of reaction time. Furthermore, in the addition of light (365 nm) to Fenton process (photo-Fenton process), the reaction has been accelerated. This improvement could be related to a better production of radicals $^\bullet\text{OH}$. In another hand, degradation kinetic followed pseudo-first-order type in all cases. As the result, Fenton oxidation is shown to be a promising solution for the degradation of pyridinium-based ILs in water.

Keywords : Fenton, Ionic liquid, Photo-Fenton, Pyridinium.



Influence of the operating parameters on the stability of the emulsion for the extraction of cerium by emulsified liquid membrane

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Abstract

The technique used to recover and concentrate the cerium was that of emulsified liquid membrane extraction. Derived from liquid-liquid extraction, it allows the simultaneous extraction and desextraction steps and the achievement of high concentration factors.

The success of this technique depends on a key factor, it is the composition of the emulsion. The major problem encountered during the application of the emulsified liquid membrane technique is the stability of the emulsion since the expulsion of the internal phase (receptor) to the external phase (to be treated) reduces the effectiveness of the extraction of the solute.

The emulsion is prepared using Span 80 as a hydrophobic surfactant and di (2-ethylhexyl) phosphoric acid (D2EHPA) as extractant, kerosene as a diluent and an internal aqueous phase (trapping) of nitric acid. . in this study we have studied the important parameters affecting the stability of the emulsion. The results obtained show that the optimal operating conditions for the preparation of a very stable W / O emulsion are: a concentration of Span 80 of 3% (in mass), an emulsification time of 5 minutes, and a stirring speed of 200 rpm, a concentration of the internal phase (HNO 3) of 0.2 N. It is obvious that kerosene brings to the system a better stability compared to other diluents.

Keywords: Extraction; Stability; Cerium; Emulsified Liquid Membrane.



Extraction of Diatrizoic acid from aqueous solution by emulsion liquid membrane

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Abstract

Drug residues are emerging pollutants whose effects on human health but also aquatic fauna are poorly understood. It is recognized that all aquatic compartments are contaminated by this type of pollution. Diatrizoic acid (DAT) is a radiographic contrast agent, used in diagnostic radiography. It's very difficult to treat the effluent charged with DAT by conventional methods. Therefore, it's paramount to apply the advanced process. The emulsion liquid membrane process (ELM) is a subject of actuality, it has proved that is a great advanced extraction process to completely remove pharmaceutical compounds present in wastewater. The ELM process is carried out by permeation of solute through organic liquid phase from a feed phase to a receiving phase. Its greatness lies in high efficiency, extraction and stripping in one stage, simplicity of design and its ease of use. An ELM system was prepared for the removal DTA from aqueous solution. This system is made up of Span 80 as the surfactant, Kerosene as diluent, Aliquat 336 as carrier and potassium chloride as the inner aqueous solution. Influence operational parameters such as volume ratio of internal phase to membrane phase, volume ratio of the emulsion to external phase and diluent type that affects the permeation of DTA was examined. Under the most favorable conditions, a very good extraction efficiency of DTA (>80%) was obtained.

Key words: Aliquat 336, Diatrizoic acid, Emulsion liquid membrane, Extraction.



Destroy of the methylene bleu using an electrochemical process Electro-Fenton

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Abstract

The high distribution of methylene bleu in water could cause a grave menace to the environment, as they can be deadly to existing organisms, and their manufacturing applications can produce desecrate streams counting the dyes; it would be necessary to set up a process of treatment to maintain away possible harm to the environment, and also to keep away from commotion of the ecosystem. As a result, electrochemical method was used as destroying for the methylene blue dye; the degradation pathway of methylene bleu by Electro Fenton process using Carbon felt cathode was investigated via UV and total organic Carbone analysis. The total organic Carbone removal of methylene bleu reached a highest value after 4h 30min of treatment with the optimal applied current at 700 mA and 0.2 mM catalyst concentration. In this study, we worked at different courante tensions, pH and catalyst concentration. The toxicity of treated solution increased rapidly to its highest value at the early stage of electrolysis (several minutes). To conclude, a clear degradation pathway of methylene bleu was proposed, and could further be applied to other manufacturing applications in aquatic environment.

