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## CONTAMINACIÓN POR METALES PESADOS EN UN SUELO URBANO INDUSTRIAL Y EN LA VEGETACIÓN DEL SITIO

\* Abelardo González Aragón<sup>1</sup>  
Margarita Beltrán Villavicencio<sup>1</sup>  
Ilse Ayala Quiroz<sup>1</sup>  
Mabel Vaca Mier<sup>1</sup>  
Alethia Vázquez Morillas<sup>1</sup>

HEAVY METALS POLLUTION OF URBAN-INDUSTRIAL  
SOIL AND ITS VEGETATION

Recibido el 19 de agosto de 2011; Aceptado el 10 de abril de 2012

### Abstract

Pollution of soil by heavy metals is established by comparison against the defined value in the local regulations. In Mexico the NOM-147-SEMARNAT/SSA1-2004 defines the concentration criteria for As, Ba, Be, Cd, Cr VI, Hg, Ni, Ag, Pb, Se, Tl and V that must be achieved in order to consider that a contaminated soil has been remediated.

The goals of this project were: 1) to evaluate the metals distribution and pollution level; and 2) the metals assimilation in the tissue of plants, of an urban-industrial site located north of Mexico City that had been exposed to pollution by heavy metals for more than five decades, as a result of uncontrolled process leaks; the infiltration had reached up to 15 m depth. Due to the site background, it was assumed that Ni, As and Cu were present in soil. Heavy metals were measured in both, the soil in site and the vegetation of the surrounding area.

Soil samples taken between 3.2 and 5.0 m depth showed a Ni content up to 2010 ppm, while As was 4580 ppm and Cu was up to 29222 ppm. Heavy metals were also found in the leaves of trees of the surrounding area, confirming metals assimilation through their roots. Metal concentration in plant tissue (reported as ppm metal per biomass dry weight) was found up to 60 ppm Ni, 472 ppm Cu and 85.4 ppm As. These values are higher than the average metal concentration found for plants.

**Key words:** heavy metals, sampling, soils, vegetation.

<sup>1</sup>Departamento de Energía, Universidad Autónoma Metropolitana

\*Autor correspondiente: Departamento de Energía, Universidad Autónoma Metropolitana. Av. San Pablo 180, Col. ReynosaTamaulipas, Azcapotzalco, D.F. C.P. 02200, México. Email: [mbv@correo.azc.uam.mx](mailto:mbv@correo.azc.uam.mx)



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## MÉTODO DE OBTENCIÓN DE LA GENERACIÓN DE RESÍDUOS DE SERVICIOS DE SALUD PARA MONITOREAR LA EJECUCIÓN DEL PLAN DE GESTIÓN DE RESÍDUOS EN UN HOSPITAL

Amanda Borges Ribeiro<sup>1</sup>  
\* Reinaldo Pisani Júnior<sup>2</sup>

*METHOD TO OBTAIN THE HEALTHCARE WASTE  
GENERATION IN ORDER TO MONITOR THE FULFILLMENT  
OF WASTE MANAGEMENT PLAN IN A HOSPITAL*

*Recibido el 9 de septiembre de 2011; Aceptado el 14 de mayo de 2012*

### Abstract

In Brazil, health care establishments are required to follow a Healthcare Wastes Management Plan. In order to evaluate the implementation of HWMP, it is proposed to survey and comparison of standardized indicators to healthcare waste generation from groups A, B, C and E for internal (hospitalization) and external (appointment) attendances, before and after plan implementation. Waste segregation is a fundamental step for waste management, in this sense, the amount of wastes was divided into groups according as they were discarded in the establishment and later reclassified as they should ideally be segregated. The ratio between indicators of waste generation of the same group with and without reclassification could serve to assess the quality of the separation performed in the hospital. The healthcare waste generation indicators parameterized, in  $\text{kg.occupied bed}^{-1}.\text{d}^{-1}$  and  $\text{kg.attendance}^{-1}$  for the internal and external attendances, made it possible to quantify the waste reduction in periods in which the numbers of attendances were different. The Mercy Hospital of Altinópolis (Brazil) served as a case study for applying the method before and after HWMP implementation. The comparison between healthcare waste generation indicators showed the waste reduction related to attendances (8% in internal and 28% in external) and the improvement in recyclables separation, which initially accounted 3% of D Group and became 21% after the HWMP.

