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HOBBIES: Reading, Indoor games, Travelling and Meeting people.

EDUCATION

Ph.D Analytical/Environmental Chemistry (2010).

Ambrose Alli University, Ekpoma, Edo State, Nigeria.

Thesis: Characterization and Treatment of Some Industrial Sludge Using Locally Sourced Coagulants.

M.Sc. Analytical/Environmental Chemistry (1998)

University of Benin, Benin City, Edo State, Nigeria.

Dissertation: *Levels of OrganoChlorine Pesticide (OCP) Residues in Some Fishes and water From Some Rivers in Edo State, Nigeria.*

B.Sc. (Hons). Industrial Chemistry (1988)

University of Benin, Benin City, Edo State, Nigeria.

Project: *Some Aspects of Small Scale Industries (Adhesives, Shaving Cream and Candle Production).*

PROFESSIONAL EXPERIENCE:

Reader, Department of Chemistry, Faculty of Physical Sciences, Ambrose Alli University, Ekpoma, Edo State, Nigeria. I joined the University as an Assistant Lecturer in the year 1999 and rose through the ranks to my present status.

I had done some consultancy services before joining the University in the area of Environment, Safety and Management/Manpower Development.

I still render services in my current research areas of Environmental, Food and Public Health Chemistry.

ADDITIONAL SKILLS

- Good communication and interpersonal relationship
- Highly professional and pro-active
- Posses personal charisma and probity

MEMBERSHIP OF LEARNED SOCIETY.

Member, Chemical Society of Nigeria. (MCSN).

Member Chemistry Advancement Society (CAS)

Member International Union of Pure and Applied Chemistry (IUPAC)

Member, American Chemical Society, (ACS)

I am formalizing my membership of the Material Science and Technology of Nigeria (MSN).

TEACHING EXPERIENCE

I have lectured for over eighteen (18) years in virtually all areas in Chemistry/Industrial Chemistry at Undergraduate and Post-Graduate levels and supervised more than 200 undergraduate project and seminar students, Supervised and Co-supervised six (6) M.Sc students, three (3) Post-Graduate Diploma (PGD) students and currently supervising and co-supervising four (4) M.Sc students, 5 PhD students and over 10 undergraduate students.

ADMINISTRATIVE RESPONSIBILITIES

Course Level Adviser/Counselor, One time member, Monitoring Team, also served as a Coordinator and currently as Coordinator, Foundation Programme. I also served in the Faculty Environmental Sanitation committee. A former **Coordinator** Postgraduate Programme in the Department.

I was on **Sabbatical as an Asst. Director**, Research Support Services, Rubber Research Institute of Nigeria (RRIN), Iyanomo, Edo State, Nigeria.

On the social note and good relationship with my colleagues, I was **former President**, Ambrose All University Senior Staff Club, Ekpoma, Edo State, Nigeria.

I am the immediate past Ag. Head, Department of Chemistry, Faculty of Physical Sciences, Ambrose Alli University, Ekpoma, Edo State, Nigeria (2014-2016). I am the Current **Chairman**, Chemistry Advancement Society (CAS) in the Department, the Publisher of CAS journal, a reputable scientific journal, available online @www.casjournal.org.

RESEARCH AND PUBLICATIONS

I have 42 published scientific researched works in reputable Local, National (25) and International journals (17).

I am a co-editor in a book currently in use for undergraduate and postgraduate Experimental Chemistry titled "A Guide to Experimental Chemistry published by Sylvia Publishing Inc, Nigeria in 2017.

ABSTRACTS

Tropical Journal of Environmental Science & Health 3 (1): 24-28 (2000).

Characterization of effluent produced by rubber factories in selected towns of Nigeria

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Key words: Effluent, rubber factories, coliforms, micro-organisms

Abstract

Effluent from twenty one (21) rubber processing factories in some selected towns in seven (7) states of Nigeria was investigated. Results indicate variety of micro-organisms with high count. A range of (8.5×10^4 - 1.25×10^6 cfu/ml), (0.4×10^1 - 5.7×10^3 cfu/ml), and 200-2400 mpn/100ml) were recorded for total bacteria, total fungi and total coliform count respectively in all the sample analysed. Pathogens such as Escherichi coli, salmonella sp, shiyellas sp, clostridium sp and staphylococcus sp. Were implicated. High Biochemical Oxygen Demand (BOD₅) (150-32mg/1), total dissolved Solids (250-450mg/1), total suspended solids (51.0-250mg/1), turbidity (1.70-19.20mg/1), pH (5.80-8.10), alkalinity (2.00-3.45) and Acidity (1.53-3.30) were detected. Nitrate (1.31-4.80mg/1), Sulphate (0.20-0.8 1mg/1), Phosphate (0.32-1.56mg/1), Iron (0.12-1.96mg/1), lead (0.16-2.40mg/1), Chromium (0.13-0.56mg/1) and others were recorded in all the factories investigated. However, cadmium and mercury were not detected, where as, chloride, calcium, magnesium, sodium and potassium were detected in appreciable amount. Results are useful in designing treatment facilities and strategies for making the effluent environmentally friendly.

Changes in the Quality of Rubber Effluent Under Tropical Ambient Condition

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Abstract

Change in the quality of rubber effluent under tropical ambient condition was investigated for 28 days duration. The pH decreased slightly from 6.90(0.1) to 5.3(0.1) where as the acidity increased from 3.48(0.20) to 3.69(0.1) however the alkalinity was fairly stable. Various degrees of decrease were recorded in the temperature (°C), conductivity, (us/cm), total dissolved solids (mg/l), biological oxygen demand (mg/l), total suspended solids (mg/l) and organic carbon (mg/l). Total viable bacteria count increase from 1.22×10^5 to 2.41×10^8 and thereafter decreased steadily to 40×10^3 while total fungi count decreased from 5.6×10^4 to 2.0×10^1 at the end of the storage period respectively. Eight bacteria genera, bacillus, clostridium, staphylococcus streptococcus, Escherichia coli. Salmonella, shigella, klebsiella were detected while the fungi genera include, rhizopus, penicillium, aspergillus, geotrichum, alternaria, botrytis and monocillium. Ecological succession was observed, amongst the various groups of micro-organisms, especially in the fungi group-isolated. Results obtained are useful in developing, measures, data and indices that may be useful in rubber effluent and management.

BIODETERIORATION OF AKPU PRODUCED FROM CASSAVA (MANIHOT ESCULENTA –CRANTZ) AND THE EFFECT OF SODIUM BENZOATE ALONE OR IN COMBINATION WITH ASCORBIC ACID.

BY

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ABSTRACT

Biodeterioration of Akpu produced from cassava (Manihot esculenta-Crantz) during storage under tropical ambient temperature and the effect of sodium benzoate (SB) alone or in combination with ascorbic acid (AA) was investigated for eight (8) weeks duration. Results shows that high bioload (1.01×10^9 cfu/g) and fungi count (1.10×10^{10}) was recorded at the 16th day of storage and thereafter decrease gradually. Treatment with different concentrations of SB and SBAA resulted in no growth of the associated microorganism up to the 28th and 42nd day of storage with minimal growth which was not sustained. Five bacteria genera (Bacillus, Streptococcus, Staphylococcus, Pseudomonas, and Alcaligens) and eight fungi groups (Aspergillus, Pencillium, Fusarium, Alternaria, Rhizopus, Mucor, Trichoderma and Geotrichum) were isolated during storage. Whereas, only Bacillus, Streptococcus and Aspergillus were detected in SB and SBAA treated samples. The pH decreased gradually to 3.26 ± 0.01 while the titratable acidity increased to 0.05 ± 0.01 at the end of storage period. However these were fairly stable in SB and SBAA treated samples. The various degree of deterioration recorded in the protein, lipid, ash and carbohydrate contents at the end of the storage period were significantly different ($p < 0.05, 0.01, 0.001$), but SB treated samples were fairly stable throughout the storage period. However, marked reduction as recorded in protein, lipid, ash and especially carbohydrate contents in SBAA treated samples. Fifty six (56%) percent decrease as observed in the hydrocyanic acid compared to 35% and 25% decrease noted in SB and SBAA treated samples respectively. Overall sensory evaluation shows that SB treated samples were highly acceptable even though freshly prepared samples were preferred.

Key Words: Biodeterioration, Akpu, sodium benzoate and Ascorbic acids.