Keywords : Carbon felt, Electro Fenton, Environment, Methylene bleu, Treatment.



Simulation of the behavior of the different pollution parameters during biological treatment using the kinetic model ASM1

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Abstract

Wastewater treatment occupies a fundamental place in the process of protecting and preserving public health by protecting the quality of natural waters, it is carried out in wastewater treatment plants (WWTP), composed of different stages of treatment in order to eliminate the various forms of pollution, the biological stage is very important, it makes it possible to transform the biodegradable pollution into biomass for later elimination in the sludge treatment system.

The modeling of the substrate-biomass relationship has been initiated by the multi-substrate MONOD model to arrive at the ASM1 activated sludge model which supports the elimination of the carbon and nitrogen load. The processes of the latter have been applied in the development of the material balance of the biological basin of the treatment plant of Constantine IBN ZIAD receiving the wastewater from Grand Constantine. This wastewater treatment plant is of the Anoxie-Aéré (AO) type, eliminating the carbon and nitrogen loads by sequentially arranging an anoxic zone and an aerated zone in the biological basin. The modeling of the various material balances of the biological basin was carried out by considering the model ASM1 (Activated sludge model N ° 1) to describe the different kinetics of the independent variables considered in the process of elimination of the carbon and nitrogen load. The equations thus developed have been posed and solved through the development of a simulation program under MATLAB.

The simulation began with the validation of the program, checking the principle of mass conservation, comparing the conversion constant (biomass / substrate) calculated from the simulated results and that considered initially in the simulation program.

The model was validated and then used to simulate the evolution of the different pollution parameters over time during the biological treatment to increase the effect of kinetics only on the behavior of the Constantine wastewater treatment plant IBN ZIAD.

Keywords: functioning, Wastewater treatment plant of Constantine IBN ZIAD, Activated sludge Model ASM1, simulation.



INFLUENCE DES MATRICES NATURELLES SUR LA DEGRADATION DU VERT CIBACRON PAR ULTRAVIOLET

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Abstract

De nos jours, le traitement des eaux et des eaux usées chargées en matières organiques réfractaires telles que les colorants synthétiques devient un problème sérieux. Le traitement sonochimique est un des procédés d'oxydation avancés qui prouve son efficacité d'éliminer des polluants organiques présents à faibles concentrations dans des effluents aqueux. Le traitement par UV est un des AOPs qui prouve son efficacité à dégrader efficacement des matières organiques rebelles aux traitements classiques. Dans ce travail, la dégradation d'un colorant réfractaire, le vert cibacron, par irradiation ultraviolettes a été réalisée. L'influence de plusieurs additives organiques et minérales sur la vitesse de dégradation a été examinée. De plus, l'effet des matrices naturelles a été bien clarifié. Les résultats obtenus montrent clairement que le procédé étudié est promoteur pour le traitement des effluents textiles chargés en colorants synthétiques persistants.

Mots Clés: Traitement des eaux, matières organiques réfractaires, procédés d'oxydation avancés, Photo



Removal of ibuprofen from water by a regenerated clay waste

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Abstract

This work presents the study of the regeneration of a spent bleaching earth (SBE) originating from the edible oil refinery and the use of the regenerated material (RSBE) in the water treatment containing ibuprofen. This waste is a bentonite (clay) activated at hot by sulfuric acid and used in the edible oil bleaching. The regeneration method adopted in this study is based on the heat treatment of the argillaceous waste (SBE) in furnace at 400 °C during an hour, followed by a washing in the cold by hydrochloric acid solution 1 M. The regenerated material (RSBE) was characterized by several techniques (X-ray diffraction, FTIR and elementary methods). The characterization results show that the bentonite structure was not affected by the heat treatment in furnace and that this treatment has only caused the disappearance of organic compounds from the spent bleaching earth. The Regenerated spent bleaching earth (RSBE) was then tested in the removal of ibuprofen from aqueous solution by adsorption to estimate the efficiency of the regeneration method used in this investigation. The effect of physicochemical parameters on the