**Key Words:** Characterization, Hospital, Management plan, Healthcare waste.

<sup>1</sup> Universidade de Ribeirão Preto (UNAERP)

\* Autor Corresponsal: Av. Costabile Romano, 2201. Ribeirânia, Ribeirão Preto, São Paulo. CEP 14096-900. Brasil  
Email: [pisanijr@terra.com.br](mailto:pisanijr@terra.com.br)

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## INFLUÊNCIA DA VARIAÇÃO DA RAZÃO MOLAR METANOL/ÓLEO E DO CATALISADOR NAS CONCENTRAÇÕES DE AMÔNIA E FÓSFORO DAS ÁGUAS DE LAVAGEM OBTIDAS NA ETAPA DE PURIFICAÇÃO DO BIODIESEL

\* Erika de Almeida Sampaio Braga<sup>1</sup>  
Marisete Dantas de Aquino<sup>1</sup>  
Carlos Márcio Soares Rocha<sup>1</sup>  
Anne Kamyle Carneiro Leite<sup>1</sup>

*INFLUENCE OF VARIATION MOLAR RATIO METHANOL/OIL AND CATALYST IN AMMONIA CONCENTRATION AND PHOSPHORUS WASHING WATER OBTAINED FROM STEP PURIFICATION OF BIODIESEL*

*Recibido el 17 de enero de 2012; Aceptado el 14 de mayo de 2012*

### Abstract

Biodiesel is a fuel derived from renewable sources and can be obtained by different processes, but transesterification, which consists of a chemical reaction between vegetable oils or animal fats with an alcohol in the presence of a catalyst, is the most used. The parameters at 60 ° C and molar ratio of methanol / vegetable oil 6:1, has been defined as a standard condition for the reaction of methyl transesterification. This study aimed to observe the effect of varying the molar ratio between oil and alcohol and catalyst in concentrations of ammonia and phosphorus from the water washing step of the purification of biodiesel using feedstock crude oil from soybeans. After the reaction of formation of the separation of biodiesel and glycerin, the biodiesel produced was washed with distilled water three times to decrease the residual impurities from the transesterification reaction. Parameters were selected: total ammonia, total phosphorus, because they are constituents in the oil. Were also determined pH values. To perform the analysis followed the general guidelines of Standard Methods for Examination of Water and Wastewater (APHA, 2005). We observed that concentrations of ammonia and phosphorus in the washing water are influenced by varying the molar ratio of oil and alcohol, decreasing the 1st to the 3rd rinse water.

**Key Words:** biodiesel, transesterification, washing water

<sup>1</sup> Universidade Federal do Ceará

\* *Autor correspondente:* Avenida Humberto Monte S/N Campus do Pici Fortaleza-CE CEP 60451-970, Brasil. Email; [andreierika@yahoo.com.br](mailto:andreierika@yahoo.com.br)

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## ANÁLISE DE DESEMPENHO DO CARVÃO ATIVADO E ANÉIS DE POLIETILENO EM BIOFILTRO AERADO PARA O PÓS- TRATAMENTO DE ESGOTO SANITÁRIO

\* Patrícia Bilotta<sup>1</sup>  
Ana Beatriz Barbosa Vinci Lima<sup>2</sup>  
Luiz Antonio Daniel<sup>3</sup>

*PERFORMANCE ANALYSIS OF ACTIVATED CARBON AND  
POLYETHYLENE RINGS IN AERATED BIOFILTER FOR THE  
POST-TREATMENT OF WASTEWATER*

*Recibido el 16 de febrero de 2012; Aceptado el 15 de mayo de 2012*

### Abstract

The study intend to evaluate the performance of the granular activated carbon and polyethylene rings as a means to support the establishment of the biomass in an aerated biofilter to remove suspended and dissolved solids in domestic sewage and to promote nitrification reactions. In the tests was used effluent from UASB reactor on an WTP. Polyethylene rings were obtained by cutting corrugated conduit (diameter 2.0 cm, length 2.5 cm). The monitoring parameters were: COD, total nitrogen, nitrate, pH and alkalinity. The results showed an average increase of 27.6% in the efficiency of COD reduction in the biological filter containing polyethylene rings in relation to granular activated carbon. This behaviour may be associated with more efficient distribution of the active biomass on the polyethylene rings, due to the greater surface area available as a result of its spatial conformation. The results also showed that the biological treatment promoted on the surface of the polyethylene rings allowed to minimize the COD peak variation in the period of the system monitoring and promoted increase superior to 100% in the efficiency in the nitrification of the secondary treatment. As post-treatment the results demonstrated the effective potentiality of the polyethylene rings as medium support to meet the limit concentration of biodegradable organic matter prior to its release into watercourse, according to guidelines established by brazilian legislation. Furthermore, the polyethylene rings allow the reduction of costs in relation to activated carbon and substantial reduction of the mass by area occupied inside the biofilter.