**AN OVERVIEW OF ANAEROBIC SYSTEMS FOR DOMESTIC AND INDUSTRIAL
SLUDGE TREATMENT**

Asia, I. O. Egwaikhide, P. A. Ize-Iyamu, O.K . and Egbon, E. E.
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(Accepted 15th September, 2003)

ABSTRACT

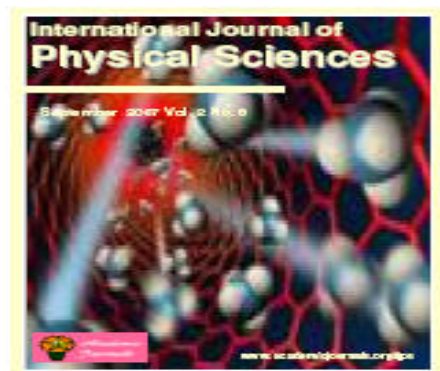
The increasing global concern on the environment demands that wastes should be properly managed in order to minimize and possibly eliminates their potential harm to public health and the environment. Amongst the various practical treatment method, anaerobic digestion is often the most attractive solution for treatment of sludge due to the following advantages: a high BOD and COD reduction, a high solids reduction, reduction of nitrates and phosphates, production of energy as biogas, production of a bio-fertilizer, small production of already stabilized biological sludge that can be used as nutrients, lower capital investment and operating cost. In Nigeria, besides the inherent advantages, climatic conditions are favourable and there is a considerable capacity to develop and optimize the process in research institutions and universities.

ADSORPTION OF PHENOLS FROM AQUEOUS SOLUTION
USING MODIFIED KAOLINITE

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ABSTRACT:

Widespread contamination of soil and groundwater by many synthetic organic chemicals has been recognized as an issue of growing importance in recent years. Phenoxylb compounds when added to the soil may react with the soil clay minerals. This study concerns such reactions. Result obtained show that these organic molecules are strongly sorbed by the (kaolinite) clay minerals both by raw clay and organic modified one, with the later exhibiting far better sorption inter phase than the former.



Concentrations of residues from organochlorine pesticide in water and fish from some rivers in Edo State Nigeria

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Abstract

The levels of organochlorine pesticide residues in water and fish from some rivers in Edo State were determined. The water samples were extracted with 15% diethyl ether in hexane, the extracts were treated with copper tunings for the elimination of sulphur interference and analyzed using a gas chromatograph fitted with an electron capture detector. In all the water samples analyzed, the organochlorine pesticide residues determined (Lindane, Aldrin, pp-DDE, op-DDD, pp-DDD, op-DDT, and pp-DDT) were present, except in Ikoro River, where the water samples exhibited non-detectable levels of pp-DDE and pp-DDT. The level of pp-DDT, (0.7442 ppb) was highest in Ogba River, followed by Lindane (0.7130 ppb), Aldrin (0.5985ppb). Lindane (0.7928 and 0.5912ppb) was found to be highest in river Ovia and Ikoro respectively followed by Aldrin (0.7731 and 0.4867 ppb). The other organochlorine pesticides were present in varied levels from 0.3097 - 0.4860 ppb in Ogba River; ND-0.3100 ppb in Ikoro River and 0.3019 - 0.5557 ppb in Ovia River. The pesticides residues in fish samples were extracted by Soxhlet extraction process using a mixture of hexane and acetone, the extracts cleaned and analyzed using a gas chromatograph fitted with an electron capture detector. The organochlorine pesticide residues detected in water were also present in the fishes but at higher concentrations. This can be due to OCPs being lipophilic. The concentrations of these OCP residues were more in the bottom to middle feeders (Cts) than in the top to middle feeders (Tzs). Lindane levels (0.063 mg/g); 0.054 and 0.039 mg/g were detected in fish from Ovia, Ogba and Ikoro rivers respectively. While Aldrin was found present in 0.059 and 0.027 mg/g in the bottom and top feeders from Ovia river. However these levels were quite high when compared with the allowable Federal Environmental Protection Agency (FEPA) now Federal Ministry of Environment limits and can be harmful if the trend is not checked.

Key words: Organochlorine, pesticide residues, rivers, fishes, safety, water, seafood.

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Full Length Research Paper

The effects of petroleum exploration and production operations on the heavy metals contents of soil and groundwater in the Niger Delta

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Abstract

Soil and water samples obtained from four sampling points; around an oil well head, flare site, waste pit and effluent discharge point in an exploration area in the Niger Delta were analysed for their heavy metals contents. The results showed that the amount of lead present in the soil ranges from 3.40 – 99.40 mg/kg, copper values were in the range of 5.10 – 49.30 mg/kg, Nickel concentration vary from 1.60 – 13.80 mg/kg, values for cadmium, iron, zinc, and chromium were 0.04 – 0.95 mg/kg, 536.00 – 12,872.00 mg/kg, 11.1 – 274.00 mg/kg and 1.30 – 165.00 mg/kg respectively. Apart from zinc and nickel, all other heavy metals were higher than the toxicity limits for heavy metals in natural soil; this implies pollution of the soil by heavy metals. Also the waters were found to be polluted by lead, the pH of the water samples was found to deviate significantly from DPR limits and W.H.O. standard for potable water. This also implies pollution. Remediation measures were suggested so as to render the soil and ground water fit for use.

Key words: Soil, water, heavy metals, pollution, exploration

Proximate and Mineral Composition of Mucuna Pruriens

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ABSTRACT

The leaves of Mucuna pruriens (Devils beans) were studied and the proximate evaluation and composition of some of the mineral nutrient were out. The aim as to find out why pregnant women and anaemic patients consume leave extract of this plant. The results show viz: Crude protein, 4.13% \pm 0.06, Crude fat 0.01% \pm 0.00, Crude fibre 10.17% \pm 1.62, Carbohydrates 60.93% \pm 1.22 with converted fat to fatty acid and metabolisable energy of 0.008% and 103.58KJ/100mg respectively. While mineral components, which were determined using appropriate analytical tools were measured in mg/100g, viz: Na=31.57% \pm 0.2f0, K=38.19% \pm 0.31, Mg=18.13% \pm 0.5, Ca=22.01% \pm 0.09, Mn=3.17% \pm 0.019, Zn=17.28% \pm 0.04, P=55.09 \pm 0.28, Fe=8.47 \pm 0.26. These results show a high metabolisable energy value with low fat to fatty acid value and remarkable high iron (Fe) content in the sample tested.

COMPARATIVE STUDIES ON THE TREATMENT OF BREWERY SLUDGE USING LOCALLY SOURCED AND CONVENTIONAL COAGULANTS.

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Received August 11 2009 Accepted September 25 2009

ABSTRACT

*Composite sampling was done in the collection of sludge from the Brewery. The collected sludge samplers were characterized physicochemically according to standard procedures and were each found to have pollution potentials on the basis of some parameters determined, amongst which were COD, Turbidity, BOD, and Heavy metals. The values of these pollutant indicators were quite high, varying from one industry to another. Optimum dosage of the locally sourced coagulant, *Jatropha gossypifolia* stem latex and the conventional coagulant, alum were determined and were found to be 1.00ml for *Jatropha gossypifolia* stem latex at a pH of 6.7 and 3.80gm for alum at pH 4.3 respectively. The sludge samples were treated using the optimum coagulant dosages proportionally. The results obtained show that, there were reductions in pollution indicators as observed from the values of the parameters determined, thus, an improvement on the quality of the sludge samples. In the sludge treated with the locally sourced coagulants, there was 78.28%, 78.91% and 88.25% reduction in the COB, BOD and Turbidity. The total solid and suspended solids increased by 22.24% and 14.47% respectively, while in the treatment with the conventional coagulant, COD BOD and Turbidity reduce by 91.00%, 93.00% and 86.78% respectively. The total and suspended solids increased by 26.46% and 20.85% respectively. A comparison of the locally sourced coagulant with the conventional ones showed that it was not only as good but also be possible replacement for the conventional coagulant.*

Keywords: Sludge, *Jatropha gossypifolia*, Alum, Pollution.

KINETIC ANALYSIS AND EFFICIENCY EVALUATION OF BIOBEMEDIATION TECHNOLOGY ON DIESEL CONTAMINATED SOIL IN THE NIGER DELTA AREA OF NIGERIA.