adsorption of ibuprofen on the regenerated spent bleaching earth and the virgin bleaching earth (VBE) was highlighted. The obtained results show that the ibuprofen is quickly adsorbed on the two materials. The ibuprofen amount adsorbed on the two adsorbents increases with the increase of the initial solute concentration. The solution pH plays a very important role in the adsorption process of ibuprofen by regenerated waste (RSBE). The ibuprofen elimination reaches its maximum in the acid medium. The kinetic modeling showed that the adsorption process can be well described with the pseudo-second-order kinetic model. The sorption isotherms followed the Langmuir and the Freundlich models. The calculation of q_{max} and $1/n$ with these both types of isotherm showed that the regenerated material found its adsorption capacities and can be used as a low-cost adsorbent for the ibuprofen removal.

Keywords: Spent bleaching earth, Waste, Regeneration, Ibuprofen, Adsorption.



HYDRODYNAMIC BEHAVIOR STUDY OF MBBR

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Abstract

The notion of residence time distribution (RTD) is used in process engineering to characterize the hydrodynamics of a chemical reactor or other installation that is traversed by circulating fluid. It allows:

- To diagnose the presence of stagnant areas or short circuit phenomena;
- Or to be able to establish a hydrodynamic flow model that makes it possible to calculate the chemical performance of a reactor.

In recent years, the distribution of residence time (RTD) has become an important tool for the analysis of industrial units and reactors, especially those used in water. This problem is very often associated with the determination of the functional characteristics of an object. By RTD characteristics of flow reactors, we mean a set of parameters and state variables that contain complete information about the operation of a flow reactor. Two approaches are possible: the determination of these characteristics by a tracer study or numerical simulations using hydrodynamic models (DANCKWERTS P.V n.d.).

In general, measurements of the residence time distribution (RTD) are obtained from tracing experiments that consist of an impulse response method. The injection of a tracer is done at the input of a system and a probe is introduced at the output to record the concentration-time curve. A variety of methods for the exploitation of experimental RTD are listed by (BjÖrnstad.T. and All, 2001). RTD measurements are an effective tool that can help to better understand and determine different hydrodynamic parameters.

The experimental system used in this work; consists of an MBBR reactor, with a capacity of 2.25 liters. The reactor was filled with 165.2 g of the carrier medium (Kaldnes k1). The tracer used in this study was a 3M NaCl sodium chloride solution. NaCl is an economical tracer, easy to use and has the property of changing the conductivity of water.

In this study several effects on the hydraulic behavior of the reactor such as:

- Effect of stirring speed on RTD
- Support quantity effect
- Flow effect in the RTD
-

Keywords: residence time distribution, Moving bed biofilm reactor, Kaldnes k1.



Energy recovery of university kitchen waste, statistical and experimental studies, case of the University Salah Bounider Constantine 03

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Abstract

The present research work concerns the study of the biodegradability of kitchen waste (KW) from university restaurants of Constantine 3 University, anaerobically in two different conditions, thermophilic and mesophilic.

737,444 tons of KW are annually generated by the thirteen university restaurants, of which 48.58% is generated in lunch and the rest is generated in dinner. The characterization in terms of pollution parameters of these wastes and respirometric biodegradability tests have confirmed the organic nature, with the presence of plastic and egg shells. The plastic was removed from the samples used in the biodegradation tests and the egg shells were not altered after these same tests.