**Key Words:** COT, nitrification, biological filter, biological treatment.

<sup>1</sup> Laboratório de Análises Físico-Químicas, Embrapa Suínos e Aves

<sup>2</sup> TCRE Engenharia Ltda

<sup>3</sup> Departamento de Hidráulica e Saneamento, Universidade de São Paulo

\* *Autor correspondente:* Laboratório de Análises Físico-Químicas, Embrapa Suínos e Aves. Santa Catarina/Brasil.  
Email: [pb.bilotta@gmail.com](mailto:pb.bilotta@gmail.com)

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## ESTUDOS DE TRATABILIDADE DAS ÁGUAS DO RIO PARAÍBA DO SUL QUE ABASTECEM O MUNICÍPIO DE SÃO JOSÉ DOS CAMPOS/SP

Talita Natália Ferrari<sup>1</sup>  
\*Marcelo De Julio<sup>1</sup>  
Tatiane Sakamoto De Julio<sup>2</sup>  
Wilson Cabral de Sousa Júnior<sup>1</sup>

*WATER TREATABILITY STUDIES OF PARAIBA DO SUL  
RIVER WHICH SUPPLY SÃO JOSÉ DOS CAMPOS/SP CITY*

*Recibido el 6 de abril de 2012; Aceptado el 23 de mayo de 2012*

### Abstract

This paper presents the results of a study on the behavior of two coagulants, aluminium sulfate and Fenton's reagent, on the water treatment in a medium sized city in Sao Paulo State, Brazil. The water sample was collected in two different seasonal periods: wet and dry. It was varied dosages and their respective coagulation pH values and the coagulation diagrams were established, in order to choose the most appropriate pair of values 'coagulant dosage versus coagulation pH' taking into account the turbidity removal. The results shown that the Fenton's reagent was more efficient in removing turbidity, during the analysis of the diagrams and after the addition of cationic polymer and filtration, and indeed, it has provided lower concentrations of trihalomethanes at the end of treatment. However, with aluminium sulfate all measured parameters were below the Brazilian drinking water standard. The comparison has pointed out that either aluminium sulfate or Fenton's reagent can be used to treat the water samples from Paraiba do Sul river.

**Key Words:** Coagulation diagrams, Fenton's reagent, THM, treatability studies.

<sup>1</sup> Departamento de Recursos Hídricos e Saneamento Ambiental, Divisão de Engenharia Civil, Instituto Tecnológico de Aeronáutica (ITA).

<sup>2</sup> Departamento de Engenharia Civil, Universidade de Taubaté (UNITAU).

\*Autor correspondente: CTA – ITA – IEI – Praça Marechal Eduardo Gomes, 50 - Vila das Acácias - São José dos Campos – SP – CEP 12.228-900 – Brasil. Email: [dejulio@ita.br](mailto:dejulio@ita.br)

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## APLICAÇÃO DO RESÍDUO ARGILOSO DO PÓLO GESSEIRO DO ARARIPE (PERNAMBUCO – BRASIL) COMO ADSORVENTE DE CORANTE TÊXTIL.

Victor Fernandes Bezerra de Mello<sup>1</sup>  
Juliana dos Prazeres Gama de Abreu<sup>1</sup>  
Joelma Morais Ferreira<sup>1</sup>  
José Fernando Thomé Juca<sup>2</sup>  
\*Maurício A. da Motta Sobrinho<sup>1,2</sup>

APPLICATION OF THE WASTE CLAY PLASTER POLE OF  
ARARIPE (PERNAMBUCO - BRAZIL) AS ADSORBENT OF  
TEXTILE DYE

Recibido el 29 de marzo de 2012; Aceptado el 26 de junio de 2012

### Abstract

The state of Pernambuco, northeastern Brazil, has a large deposit of gypsum, which made the Araripe region as one of the main centers of the country plasterers. Coupled with the economic development has been the generation of large volumes of waste generated from the extraction of ore. In this center of development within the state there is a textile center which accounts for 14% of national production of jeans. Joining these two poles, this study aims to use an inexpensive adsorbent, such as clays of the send-off of the Araripe, which is an environmental liability. Clays were tested fresh and heat treated at different temperatures, to optimize treatment of it. To the best condition, the residue was characterized by X-ray diffraction and BET. Then we performed a second design to optimize the adsorptive process. The results obtained, it was concluded that the best condition is for a smaller mass, higher and lower temperature stirring for both systems dye / clay with a removal of 99,82%.