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Department of Chemistry, Ambrose Alli University, P.M.B 14, Ekpoma, Edo State, Nigeria

Abstract

The effect of diesel oil pollution on soil properties and the potentials of bio-remediating the polluted soil using indigenous soil microbes under suitable conditions as well as the kinetics of the process was investigated. Soil spiked with 10% diesel oil were characterized for pH, total petroleum hydrocarbon content (TPH), conductivity, particle size, total organic carbon(TOC), total nitrogen(TN), total phosphorus(TP) and heavy metals (Cd, Pb, Ni, V and Cr) before contamination, after contamination and at the end of the remediation process using standard analytical methods. The effect of diesel pollution on the soil properties were quit revealing as a reduction of pH, conductivity and phosphorous level, with a significant increase in the total petroleum hydrocarbon content of the soil was observed. Presence of heavy metals such as Cd, Ni and V were detected in the control soil but surprisingly gave lower concentrations in the diesel contaminated and bioremediated soils. Diesel contaminant affected the heterotrophic microbes as an initial decrease in population was observed. However the hydrocarbon utilizing microbes effectively degraded the contaminant as evident in subsequent increase in population due to presence of available nutrient source and drastic hydrocarbon depletion. The rate of microbial degradation was found to be pH 4.6-9.8. The bioremediation process was found to be highly effective and efficient as 77.95% remediation efficiency was achieved on the sixth week. Kinetic analysis shows that the degradation pattern followed first order with a rate value of unity showing the opposing trend between the concentration of the contaminant in the soil (C_s) and the concentration degraded by the microbes (C_d), which explains that as C_s is decreasing with time, C_d is increasing.

Keywords: Biodegradation, Diesel, Isotherm, Soil, Total petroleum hydrocarbon.

Characterization and Treatment of Sludge from the Brewery using Chitosan

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ABSTRACT

Sludge samples were collected from the brewery (composite sampling type). The collected sludge samples were characterized physicochemically according to standard procedures and were each found to be polluted on the basis of some parameters determined, amongst which are COD, Turbidity, and BOD. Triplicate determinations were done in each case and the mean values obtained from statistical evaluation using the Tukey-Kramer multiple comparison tests. The values obtained for sludge were found to be 2072 mg/l, 1034 NTU. and 640mg/l for COD, Turbidity, and BOD, respectively. The Total Solids (TS) and Suspended Solids (SS) were 7307.50 mg/l and 2067.50 mg/l, respectively. Optimum dosage of the coagulant determined was 1.50 ml of 1% chitosan solution/100ml sludge. On the basis of this, the sludge was treated proportionally and the treated sludge sample, characterized. From the results obtained, there were significant reductions ($p < 0.05$) in pollution as indicated from the values of the parameters determined, thus, an improvement on the quality of the sludge samples with 81.48%, 81.72%, and 88.27% reduction in the COD, BOD, and Turbidity, respectively. The TS and SS increased by 29.01% and 18.73%, respectively. Chitosan was found to be effective at low levels, its effectiveness is less pH dependent and does not pose problems in terms of residual metal contamination and are generally more biodegradable, therefore more environmental friendly. It is ready availability and cheap. The use of the coagulant for the treatment of sludge can be so recommended as the treated sludge could either be used as soil conditioners/enhancers, land filling/reclamation or added to other materials for block making. Studies are underway in their use in the treatment of industrial effluent.

(Keywords: sludge, biological oxygen demand, BOD, chemical oxygen demand, COD, turbidity, chitosan, coagulant)

Equilibrium and Kinetic Studies of the Reaction of Aquomet Derivative of Pigeon Haemoglobin with 5,5¹ Dithiobis (2-Nitrobenzoic Acid).

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ABSTRACT

The sulphydryl groups Cysf9(93) β and Cys β 5(23) β present in the aquomet derivative of pigeon haemoglobin were investigated for their equilibrium and kinetic parameters by monitoring their reaction with 5,5¹- dithiobis (2-nitrobenzoic acid) (DTNB) with the aid of a UV-visible spectrophotometer. At specific pH (5.7-9.0) the absorbances of mixtures of varying DTNB concentrations (0.015mM-0.34mM) and a fixed concentration of aquomet haemoglobin (50mM haem) thermostated at 25°C was measured at a wavelength of 412nm. Data was analyzed with the aid of a computer program written on Micromaths scientist software. Equilibrium constant K_{eq} varied between 17.3 and 0.02 for both sulphydryl groups reflecting a decrease by almost three orders of magnitude between pH 5.7 and 9.0. The apparent second order reverse rate constant (k_r) for the reaction of the sulphydryl groups with DTNB was calculated to be 26.29 to 63,516 $\text{dm}^3\text{mol}^{-1}\text{sec}^{-1}$ and 4.31 to 1358.203 $\text{dm}^3\text{mol}^{-1}\text{sec}^{-1}$ between pH 5.7-9.0 for Cysf9(93) β and Cys β 5(23) β , respectively. Elucidation of the apparent second order reverse rate constant (k_r) which has not been feasible from kinetic experiments was made possible from this study. A quantitative assessment of the pH- dependence profile shows that k_r increases by almost three orders of magnitude for Cysf9(93) β and two orders of magnitude for Cys β 5(23) β between the pH range studied indicating higher reactivity for Cysf9(93) β . This information is vital for a comprehensive understanding of the kinetics and reactivity of the sulphydryl groups in pigeon haemoglobin (aquomethaemoglobin).

(Keywords: aquomethaemoglobin, pigeon, DTNB, equilibrium constants, Cysf9(93) β , Cys β 5(23) β)

A Comparative Evaluation and Toxicity Assessment of Heavy Metals in Commonly Smoked Cigarette Brands and Local Tobacco Snuff Purchased and Consumed in Nigeria

[Akpoveta O. Vincent](#), [Osakwe A. Steven](#), [Egharevba Felix](#), [Osaro K. Ize-Iyamu](#), [Akpoveta A. Veronica](#), [Osazuwa E. Jato](#), [Okoh E. Benedict](#), [Okwagi Patrick](#), [Aweatefe J. Kehinde](#), [Odjighere Mathew](#) and [Weltime O. Medjor](#)

Abstract: The concentration levels of some heavy metals were investigated in ten different brands of commonly smoked cigarettes in Nigeria and compared with the results of similar heavy metals determined in tobacco snuff consumed in Nigeria with the aim of evaluating and comparing the level of heavy metal contamination in them as well as assessing their toxicity levels. Samples were representatively collected from the thirty six states of Nigeria and determined for heavy metal contents using conventional analytical methods. The mean concentration range of Pb in snuff and cigarette brands was 0.12-3.10 mg kg⁻¹. Pb values found in cigarette samples fell within the recommended standards except for snuff (3.10 mg kg⁻¹) which exceeded the limit. The mean concentration range of Cd in snuff and cigarettes was 0.02-3.55 mg kg⁻¹ with samples such as benson and hedges, yes, lemon and butter, green sport, sweet menthol and snuff exceeding safe limit indicating significant pollution in Cd for these samples. Cu has a mean concentration range of 6.02-15.85 mg kg⁻¹ in all the samples with most samples exceeding the recommended standards except for st moritz, marlboro and benson and hedges which fell within the limit. The concentrations of Ni (0.11-0.17 mg kg⁻¹), Cr (0.14-0.16 mg kg⁻¹) and Zn (7.30-24.02 mg kg⁻¹) all fell within the recommended standard. Significant variations were observed in the concentrations of all the metals studied except for chromium which gave similar results (0.14 mg kg⁻¹) for all the samples. A quantification of the contamination/pollution index for heavy metals in the snuff and different brand of cigarette samples studied in Nigeria shows that the samples are highly contaminated and polluted in some of the metals studied and therefore constitutes major health risk to the local population since the physical health of consumers is being threatened. Most of the results in this study were in the same range and in some cases found to be lower except for Cd concentration in snuff which was higher when compared to the result of similar studies in cigarettes commonly smoked in Germany, Greece, India Australia, China, Canada, Russia and USA. The significant concentration levels of heavy metals in the different cigarette brands and tobacco snuff studied were attributed to primary factors which influence the level of heavy metals already in the growing tobacco plant. The presence of such toxic metal contaminants in an already deadly consumer product demonstrates the need for strong regulation of tobacco products.

TREATMENT OF WASTE WATER FROM FOOD INDUSTRY USING CLAY

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Ekpoma, Edo State.

Abstract

The waste water samples were collected using composite sampling technique from a fast food centre in Ekpoma and characterized physic-chemically according to standard procedures and were found to have pollution potentials. The samples were treated clay in a batch system the samples showed a colour change from brown (before treatment) to a very light brown (after treatment). There was reduction in turbidity values from 296.43-113.60 NTU; conductivity, 110.00-55.84 mscm^{-3} and dissolved solids, 77.40-17.23mg/l. The percentage reduction of COD AND BOD was 78.0% and 79.09% respectively. The study also shows that TS and phepol had percentage reduction of 76% and 58% respectively. The investigation shows that clay is a potential substance for adsorption of environment pollutants such as Pb, Cd, Cu, Zn and Cr which were reduced to below detectable levels.

