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Physical Sciences

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PRELIMINARY STUDIES ON THE ELECTRICAL CONDUCTANCE AND THE VISCOSITY OF SOME NIGERIAN TRADITIONAL SOAPS IN AQUEOUS SOLUTION

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The viscosity and electrical conductance of some Nigerian traditional soaps and their separate mixtures with sodium chloride and calcium chloride have been examined. The activation energies of viscous flow and of electrical conductance were evaluated from viscous and conductance data respectively. Results on viscous flow suggest structural similarities between the soaps examined. The halides used enhanced the electrical conductance of the soaps in solution and hence the halides can be used to dope the conducting ability of the soaps. The soap solution thus doped could be used industrially as electrolyte, an economic use to which the soaps has not been put hitherto.

Key words: Viscosity, Electrical conductance, Electrolyte, Traditional soap, Activation energy.

SCAVENGING CADMIUM, COPPER, LEAD, NICKEL AND ZINC IONS FROM AQUEOUS SOLUTION BY MODIFIED CELLULOSIC SORBENT

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The adsorption of Cd, Cu, Pb, Ni and Zn ions on maize (*Zea mays*) stalk meal was examined by equilibrium studies at 29°C. The amounts of the metal ions removed from solution depended on the metal ion type, the ionic size of the metals and were enhanced by EDTA (%N=12.05) modification of the cellulosic sorbent. The sorption coefficient, K_d , of the metal ions between the absorbent phase and the bulk aqueous phase was found. The sorption data fitted the Langmuir isotherm equation and the maximum metal ion binding capacities, X_m of 20.5 mg g⁻¹ and 9.2 mg g⁻¹ for Cd (II), and of 12.2 mg g⁻¹ and 7.0 mg g⁻¹ for Cu (II) on EDTA modified and unmodified maize stalk meal were determined. This modification amounts to an increase of 44.87% and 57.38% for Cd (II) and Cu (II) ions adsorbed respectively. Ni (II), Zn (II) and Pb (II) ions showed X_m of 2.5 mg g⁻¹, 4.3 mg g⁻¹ and 20.3 mg g⁻¹ for the unmodified sorbent respectively. The sorption on the unmodified sorbent of lead ions from solutions containing zinc ions shows that lead ions are preferentially removed from solution.

Key words: Sorption coefficient, Metal ions, Langmuir isotherm equation.

DIELECTRIC STRENGTH OF SOME BLENDED POLYMERS PREPARED IN THE FORM OF THICK FILM

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Careful measurements of dielectric strength (DS) of blended polymeric material have been accomplished. For the measurements of DS of the films (1.0 mm thickness) prepared from these blends, McKeown's electrode system with stainless steel electrodes of 25mm diameter was used. Three types of blends were prepared. They were PE-PMA, PS-PI and PS-PE-PI. The film prepared from the blend 100% PMA had IBDS value as 200 kVmm^{-1} whereas the additions of PE enhanced IBDS value to 212 and 205 kVmm^{-1} respectively at (PE/PMA) 20/80 and 5/95 ratios. 100% PI produced IBDS as 250 kVmm^{-1} . The addition of PS decreased the value of IBDS. On the other hand the blend of these polymers (PS-PE-PI) at PS/PE/PI ratio of 70/10/20 gave highest IBDS (263 kVmm^{-1}). The break down is initiated by free electrons accelerated by electric field in the largest of the holes present in the amorphous phase of these polymers. These holes were formed during the production of films. Nature, ageing, photodegradation of polymeric material, shape of specimen and good contact of specimen with the surface of electrode influence on the IBDS values and help in excluding the partial discharges.

Key words: Low density polyethylene LDPE, Impulse breakdown strength, Blending of polymeric composites, Copolymers, Ethylene methyl acrylate.