**Key Words:** adsorption, textile dye, residual clay, indigo

<sup>1</sup> \*Laboratório Interdisciplinar de Meio Ambiente (LIMA-UFPE)

<sup>2</sup> Grupo de Resíduos Sólidos (GRS-UFPE), Departamento de Engenharia Civil- CTG, Universidade Federal de Pernambuco Av. Acadêmico Hélio Ramos, s/n- CEP 50740-530 – Brasil

\*Autor Correspondal: Departamento de Engenharia Química, CTG, Universidade Federal de Pernambuco. Rua Prof. Arthur de Sá, s/n - Cidade Universitária – 50740-521. Recife, Pernambuco, Brasil. Email: [mottas@ufpe.br](mailto:mottas@ufpe.br).

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## TRATAMIENTO ALCALINO DE LOS RESIDUOS AGROINDUSTRIALES DE LA PRODUCCIÓN DEL TEQUILA, PARA SU USO COMO COMPLEMENTO DE ALIMENTO DE RUMIANTES.

\* Clementina Rita Ramírez Cortina<sup>1</sup>  
María de la Soledad Alonso Gutiérrez<sup>2</sup>  
Luc Rigal<sup>2</sup>

*AGROINDUSTRIAL RESIDUALS ALKALINE TREATMENT  
OF THE TEQUILA PRODUCTION, FOR ITS USE AS A  
RUMIANTS' FOOD COMPLEMENT*

*Recibido el 25 de julio de 2011; Aceptado el 29 de junio de 2012*

### Abstract

In the Tequila production, an alcoholic beverage from Mexico, almost 0.8 Kg of agroindustrial residuals (agave bagasse) are generated for every tequila liter produced. These residuals are currently being deposited in confined places, without any treatment or utilization. The agave bagasse analysis resulted in: cellulose 42%, lignin 14%, hemicellulose 18.5%, total nitrogen 2.6%, pectine 0.8%, fats and oils 0.8%, total reducer sugars 5%, ashes 6.2%. In this research, the technical feasibility of the use of bagasse as ruminant fodder was studied. To be able to use the bagasse as fodder complement it is necessary to increase its digestibility, so bagasse alkaline treatments were carried out for this purpose. Sodium hydroxide, ammonium hydroxide and calcium hydroxide were used for the alkaline treatments. The process operating conditions were: temperature 30 and 50 °C; alkali concentration 2, 5 and 10 %, bagasse humidity 20 and 80%, reaction time 24 hours. The bagasse digestibility with treatment and without treatment was carried out by the in sacco method. The digestibility increase with alkali was as follows: with sodium hydroxide it was around 43%, with ammonium hydroxide it was 50% approximately and with calcium hydroxide it was about 54% without treatment the bagasse digestibility was of 36%.

**Key Words:** Agave, alkaline treatment, bagasse, digestibility.

<sup>1</sup> Departamento de Energía, Universidad Autónoma Metropolitana - Azcapotzalco.

<sup>2</sup> Ecole Nationale Supérieure de Chimie de Toulouse de l'Institut National Polytechnique de Toulouse, France.