Keywords: Clay, pollutants, wastewater, adsorption.

FOOD INDUSTRY WASTEWATER TREATMENT USING SURFACTANT MODIFIED CLAY

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Edo State.

Abstract

Wastewater was collected from a fast food centre in Ekpoma, using composite sampling technique. The wastewater was physic-chemically characterised according to standard procedures before treatment using hexyldecyltrimethylammonium bromide (HDTMAB) modified clay in a batch system. The results obtained showed that there were reductions in pollution indicators as observed from the values of the various of the various pollution parameters investigated; an appreciable improvement on the quality of the water. The colour of the wastewater changed from dark brown to light brown after treatment. There was reduction in turbidity values from 296.43-1.07 NTU; Colour, 8.90-0.08 and dissolved solids, 77.40mg/l-8.67mg/l. Percentage reduction of COD AND BOD, phenol, oil and grease were 76.6%, 78.4%, 98.2% and 84.04% respectively. Traces of heavy metals were reduced to below detectable levels. The results from investigation showed that surfactant modified clay can be effective in the treatment of wastewater.

Keywords: Clay, surfactant, pollutants, wastewater, adsorption.

Surfactant Enhanced Soil Washing Technique and its Kinetics on the Remediation of Crude Oil Contaminated Soil.

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ABSTRACT

Hydrocarbons are considered as global environmental threats because of their toxic and mutagenic effects, therefore the removal of this contaminant from the environment becomes increasingly important. Surfactants aid in the removal of organic contaminants from the soil, but the choice of surfactant, suitability, its environmental friendliness, toxicity, and effectiveness must be of paramount concern. The primary objective of this study was to evaluate the efficiency and effectiveness of using sodium dodecyl sulphate (SDS) surfactant in remediating crude oil contaminated soil through surfactant enhanced soil washing technique at established optimum conditions; kinetic evaluation of the process as well as the surfactant treatment effect on soil quality. Soil was artificially contaminated with 10% crude oil by laboratory simulation. Crude oil contamination adversely affected soil properties such as pH, conductivity, and total phosphorus as there was statistical significance at $p < 0.05$. Optimum concentration established for SDS was found to be 40,000ppm at ambient temperature for the surfactant treatment. The surfactant method was found to be very rapid and effective with 88.32% remediation efficiency achieved at the end of seven hours as there was significant difference statistically at $p < 0.05$ in the Removal rate or treatment efficiency. The kinetics of the process followed first order with a rate constant of 0.291 hour^{-1} and calculated half life of 2 hours 24 minutes. A computation of the TPH degradation isotherm (K_d) gave negative value of unity showing the opposing trend between the concentration of the contaminant in the soil (C_s) and the concentration removed by the surfactant (C_d); which explains that as C_s is decreasing with time, C_d is increasing. The surfactant method was found to improve the physicochemical quality of the contaminated soil at the end of the treatment process as evident in the reduction of heavy metals concentration as well as improvement in pH and conductivity property. The mechanism of hydrocarbon removal was by solubilization and mobilization of the contaminant which is usually achieved by reducing the surface and interfacial tension between air/water, oil/water and soil/water systems. SDS surfactant is biodegradable and non-toxic, thus reducing the risk of future environmental problems after the remediation process, making it an environmental friendly technique. This technique was found to be very promising because it is capable of reducing both hydrocarbon and heavy metals concentration as well improving the deteriorated properties of the soil which are essential for soil quality and productivity.

(Keywords: sodium dodecyl sulphate, SDS, surfactant, optimization study, degradation isotherm, kinetics, total petroleum hydrocarbon)

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ABSTRACT

Water contamination is a major global problem which requires ongoing evaluation and revision of water resources policy at all levels. It has been suggested that it is the leading worldwide cause of disease and deaths; it accounts for the death of more than 14,000 people daily. Groundwater samples were obtained by grab sampling technique from the tap of chemistry department, Delta state University, Abraka, that has its source from a borehole located within the University. Pollution was simulated in the laboratory by contaminating 90 ml of the groundwater samples with 10 ml of crude-oil in plastic microcosm to produce 10% contamination. Optimum conditions obtained for the Fenton-oxidative method employed in the study were 250,000mg/l H₂O₂ and 200mg/l FeSO₄ at ambient temperature (28-32°C). At the end of the chemical remediation experiment, the Fenton-oxidative method was found to be extremely rapid, with the reaction been exothermic and following second order kinetics. The rate constant of the reaction was 0.00052mol⁻¹dm³hr⁻¹ with half-life of 0.38hour. 86.10% removal efficiency of total petroleum hydrocarbon as crude-oil was achieved after six hours. Control experiment was a microcosm that contained contaminated groundwater sample without the treatment chemical solution. Only about 2.8-3.2% reduction of total petroleum hydrocarbon as crude oil was observed that may be due to evaporation. The Fenton-oxidative method for crude oil-contaminated groundwater gave remediation efficiency of 24.35 % (Cd); 31.63% (Pb); 32.58% (Ni) 44.3%; (Cr); 98.84% (V). Except for vanadium, where chemical leaching of the metal in acidic medium was very effective, other heavy metal concentrations were higher than maximum permissible levels recommended by World Health Organization (W.H.O). This suggests that Fenton-oxidative method is not effective in the removal of Cd, Pb, Ni and Cr from groundwater polluted with crude-oil. The remediated polluted groundwater sample was found to have most of its physicochemical parameters as close match with the unpolluted groundwater sample and World Health Organization (W.H.O) permissible limits. The overall implication is that crude-oil polluted groundwater remediated by Fenton-oxidative method needs post-treatment to improve on its portability for drinking/domestic and agricultural uses.

Keywords : Groundwater, crude-oil, contamination, heavy metal, chemical leaching



Characterization and Treatment of Sludge from the Brewery Using *Jatropha gossypifolia* Stem Latex

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Abstract: Sludge according to the US Environmental Protection Agency (EPA) defined sludge as the semi – liquid residue or slurry remaining from treatment of industrial water and wastewater. Composite sampling was done in the collection of sludge from a Brewery. Locally sourced natural coagulant of plant origin, *jatropha gossypifolia* stem latex was also collected. The stem latex is commonly used by people in this part of the country to stop bleeding from minor cuts, injuries and bruises. The collected sludge sample was characterized physicochemical according to standard procedures and was found to have high pollution potentials on the basis of some parameters determined, amongst which COD, Turbidity and BOD are. The values were found to be

1034.00NTU, 640.00mg/l and 2072.19mg/l for Turbidity, BOD and COD respectively. The Total Solids (TS) and Suspended Solids (SS) were 7307.50mg/l and 2067.50mg/l respectively. Optimum dosage of the coagulant was determined for the *jatropha gossypifolia* stem latex and was 1.00 ml at pH of 6.7. On the basis of this, the sludge was treated and the treated sludge sample, characterized. Triplicate determinations were done in each case and the mean values and standard deviations obtained from statistical evaluation using the Tukey-Kramer multiple comparison tests. From the results obtained, there were significant reductions ($p < 0.05$) in pollution in measured parameters indicated by the values of the parameters determined, thus, an improvement on the quality of the sludge samples with 78.28%, 78.91% and 88.25% reduction in the COD, BOD and Turbidity in the treated sludge sample. The total and suspended solids increased by 22.24% and 14.47% respectively. The *jatropha gossypifolia* stem latex was

also effective at low levels, its effectiveness is less pH dependent and does not pose problems in terms of residual metal contamination and are generally more biodegradable, therefore more environmental friendly. It is readily available, cheap and easy to handle. The use of the coagulant for the treatment of sludge can be so recommended.