STUDY OF THE RATES OF BIMOLECULAR IONIC REACTION BETWEEN DIBROMOSUCCINATE AND HYDROXIDE IONS

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The effect of dielectric constant (ϵ) and solvent effects on the rates of bimolecular ionic reaction between dibromosuccinate and hydroxide ions have been studied. Two mixed solvents i.e. water-ethanol and water-methanol were used for the measurements of the effect of dielectric constant. The rate constants in different aquo-organic mixtures have been found to lie in the order methanol > ethanol. The radii of the activated complex for water-ethanol and water-methanol media have been evaluated from the slopes of the plots of logarithm of rate constant at zero ionic strength ($\log k_0$) and reciprocal of the dielectric constant ($1/\epsilon$). It is established that the shape of the activated complex in aquo-organic mixtures is similar to Laider-Eyring's approach of single sphere model in this particular reaction.

Key words: Rate constants, Second order kinetics, Dielectric constant, Solvent effect, Single sphere model.

ASSESSMENT OF HEAVY METALS IN *CLARINS BUTHOPOGON* (FISH) PARTS AND *NYMPHAEA LOTUS* (AQUATIC PLANT) IN RIVER NIGER, DELTA STATE OF NIGERIA

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River Niger, the largest river in Nigeria flows southwards across Asaba and Onitsha to the Delta areas. The *clarins buthopogon* (fish) and *Nymphaea lotus* (aquatic plant) from the River Niger at Asaba were sampled for analysis using Atomic Absorption Spectrophotometer (AAS). The concentration of the heavy metals from the three parts of the fish (head, muscle and tail) had the following ranges: Cr, 8.90-9.70; Cu, 2.90-3.90; Fe, 6.00-113.20; Mg, 138.00-3398; Ni, 5.48-14.68; Pb, 0.20-1.60; Hg, 0.38-2.00 and Cd, 1.41-1.78 mg kg⁻¹ on dry weight basis. These values were higher than those obtained in Kaduna River and Mediterranean coaster waters. The concentrations in *Nymphaea Lotus* (aquatic plant) were extremely high (Cr, 20.30; Cu, 10.70; Fe, 569.20; Mg, 6798.00; Ni, 72.08; Pb, 6.00; Hg, 51.30 and Cd, 31.10 mg kg⁻¹ dry weight) and were also higher than those of fish part. The bioaccumulation of heavy metals in fish parts and aquatic plant indicated pollution, as per WHO and FEPA standards for aquatic life.

Key words: Industrial pollutants, Water contamination, Metal accumulation, Fish, Aquatic plants, River Niger.

Short Communication

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SPECTROPHOTOMETRIC DETERMINATION OF METALS IN PAKISTANI AND FOREIGN BRAND CIGARETTE TOBACCO

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Short Communication

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**SPECTROSCOPIC STUDY OF CATIONIC
HEMICYANINE DYES IN LITHIUM DODE-
CYL SULFATE SOLUTION**

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Hemicyanine dyes are effective voltage sensitive probes in

Biological Sciences

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PERSISTENCE OF PESTICIDE FORMULATIONS ALONE AND IN COMBINATION WITH FERTILIZERS IN SOIL

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Experiments were designed to investigate the persistence of the active ingredients in commercial pesticide formulations viz, cypermethrin 10% EC, fenvalerate 20% EC, deltamethrin 25% EC, malathion 25% EC, profenofos 40% EC and chlorfenvinphos 25% EC alone and with various commercial fertilizers viz, urea, DAP (Diammonium phosphate) & SOP (Sulphate of potash) in soil. All fertilizers were added @ 1% to soil collected from vegetable growing areas near Karachi with insecticide fortifications @ 100 ppm and 400 ppm. Results indicate that the application of fertilizers with insecticides does affect the persistence of the insecticides to some extent although each insecticide behaved differently. Malathion was most affected by all fertilizers and deltamethrin least affected.

Key words: Persistence, Fertilizer, Insecticide, Soil.

ROOSTING ECOLOGY OF RED JUNGLE FOWL (*GALLUS GALLUS SPADICEUS*) IN OIL PALM PLANTATION

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Roosting ecology of Red Junglefowl (*Gallus gallus spadiceus*) was studied in oil palm plantation at Sungai Sedu Estate, Selangor, Malaysia. The data were collected by observing the Red Junglefowls directly and with the aid of radio telemetry. Student's t-test was used to examine the differences of roosting activities between males. Pearson correlation analysis was done to examine the relationship between environmental factors and roosting behaviour. The results showed that the Red Junglefowl preferred horizontal frond for roosting at night. In choosing a suitable roosting site, it climbed and walked on the branch step by step and frequently changed branches and trees from time to time. The roosting height varied between 4 to 12 m. However, hen with chicks roosted lower than other birds. The Red Junglefowl departed 7 min earlier than sunrise and roosted 2 min before sunset. The average time spent on roosting on tree was about 11 h 47 min. Generally, the female went to roost earlier than the male and the male departed earlier than the female.