\*Autor Corresponsal: Departamento de Energía, División de CBI, Universidad Autónoma Metropolitana – Azcapotzalco. San Pablo 180, Colonia Reynosa Tamaulipas, Delegación Azcapotzalco, CP 02200 México D. F., México.  
Email: [crrc@correo.azc.uam.mx](mailto:crrc@correo.azc.uam.mx)

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## MINIMIZAÇÃO DA POLUIÇÃO DA ÁGUA NO PROCESSO DE REFINO DO PETRÓLEO

\* Carlos Enrique de M. Jerônimo<sup>1</sup>  
Elias Andrade Braga<sup>1</sup>  
André Paulo Santos Novato<sup>1</sup>  
Carlos Eduardo Santos Costa<sup>1</sup>  
Fábio Merçon<sup>2</sup>

### MINIMIZATION OF WATER POLLUTION IN THE PROCESS OF OIL REFINING

Recibido el 7 de marzo de 2012; Aceptado el 29 de junio de 2012

#### Abstract

In the current times of economy and globalization pollution, the word of order of the companies is the biggest productivity, with adequate use of the available water, reuses of effluent, more trustworthy industrial processes and reduction of impacts on the environment. In the industry of the oil refining it is not different, is large the necessity of a more efficient management of the water resources in view of the enormous amounts of water used and, for consequence, the great generation of effluent. In this work one searched to identify opportunity of cleaner production, by means of operational and managing improvements in the management of the water resources in Brazilian refineries of oil. These opportunity's objectives is to eliminate, to reduce, to treat and to make use the effluent ones generated in the refineries. The diagnosis made in two refineries presented opportunities for the segregation and reuse of rainwater, reducing the load of pollutants in the effluents at source of generation and some interventions to reduce the waste of steam. This work demonstrates that the cost reduction in waste water is a viable strategy and impacting on the environmental point of view.

**Key Words:** Characterization, Hospital, Management plan, Healthcare waste.

<sup>1</sup> Engenheiro de Processamento da PETROBRAS S.A.

<sup>2</sup> Instituto de Química, Universidade do Estado do Rio de Janeiro. Rua São Francisco Xavier, nº 524, Pavilhão Haroldo Lisboa da Cunha, sala 306, Maracanã, Rio de Janeiro, RJ, CEP 20550-013.

\* *Autor Corresponsal:* Instituto de Química, Universidade do Estado do Rio de Janeiro. Rua São Francisco Xavier, nº 524, Pavilhão Haroldo Lisboa da Cunha, sala 306, Maracanã, Rio de Janeiro, RJ, CEP 20550-013. Email: [c\\_enrique@hotmail.com](mailto:c_enrique@hotmail.com)

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## Cianobacterias y Cianotoxinas en el Lago de Pátzcuaro, Michoacán, México

\* Ana Cecilia Tomasini-Ortiz<sup>1</sup>  
Gabriela Moeller-Chávez<sup>1</sup>  
José Javier Sánchez Chávez<sup>1</sup>  
Luis Alberto Bravo Inclán<sup>1</sup>

*Cyanobacteria and Cyanotoxins in Lake Patzcuaro, Michoacan, Mexico*

*Recibido el 20 de abril de 2012; Aceptado el 4 de julio de 2012*

### Abstract

One of the most common features in eutrophic water bodies is the presence of cyanobacteria which can produce cyanotoxins. In several states of Mexico, many events of cyanobacteria blooms have been reported, as well as in different urban water bodies in Mexico City. From 2009 to 2011, cyanobacteria blooms have also been observed in Pátzcuaro Lake, and in six stations, data of Mycrocistin-LR toxin, chlorophyll and the quantification of cyanobacteria were obtained. This information helped to determine the lake's health risk, according to the World Health Organization (WHO) Guide. In 2009 and according to the WHO Guide, Embarcadero, Espiritu and Quiroga stations and secondly Pacanda station, presented a very high probability of health risk; and in 2010, Quiroga, Espiritu and Pacanda, also showed a high health risk; lastly, in 2011, all stations showed an increased health risk in the month September, except in Napizaro station. It is highly recommended to have a comprehensive and effective plan to treat domestic sewage discharges and reduce diffuse pollution sources in the affected water bodies. In the case of drinking water supply and for the removal of toxins and source cyanobacteria control, the treatment process needs an appropriate and strategic design. Finally, it is vital to inform the surface water users of the implications and health risks of using water with a clear and / or persistent presence of toxic cyanobacteria.

**Key Words:** Cyanobacteria, Cyanotoxin, Eutrophication, Blooms, Health Risk.

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<sup>1</sup> Instituto Mexicano de Tecnología del Agua.

\* *Autor Corresponsal:* Instituto Mexicano de Tecnología del Agua. Paseo Cuauhnáhuac 8532, Col. Progreso, Jiutepec, Morelos. 62550. México. Email: [atomasini@tlaloc.imta.mx](mailto:atomasini@tlaloc.imta.mx)