Keywords: Sludge, *Jatropha gossypifolia*, Pollution,

PHYSICOCHEMICAL TREATMENT OF BREWERY SLUDGE WITH LOCALLY SOURCED COAGULANTS (CHITOSAN AND CLAY)

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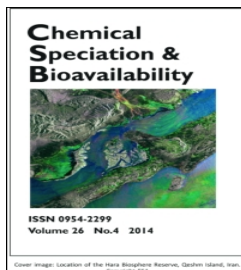
ABSTRACT

One week composite sampling was done in the collection of sludge from the Brewery. Locally sourced coagulants, chitosan and clay were also collected. The collected sludge sample was characterized according to standard procedures and values of some of the parameters; Turbidity, BOD and COD were found to be 1034.00 ± 4.10 NTU, 640.00 ± 4.00 mg/l and

2072.19 ± 4.55 mg/l respectively. The Total Solids (TS) and Suspended Solids (SS) were

7307.50 ± 3.60 and 2067.50 ± 4.20 mg/l respectively. This portends pollution. Optimum dosage determined for the combined/mixed coagulants was found to be 2.40ml of 1% chitosan solution combined with 2.40g of clay per 100ml sludge at pH of 6.7. On the basis of this, the sludge was treated and the treated sludge sample, characterized. Triplicate determinations were done in each case and the mean values and standard deviations obtained from statistical evaluation using the Tukey-Kramer multiple comparison tests. From the results obtained, there were significant reductions ($p < 0.05$) in pollution in measured parameters of the sludge samples with 88.54 %, 89.81 % and 93.20 % reduction in the COD, BOD and Turbidity in the treated sludge sample, thus an improvement in the quality of the sludge in terms of pollutant load. The total and suspended solids increased expectedly, by 26.99% and 21.40 % respectively. The synergistic effects of the combined coagulants were very evident in the results obtained. Locally sourced coagulants posses numerous advantages including their less pH dependence and do not pose challenges in terms of residual metal contamination and are generally more biodegradable, therefore more environmental friendly. They are readily available, cheap and easy to handle. The use of the coagulants for the treatment of sludge and indeed where coagulation and flocculation is desirous can be so recommended.

Keywords: Sludge, Chitosan, Exoskeleton, Clay, Pollution, Synergistic.



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Chemical forms of heavy metals in soils around municipal waste dumpsites in Asaba Metropolis, Delta State, Nigeria

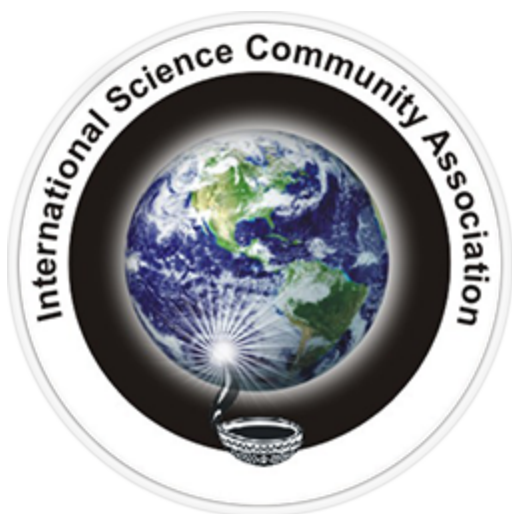
[S. A. Osakwe](#), [O. V. Akpoveta](#), [B. E. Okoh](#) & [O. K. Ize-Iyamu](#)

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Abstract

The chemical forms of copper, lead, manganese and zinc in soils around five selected municipal waste dumpsites in Asaba metropolis, Delta State, Nigeria, were studied, using the Ma and Rao six-step sequential chemical extraction procedure, with a view to providing information on the bioavailability and mobility of the metals in the soil matrix. The results showed that lead and manganese were speciated into residual fractions with averages of 60.32 and 82.24% respectively, while copper and zinc were associated with organic and Fe–Mn oxide fractions respectively with respective averages of 47.91 and 63.21%. The residual fraction also contained relatively high percentages of copper (33.18%) and zinc (20.81%). Relatively very low levels of the metals were found in the water soluble, exchangeable and carbonate fractions. The mobility factors of all the metals in all the soil profiles were generally low ranging from 1.97 to 39.99 indicating generally low availability as well as mobility. Lead and manganese associated with the residual fraction were strongly bound to soil matrix and were not bioavailable since they were occluded within the crystal lattice layer of silicates and well crystallised oxide minerals. Our results show that the metals do not pose any environmental risk or hazard. However, the soils stand the risk of being contaminated by copper and zinc since metals associated with organic and Fe–Mn oxide fractions could be bioavailable and mobilisable when the soil conditions such as pH and redox potentials change.

Keywords: [heavy metals](#), [chemical forms bioavailability](#), [soil](#), [waste dumpsites](#), [Asaba](#)



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Kinetic Studies of Bioremediation of Hydrocarbon Contaminated Groundwater

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Abstract

Bioremediation experiments were conducted at ambient temperature of 28-32⁰C and pH 5.6-8.9 to investigate the effectiveness of the process in the clean-up of groundwater contaminated by diesel. Polluted groundwater samples were simulated in the laboratory by contaminating 900ml of groundwater sample with 100ml of diesel to achieve 10% pollution in two different plastic microcosms. Two tests series were performed for a 1008-hour (42-day) residence time. In the first test, polluted groundwater sample was taken in a plastic microcosm without organic amendment (mixed-culture of pig, cow and poultry wastes). In the second test, organic amendment was added to the polluted groundwater sample in the second plastic microcosm and the bioremediation process in both cases allowed to proceed. Microbiological and TPH analyses were carried out weekly for six weeks on the second microcosm and at the sixth week for the first microcosm which acted as control. The indices of biodegradation monitored included total changes in: total heterotrophic bacteria (THB), total hydrocarbon utilizing bacteria (THUB), total fungal (TF) counts and changes in total petroleum hydrocarbon (TPH). The response of the indigenous microbes (heterotrophs,

hydrocarbon utilizers and fungal) was positive in the second microcosm where biodegradation occurred as a result of the microbial activities. No appreciable biodegradation occurred in the control microcosm, except for about 3% loss of total petroleum hydrocarbon due to evaporation. 91.53% removal efficiency for total petroleum hydrocarbons was obtained in the first microcosm at the end of the sixth week. Bioremediation of groundwater polluted with diesel is a first order reaction with rate constant of 0.002hour^{-1} and half-life ($t_{1/2}$) of 346.5 hours. The overall assessments of the quality of the contaminated water samples after remediation were close match to the unpolluted water sample with some selected physicochemical parameters (pH, DO, BOD₅, and salinity as chloride) within the WHO standard for surface/underground water while COD was far above limits recommended by W.H.O.



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The Use of Jatropha Gossypifolia Stem Latex and Chitosan in the Treatment of Brewery Sludge

Author: Ize-Iyamu K. Osaro, Osakwe A. Stephen, Egbon E. Emmanuel, Ize-Iyamu O. Christie, Akpoveta O. Vincent

Category: Research Paper

Abstract:

Sludge, the settleable solids separated from liquids during various processes was collected by composite sampling method from the Brewery. Locally sourced natural coagulants, jatropha gossypifolia stem latex and chitosan were also collected. The collected sludge sample was characterized physicochemically according to standard procedures and was found to have high pollution potentials on the basis of some parameters determined. The values of some of the parameters were found to be 1034.00NTU, 640.00mg/l and 2072.19mg/l for Turbidity, BOD and COD respectively. The Total Solids (TS) and Suspended Solids (SS) were 7307.50mg/l and 2067.50mg/l respectively. Optimum dosage determined for the combined/mixed coagulants was 1.10ml of jatropha gossypifolia stem latex and 1.10ml of 1% chitosan solution respectively per 100ml sludge at pH of 6.7. On the basis of this, the sludge was treated and the treated sludge sample, characterized. Triplicate determinations were done in each case and the mean values and standard deviations obtained from statistical evaluation using the Tukey-Kramer multiple comparison tests. From the results obtained, there were significant reductions ($p < 0.05$) in pollution with over 90% reduction in the COD, BOD and Turbidity in the treated sludge sample. The total and suspended solids expectedly, increased by 34.24% and 19.98% respectively. The synergistic effects of the combined coagulants were very evident in the results obtained. The coagulants are readily available, biodegradable, therefore more environmental friendly. The use of the coagulants for the treatment of sludge can be so recommended.

Keywords: Sludge, Jatropha gossypifolia, Chitosan, Exoskeleton, Pollution, Synergistic

PHARMACEUTICAL INDUSTRY WASTEWATER TREATMENT USING ORGANIC SURFACTANT MODIFIED CLAY

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ABSTRACT

This study was carried out to find out how effective and efficient clay, modifies with hexadecyltrimethylammonium (HDTMA) can be as adsorbent, to reduced various contaminants in wastewater. Waste-water was collected from pharmaceutical industry using composite sampling. The result of both untreated and treated wastewater recorded. There were converted to percentage reduction. The results shows percentage reduction of color (88.12%), total solid (61.60%), COD (87.47%), BOD (79.59%) and TKN (70.89). While phenol, THC and level of heavy metals reduced to below detectable level (BDL). Hence, surfactant modify clay can serve as effective and efficient adsorbent to sorb both organic and inorganic contaminants from wastewater and act as vital material in environment treatment processes.

Keywords: Modified, hexadecyltrimethylammonium bromide, surfactant, adsorbent, contaminant.