The results obtained showed on the one hand the importance of respirometric tests in the prediction of the waste treatment by anaerobic digestion (AD), which presented a good biodegradability irrespective of the form of the kitchen waste considered (solid or liquid form), and on the other hand the influence of the ratio Inoculum on substrate on the production of biogas and the elimination of the organic matter. The optimal I / S ratio was 0.5 with maximum biogas production of 112 ml / g TVS of methane for mesophilic conditions. For thermophilic conditions, the maximum production of methane is 416 ml / g TVS. The removal of soluble organic material was for the thermophilic conditions of 96%. In some tests, the low pH of the medium inhibited the production of biogas in discontinuous system, this was corrected by the addition of paper to increase the alkalinity of the system, there is increased production of biogas for all reports tested. This production can be improved by using other pretreatment other than the mechanical pretreatment deployed in this study (crushing). The annual production of methane will be respectively 104000 m³ / Kg. Year and 391000 m³ / Kg. Year in mesophilic and in thermophilic conditions.

Key words: Biodegradability, Anaerobic Digestion, Respirometry test, Kitchen Waste, Biogas



Solubility of Citric Acid Anhydrate in water from 313 to 333 K

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Abstract

In this contribution the solubility of citric acid ranging from 15 to 60 °C using a refractometer was measured. The solubility data were correlated with modified Apelblat equation. The obtained results showed that the solubility of citric acid anhydrate (CAA) is increased with increasing temperature and the solubility curve shows a positive slope and can be divided into two parts. The first part, below 34 °C for the monohydrate form. The second part, above 34°C belongs to the anhydrous form. The thermodynamic properties of the dissolution process, including enthalpy, entropy and Gibbs energy of CAA, were calculated. According to the experimental results, the calculated solubilities of CAA in water over the temperature range of 313-333 K by using modified Apelblat solubility model were in good agreement with the experimental data.

Keywords: Solubility, Citric acid anhydrate, modified Apelblat equation.



Removal of nitrates from water by activated carbons prepared from sawdust

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Abstract

Removal of nitrate by adsorption from aqueous solutions onto modified sawdust was studied. The sawdust was modified by impregnation with phosphoric acid using two ratio 20% and 80% then pyrolysed at 450 °C. Activated carbons obtained were characterized by different methods; Infrared spectroscopy, as well as for their porous and morphological structure by nitrogen. Adsorption capacity of activated carbons prepared was investigated under different conditions viz variations in adsorbent dose, initial concentrations of nitrate and pH. The fitting of the Freundlich, and Temkin adsorption models to the equilibrium data was investigated.

Keywords: Adsorption, kinetics, nitrates, porosity, sawdust



Environmental Assessment of the L-lysine fermentative production

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Abstract

The key factors for the assessment of any bioprocess sustainability are mainly its interaction towards the environment and the capacity to control any generated pollution, beside its social and economical aspects. These factors have direct impact on the decision-making concerning the choice of the relevant technologies at the early stages of the bioprocess design.

Therefore the present study considered the environmental impact assessment of a chosen model process, namely for the production L-lysine by fermentation using *Corynebacterium glutamicum* and glucose as the bacteria and the substrate, respectively.

The approach was, as a first step, based on the calculation of mass balances of the entry and exit streams, by means of Super Pro designer software, followed by an environmental assessment including all relevant impact categories which are classified according to calculated mass indices, deducing the set environmental factors.

In order to optimize the environmental performance of the bioprocess, other indices were also calculated. For instance the results showed that Water was the most influential relevant component from mass point of view with 20.97 and 22,32 kg/kg P for input and output, respectively. Regarding the fact that Water is an exhaustible natural resource, it is necessary to anticipate its recycling. Therefore as a second step a part of the water recovered during the purification of the main product was recycled along with L-Lysine wastes. This led to important mitigations of the environmental impacts of Water and L-Lysine as well to a production increase of the latter.

Key Word : L-lysine, Corynebacterium, Fermentaion, Environmental impact