The Treatment of Sludge from the Rubber Processing Industry with Chitosan

OK Ize-Iyamu, IO Eguavoen, EE Egbon, OC Ize-Iyamu, W Medjor, ME Chukwuedo

Abstract

Composite sludge samples were collected from a Rubber Processing industry. The collected sludge samples were characterized according to standard procedures. The values of some of the parameters were found to be 996.55 ± 5.85 NTU, 229.00 ± 7.80 mg/L and 1921.20 ± 6.50 mg/L for Turbidity, BOD and COD respectively. The Total Solids (TS) and Suspended Solids (SS) were 6217.00 ± 7.00 and 2733.00 ± 5.80 mg/L respectively. This portends pollution. Locally sourced coagulant, chitosan was obtained and the optimum dosage determined. It was found to be 2.10cm^3 of 1% chitosan solution per 100 cm^3 sludge at pH of 7.9. On the basis of this, the sludge was treated and the treated sludge sample, characterized. Triplicate determinations were done in each case and the mean values and standard deviations obtained from statistical evaluation using the Tukey-Kramer multiple comparison tests. From the results obtained, there were significant reductions ($p < 0.05$) in pollution in measured parameters of the treated sludge samples with 74.69 %, 77.67 % and 81.70 % reduction in the COD, BOD and Turbidity respectively, thus improving the quality of the sludge in terms of toxins. The total and suspended solids increased expectedly, by 30.58 % and 12.92 % respectively. The coagulant was quite effective at low levels. It also showed other characteristics of locally sourced coagulants, which include less pH dependence, readily available, cheap and easy to handle, more biodegradable, therefore more environmentally friendly. The use of the coagulant for the treatment of sludge and indeed where coagulation and flocculation is desirous can be so recommended.

Keywords: Biodegradable, Chitosan, Exoskeleton, Pollution, Sludge.

**A STUDY OF THE PHYSIC CHEMICAL PROPERTIES OF THE SURFACE
WATER AND THE HEAVY METALS COMPOSITION OF THE BOTTOM
SEDIMENTS OF IJANA RIVER, WARRI, DELTA STATE, NIGERIA.**

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Abstract

A study was carried out to investigate the concentrations, distribution and speciation of some heavy metals such as Cd, Cu, Pb, and Cr in the bottom sediments of Ijana River which has been contaminated by effluent from petroleum exploitation activities. The total concentration level Cd, Pb, Cu, and Cr were determined specifically at upstream, effluent zone, downstream and of storm water of the river, Pb, Cu and Cr were found to be most abundant metals in the river. The distribution pattern of the river indicates the source of pollution to be land based. Sequential extraction showed that 30-60% of Cd, were exchangeable fraction, indicating that Cd in the sediment posed a high risk to local environment while Cu, Pb and Cr ere at moderate risk level. From the relationship between percentage fraction of metal speciation and total metal concentration, it was found that the distribution of Cd, Cu, and Pb in some fraction were dynamic in the process of pollutants migration and the stability of metal in sediments of the river decreased in the order Cr>Pb>Cd>Cu. The correlation analysis suggest that some of the metals are strongly associated, indicating a common source or chemical similarity. The pollution load index (PLI) of the studied area ranged from 0.10 to 50.78, which indicated the sediments were polluted while the index of geoaccumulation showed that all the sampling points may face a severe metal pollution/ contamination problem in the future.

Keywords: Pollution load index (PTI), Index of Geoaccumulation, Speciation, sediment pollutants, heavy metal, correlation analysis.

PHYSIC-CHEMICAL STUDIES OF SOME CLAY DEPOSIT FROM EDO STATE

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ABSTRACT

Raw clays were collected from different parts of Edo State and physical, Mineralogical and geochemical analysis were carried out using standard procedures. Results from the physical analysis showed that, these clays can be used for brick making, catalysis, absorption and adsorption purposes. The mineralogical analysis show that kaolinite (27.70%) is present, smectice (7.64%) and quartz (70.45), which further provides their industrial and commercial values and applications when exploited. Their geochemical analyses using x-ray diffractometry, further gave credence to their utility and viability in all areas of human (and material) endeavours.

Keywords: *Absorption, adsorption, catalysis, geochemical, mineralogical, raw clay.*

TREATMENT OF WASTE WATER FROM PHARMACEUTICALS INDUSTRY USING NATIVE CLAY

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Abstract

Waste-water from pharmaceutical plant was collected using composite sampling. This was characterized and treated using native clay samples collected from selected clay deposits in Edo State of Nigeria. The aim was to find out the effectiveness of clay as coagulant in waste water treatment processes. The results of the parameters studied before and after treatment, show significant reduction. For the kaolinite clay, color, Total Solid (TS), Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), Total Kjeldahl Nitrogen, Phenol and Total Hydrocarbon Count (THC) show percentage reduction of 49.51, 51.89, 73.82, 72.81, 59.24, 82.19 and 33.85 respectively. The mixed clay sample shows percentage reduction of color (35.64), TS (50.57), COD (57.86), BOD (70.70), Phenol (80.22) and THC (19.46). Results from this study show that clay material can effectively be used as adsorbent as all heavy metals were reduced to Below Detectable Level (BDL).

Keywords: Pharmaceutical, wastewater, absorbent, reduction, composite, native clay, below detectable level.

Post Flooding Effect on Soil Quality in Nigeria: The Asaba, Onitsha Experience

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ABSTRACT

This study focuses on the post effect of flooding on soil quality parameters in agricultural farmlands in Nigeria. Soil samples were collected from farmland in Alihame Agbor, Ika South local government area of Delta state, Okwei in Asaba, Oshimil South local government area of Delta state and fegge in Onitsha South local government area of Anambra state. Farmlands in Asaba and Onitsha were used for the post flooding study, while farmland in Agbor served as control since it was not affected by flooding. Soil physicochemical parameters such as pH, electrical conductivity, total organic carbon, total organic matter, total nitrogen, total phosphorus, cation exchange capacity, moisture content and metals (Cd, Pb, Cu, Mn, Ni and K) which were used as index for assessing the effect of flooding on soil quality were analyzed using standard methods. Significant effect of flooding was observed on soil properties on the flood affected farmlands when compared to the control farmland, which was statistically justified at 95% confidence limit ($p \leq 0.05$). There were considerable decreases ranging from 4% to 53% at $p \leq 0.05$ in the values of pH, total organic carbon, total organic matter, total nitrogen, total phosphorus and cation exchange capacity on the flood affected farmlands when compared to the control farmland; except for electrical conductivity where an increase of 54% and 92% at the flood affected farmlands in Asaba and Onitsha respectively was observed when compared to the control. Higher moisture contents were also recorded of up to about 17% and 45% at the flood affected farmlands in Asaba and Onitsha respectively, when

compared to the control. Reduced concentrations ranging from 25% to 49% of essential micronutrients such as Mn, Ni and K were observed on the flood affected farmlands, reflecting the negative impact of the flood. Undesirable effect of the flood was also observed in the flood affected farmlands when compared to the control farmland as increased concentrations ranging from 18% to 114% of Cd, Pb, and Cu, were recorded. The findings of this study revealed significant impacts of the resulting flood on soil quality of the affected farmlands with major attendant effect of the flood felt on farmland in Asaba. As a consequence, measures should be put in place by government and concerned agencies to avoid future flooding of farmlands so as not to further expose the natural quality of these farmlands to the degradative and devastating effect of such flooding.

KEYWORDS: Flooding; Asaba Farmland; Onitsha Farmland; Physicochemical Property; Soil

CHARACTERIZATION AND TREATMENT OF SLUDGE FROM THE RUBBER PROCESSING INDUSTRY WITH LOCALLY SOURCED COAGULANTS (CHITOSAN AND JATROPHA GOSSYPIFOLIA STEM LATEX)

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ABSTRACT

Composite sludge sample of sludge from the rubber processing Industry was collected and also collected were the locally sourced natural coagulants, *jatropha gossypifolia* stem latex and chitosan. The collected sludge sample was characterized according to standard procedures and was found to have high pollution potentials on the basis of some parameters determined. The values of some of the parameters were found to be 996.55NTU, 229.00mg/l 1928.70and mg/l for Turbidity, BOD and COD respectively. The Total Solids (TS) and Suspended Solids (SS) were 6217.00mg/l and 2733.00mg/l respectively. Optimum dosage determined for the combined/mixed coagulants was 1.80ml of *jatropha gossypifolia* stem latex and 1.80ml of 1% chitosan solution per 100ml sludge at pH of 7.9. On the basis of this, the sludge was treated and the treated sludge sample, characterized. Triplicate determinations were done in each case and the mean values and standard deviations obtained from statistical evaluation using the Tukey-Kramer multiple comparison tests. From the results obtained, there were significant reductions ($p < 0.05$) in pollution in measured parameters indicated by the values of the parameters determined, thus, an improvement on the quality of the sludge samples with 77.50%, 83.89% and 86.95% reduction in the COD, BOD and Turbidity in the treated sludge sample. The total and suspended solids increased by 35.59% and 18.66% respectively. The synergistic effects of the combined coagulants evident in the results obtained. The coagulants were not only quite effective at low levels but also less pH dependent and do not pose problems in terms of residual metal contamination and are generally more biodegradable, therefore more environmental friendly. They are readily available, cheap and easy to handle. These advantages are quite encouraging that will necessitate its recommendation for the use of these coagulants where coagulation is desirous.

Keywords: Sludge, *Jatropha gossypifolia*, Chitosan, Exoskeleton, Pollution, Synergistic.

The Effects of pH in the Treatment of Rubber Processing Effluent Using Chitosan

Ize-Iyamu;Ize-Iyamu; Ukpebor;Osayi; Ehiwe;Aigbojie

Abstract

This study measures the effects of pH on a locally sourced material, chitosan used in the treatment of effluent from rubber processing industries. A three hourly Composite sample of the effluent was collected for five working days. Triplicate characterisations of the samples were carried out using the standard methods. The results obtained were subjected to statistical evaluation using Tukey Kramer multiple comparison tests. The results obtained from the raw rubber processing effluent are $178 \pm 2.31 \text{ mg/l}$ for TSS, $38 \pm 1.02 \text{ NTU}$ for turbidity, $312 \pm 1.32 \text{ mg/l}$ for BOD and $1069.58 \pm 2.42 \text{ mg/l}$ for COD respectively. Optimum dosage determined was 1.40 ml of 1% solution of chitosan per 100ml of sample from the rubber processing industry. Different pH values of the samples were obtained by the addition of varying quantities of 0.1M HCl and 0.1M NaOH respectively resulting in different pH values. COD determinations were done at the different pH values. The results obtained show that at pH 3.7, %COD was 87.21%, at pH 4.7, %COD was 87.29%, at pH 5.7, %COD was 87.28%, at pH 6.7, %COD was 87.24%, at pH 7.7, %COD was 87.35%, at pH 8.7, %COD was 87.27% and at pH 9.7, %COD was 87.23% for the effluent treated with 1% chitosan solution. The values obtained above showed no significant difference in the pH values. Consequently, these values indicate that change in pH has no significant effect on the performance of the locally sourced natural coagulant used for the treatment of the effluents.

Keywords: BOD, chitosan, COD, effluent, rubber, pH

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Diurnal and Spatial Trends of Indoor Carbon monoxide (CO) Emission in Some Homes Using n-Butane Gas as Cooking Fuel

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Abstract

In this study, the diurnal trends of carbon monoxide CO emission were monitored in selected houses in Benin City, Southern Nigeria. Household sampled all used n-butane gas as the main cooking fuel. Outdoor and indoor samples were collected. The characteristics of the homes; family size, cooking duration, house and kitchen design, were taken into cognizance. A mean range of 0.00-0.50ppm was recorded during non-cooking hours and 3.33-12.00ppm during cooking hours. Spatial variations were statistically significant, with the highest mean CO of 12.00ppm at house 3 (H3). This was found to be higher than the 9.00ppm and 10.00ppm values recommended by World Health Organization (WHO) and Federal Ministry of Environment (FME) standards respectively. The cooking fuel n-butane gas was identified as the main source of CO emissions. The high values obtained could be attributed to the cooking duration, poor ventilation and the state of the burners. Meteorological Parameters such as temperature and humidity, were also monitored during this study.

Keywords: carbon monoxide, diurnal n-butane gas, docimeter, in situ, electrochemical



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Original Research Article

Comparative Studies of Carbon Monoxide (CO) Exposure in Homes Using Different Cooking Fuels

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Abstracts

In-situ atmospheric monitoring of carbon monoxide (CO) was carried out in ten homes where n-butane gas, kerosene stove and firewood were used as cooking fuels respectively. Of the ten houses, four houses surveyed used n-butane gas only as the fuel type, four other houses used kerosene stove only while the last two houses used firewood only. A dosimeter, humidity/ temperature meter were used in determining the concentrations of the CO, the humidity and the temperatures in the selected homes in urban environments. The diurnal trends of carbon monoxide were monitored for about six weeks in these homes. Health Impact Assessment (HIA) was conducted in these homes using the different cooking fuels after baseline levels of carbon monoxide concentration in the homes were assessed during cooking hours and non-cooking hours. A total of 59 respondents drawn from the ten selected homes were interviewed concerning their experiences of symptoms suggestive of exposure to carbon monoxide. A total of 28 (47.5%)

respondents reported had symptoms suggestive of exposure to carbon monoxide. CO levels was highest in the houses where firewood was used as the fuel source and lowest in the houses where n-butane gas was used. However, comparing the results obtained with the World Health Organization and Federal Ministry of Environment standards of 9ppm and 10ppm respectively, the CO values were found to be above limits in some of the houses where n-butane gas, kerosene were used and above the set limits in all the houses where firewood were used as cooking fuel. CO Routine monitoring is recommended and the discontinuous use of firewood as cooking fuel should be strongly enforced not only to reduce the CO concentration but also minimize deforestation.

Keywords :

In-situ; carbon monoxide; dosimeter; diurnal trends; HIA; n-butane gas; kerosene; firewood

COMPARATIVE STUDIES OF THE USE OF *JATROPHA GOSSYPIFOLIA* STEM LATEX WITH SYNTHETIC COAGULANTS IN THE TREATMENT OF RUBBER PROCESSING SLUDGE

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Abstract

Coagulation and [flocculation](#), very essential processes in water/[wastewater](#) treatment were employed in the treatment of rubber processing sludge. The effectiveness of the use of a natural occurring *Jatropha gossypifolia* stem latex as a coagulant was compared with the synthetic/conventional coagulants; alum and iron (III) chloride for the treatment of the sludge samples. One week composite sludge samples were collected and characterized according to standard methods. Triplicate determinations were carried out and the results obtained were subjected to statistical analysis. Some of the values of parameters determined were 996.55 ± 5.85 , 229.00 ± 7.80 and 1928.70 ± 6.50 for turbidity, COD and BOD respectively. *Jatropha gossypifolia* stem latex was also characterized. The optimum dosage of *Jatropha gossypifolia* stem latex, the conventional coagulants (Alum and Iron (III) Chloride) for the treatment of rubber processing sludge samples were determined. The optimum dose were found to be 2.30ml, 3.60g, 3.50g/100ml sample for *Jatropha gossypifolia* stem latex, alum and iron (III) chloride respectively. The sludge samples were subsequently treated respectively with the different coagulants. The treated sludge samples were characterized in triplicate and again the results obtained were subjected to statistical analysis. The results obtained showed significant reductions ($p < 0.05$) of 70% reductions in BOD, COD, Turbidity of the treated sludge samples with *Jatropha gossypifolia* stem latex as well as Alum and Iron (III) Chloride respectively. Thus the effectiveness of the *Jatropha gossypifolia* stem latex showed that it was not only as good as the synthetic/conventional coagulant but could also be a possible substitute for them considering its effectiveness vis – a – vis its lower optimum dose. The *Jatropha gossypifolia* stem latex has some other advantages which include ready availability, cheapness, biodegradability and therefore more environmentally friendly and this would make it the coagulant of choice in the future.

Keywords: BOD, COD, coagulation, effluent, [flocculation](#), rubber, *Jatropha gossypifolia*, sludge.

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THE EFFECTS OF pH IN THE TREATMENT OF RUBBER PROCESSING EFFLUENT USING *JATROPHA GOSSYPIFOLIA* STEM LATEX

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ABSTRACT

This study measures the effects of pH on locally sourced coagulant, *Jatropha gossypifolia* stem latex in the treatment of effluent from rubber processing industry. A three hourly Composite sample of the effluent was collected for five working days. Triplicate characterizations of the samples were carried out using the standard methods. The results obtained were subjected to statistical evaluation using Tukey Kramer multiple comparison tests. The results obtained from the raw rubber processing effluent are 178 ± 2.31 mg/l for TSS, 38 ± 1.02 NTU for turbidity, 312 ± 1.32 mg/l for BOD and 1069.58 ± 2.42 mg/l for COD respectively. Optimum dosage determined was 0.95ml of *Jatropha gossypifolia* stem latex per 100ml of rubber processing effluent. Different pH values of the samples were obtained by the addition of varying quantities of 0.1M HCl and 0.1M NaOH respectively resulting in different pH values. COD determinations were done at the different pH values. The results obtained show that at pH 3.7, %COD was 95.19%, at pH 4.7, %COD was 95.20%, at pH 5.7, %COD was 95.26%, at pH 6.7, %COD was 95.21%, at pH 7.7, %COD was 95.26%, at pH 8.7, %COD was 95.26% and at pH 9.7 %COD was 95.22% for the effluent treated with *Jatropha gossypifolia* stem latex. However, these values indicate that change in pH has no significant effect on the performance of these locally sourced natural coagulants used for the treatment of the effluents.

Keywords: BOD, *Jatropha gossypifolia*, COD, effluent, rubber, pH
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EVALUATION OF CITRIC VALUES OF SUGAR AND pH OF SOME SELECTED FRUITS

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Abstract

This study was carried out to determine the citric acid, level of sugar and P^H values of some selected fruit collected directly from farms in Ekpoma, Edo State and evaluates the values of those parameters on daily basis for five days using standard methods. The five fruits were collected: orange, pipeapple, water melon, pawpaw and sugar cane and results that pineapple has the highest citric acid value of $0.50/100\text{cm}^3$ while water melon was the least $0.23/100\text{cm}^3$. Orange showed the highest (7.0^0 brix level of sugar), while pawpaw had the least (2.0^0 brix). The P^H values of all the fruits decreased as they aged. From the overall results, when fruits are over matured, their citric acid values, level of sugar and P^H decreased due to decrease in juice content and ripening (maturation) activities except for oranges and the results were compared with standard quality of fruits and orange was the closest of all the fruit samples studies.

Keywords: Orange, pineapple, water melon, pawpaw, sugar cane citric acid values, level of sugar, evaluate, P^H .

STUDIES ON THE MECHANISM OF ALUM COAGULATION /FLOCCULATION IN WASTEWATER TREATMENT

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Abstract

A comprehensive study was conducted on pH mechanism with Alum species using storm water, palm oil mill effluent and Abattoir effluent, Alum was dissolve in distilled water which indicates pH ranges of 5.2 – 4.1 for respective concentration ranges of 5.0 mg/l – 35.0mg/l, for the same concentrations, pH values for this effluent are distilled water 6.5, storm water 6.4, palm oil mill effluent 4.1, Abattoir effluent 6.7. without isolating any Species of Alum coagulant $Al^{3+}_{(aq)}$, $Al(OH)^{2+}_{(aq)}$, $Al(OH)^{+}_{(aq)}$, $Al(OH)_{3(aq)}$ they all had various degree of clarification with respect to pH,COD & DO, Speciation for maximum coagulation/flocculation for the three wastewaters at the corresponding pH values were as follows: storm water (STW): $Al(OH)_{3(aq)}$, (COD = 14.4 -20.8mg/l, pH = 6.2 – 5.7), $Al(OH)^{2+}_{(aq)}$ $Al(OH)^{+}_{(aq)}$ (COD = 25.6 -27.2mg/l, pH = 4.4 -5.2) $Al^{3+}_{(aq)}$, (COD = 32.0 – 33.6mg/l, pH = 3.8-4.0) Palm Oil Mill Effluent (POM) $Al(OH)_{3(aq)}$, (COD = 25.6mg/l, pH =4.0) $Al(OH)^{2+}_{aq}$, $Al(OH)^{+}_{(aq)}$ (COD = 28.8 – 36.mg/l, pH = 3.7-3.8 $Al^{3+}_{(aq)}$ (COD = 48.0-113.6mg/l, pH = 3.5-3.6), Abattoir effluent (ABE) $Al(OH)_{3(aq)}$ (COD = 121.6-134.4mg/l, pH = 5.7-5.4) $Al(OH)^{2+}_{(aq)}$, $Al(OH)^{+}_{(aq)}$ (COD = 155.2-206.4mg/l, pH=4.6-5.0), $Al^{3+}_{(aq)}$, (COD = 211.2-225.16mg/l, pH = 3.9 - 4.2). Thus, this studies shows us that water quality parameters are a function for water treatment in which pH is vital in the optimization dynamics in waste water treatment.

OPTIMUM DOSE DETERMINATION AND TREATMENT OF THE RUBBER PROCESSING EFFLUENT WITH *JATROPHA GOSSYPIFOLIA* STEM LATEX

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Abstract

Rubber processing effluent samples were characterized and treated with *Jathropa gossypifolia* stem latex which is a natural/locally available material as a coagulant for safe disposal. Samples of the effluent, the wastewater that flows out of the rubber processing factory was obtained by composite sampling method from the effluent holding tank. The samples were characterized in triplicate in accordance with standard procedures. The optimum dose needed for effective coagulation of the effluent by the locally sourced *Jatropha gossypifolia* stem latex was also determined. The results from the triplicate determinations of the effluent showed a high level of pollution as indicated by some of the parameters determined. The turbidity was 38.00NTU, COD 1176.00mg/l, BOD₅ 312.00mg/l, TS 210.00mg/l, DO 0.63 mg/l and SS 178.00mg/l. The optimum coagulant dose was found to be 1.00ml per 100ml effluent at pH of the effluent. The sample was treated based on this optimum dosage and subsequently characterized in triplicate. Turkey-Kramer multiple comparison test was used to obtain the mean values and standard deviations. The results obtained for the treated effluent showed significant reduction with $p < 0.05$ in the pollution load, with 91.42%, 87.24%, 81.98%, reduction in turbidity, COD and BOD₅ respectively. The DO value increased by 503.17%. With the impressive results, *Jatropha gossypifolia* stem latex had also proved effective as a coagulant in the treatment of rubber processing effluent and consequently its use can be recommended accordingly.

Key-words: Effluent, coagulation, optimum dose, *Jatropha gossypifolia*
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**KINETIC STUDY OF REMEDIATION OF CRUDE OIL COCONTAMINATED
SURFACE WATER BY SILICA ENCAPSULATION METHOD**

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ABSTRACT

Silica encapsulation method was employed for the remediation of 10%, 20% and 30% crude oil contaminated water samples. Enhanced effectiveness and efficiency was observed at pH = 8. Total Petroleum Hydrocarbon (TPH) as crude oil was determined with UV/Visible spectrophotometer at wavelength of 460nm. The 10% percent crude oil contaminated surface water samples had the highest percent remediation of 92.78 at the end of analysis compared to the 20% and 30% crude oil contaminated water samples with percent remediation of 91.32 and 87.98 respectively. The kinetics of the remediation fitted well into the pseudo-first order equation and gave a linear correlation of ($R^2 = 0.997, 0.984$ and 0.196) with the rate constant $K = 8.86 \times 10^{-6}, 8.11 \times 10^{-6}$ and $7.91 \times 10^{-6} \text{ mg}^{-1}\text{Lhr}$ for the 10%, 20% and 30% contaminated water samples in that order. The method is found to be effective in TPH reduction as crude oil although efficiency and effectiveness decreases as concentration of the contamination increases.

Keywords: Hydrocarbon, pseudo-first order, efficiency, optimization, sodium silicate

**THE INFLUENCE OF pH IN THE TREATMENT OF RUBBER
PROCESSING EFFLUENT USING *MORINGA OLIEFERA* SEED
POWDER AS A COAGULANT**

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ABSTRACT

In this study, the effect of change in pH of rubber processing effluent on the efficacy of *Moringa oliefera* seed powder used as a coagulant for its treatment was investigated. Samples of the effluent were collected by composite sampling and the COD of the effluent was determined in triplicate according to standard methods. The COD of the raw effluent was found to be at 1176.00 ± 1.43 . Jar test experiments were also carried out and the %COD reductions were monitored with varying pH of rubber processing effluent with equal amount of *Moringa oliefera* seed powder. At pH 2.5, %COD was 91.00%, at pH 3.2, %COD was 91.66%, at pH 4.1, %COD was 91.75%, at pH 5.5, %COD was 91.68%, at pH 6.5, %COD was 91.05%, at pH 7.0, %COD was 91.52%, at pH 8.2, %COD was 91.75%, at pH 9.9, %COD was 91.64% ., at pH 10.1, %COD was 91.61% and at pH 11.4, %COD was 91.70%. From the results obtained, no significant change in %COD reductions were observed at different pH values. These findings show that *Moringa oliefera* seed powder do not require any pH adjustment for its effective use. However, it can be a possible replacement for synthetic/conventional coagulants for water/wastewater treatment taking into cognizance its availability and environmental friendliness.

Keywords: *COD, effluent, rubber, pH, Moringa oliefera, seed, synthetic.*

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