Key words: Red Junglefowl, Oil palm plantation, Roosting time, Departure time.

TOXIC EFFECTS OF COPPER AND ZINC ON GERMINATION AND SEEDLING GROWTH OF SOME TREES

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A significant ($p < 0.05$) reduction in seed germination due to copper toxicity at 800 ppm was observed in *A. lebbeck* and *L. leucocephala*. A significant ($p < 0.05$) effect on root length in *A. lebbeck* was observed at 500 ppm of copper treatment as compared to similar concentration of zinc treatment. Higher concentration of zinc element also decreased the seedling dry weight at 1100 ppm treatment in *A. lebbeck* and *L. leucocephala*. Shoot length of *L. leucocephala* was more affected by copper treatment at 1100 ppm as compared to same concentration of zinc. The lower dose of copper at 200 ppm was found effective in decreasing the seedling growth of *L. leucocephala* and *A. lebbeck*. Seedling growth rather than seed germination appears to be the sensitive stage for both tree species when treated with copper and zinc as compared to control. *L. leucocephala* was highly affected to copper and zinc toxicity, while *A. lebbeck* was less affected. According to tolerance test it was found that tolerance against zinc was higher as compared to copper.

Keywords: Germination, Seedling growth, Tolerance, Toxicity, Trees, Copper and zinc treatment.

BIOLOGICAL EVALUATION OF WHOLE SOYMILK PRODUCED BY INDIGENOUS SOYBEAN

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A study was planned to prepare whole soymilk using two different methods from the indigenous soybean. The extraction of soymilk was carried out from whole soybean and dehulled soybean. The soymilk samples thus prepared were then analyzed and their quality of protein were evaluated by conducting 10 days feeding trial at 10% protein level to weanling albino rats. Skim milk (standard protein), cerelac of wheat (for comparison) and non-protein diets were also involved in feeding trial. Proximate analysis revealed that dehulled soybean milk is more nutritious as compared to whole soybean milk. The data on feeding trial showed Protein Efficiency Ratio (PER) 2.6,1.7; True Digestibility (TD) 90.0,88.0; Net Protein Utilization (NPU) 69.0,58.0 and Biological Value (BV) 77,66 for dehulled soymilk and whole soymilk respectively. Where as for skim milk and cerelac (wheat) PER 2.8,3.1; TD 92,92; NPU 74,66 and BV 81,71 respectively. Based upon the above results it is suggested that soymilk may be prepared on large scale from dehulled soybean and may be used as supplement food for children and population at risk.

Key words: Protein Efficiency Ratio (PER), True Digestibility (TD), Net Protein Utilization (NPU), Biological value (BV).

INFLUENCE OF NUTRIENTS ON THE BIOLOGICAL OXIDATIVE ACTIVITIES OF A LOCALLY ISOLATED *THIOBACILLUS FERROOXIDAN*

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The strain of *Thiobacillus ferrooxidans* was isolated from the Sorange coal mine water in ferrous sulphate medium. The effects of inorganic nitrogen (NH_4^+ , NO_3^-) and phosphate on the biological oxidation of copper sulphide ore were examined. It is observed that the iron was solubilized first from FeS_2 or Fe_{1-x}S to as Fe^{++} and then oxidized to Fe^{+++} . The dissolution of iron Fe^{++} was a chemical reaction whereas the conversion of Fe^{++} to Fe^{+++} was bacteria mediated. The addition and increase in the concentration of phosphate delayed and reduced the conversion of Fe^{++} to Fe^{+++} . Ammonium was found to be the preferred source of nitrogen for the isolated bacterium. The nitrogen as NH_4^+ increased the Fe^{++} oxidation whereas NO_3^- had negative effect. The solubilization of copper was directly related to the Fe^{++} iron oxidation. Maximum dissolved copper concentration were observed in 6mM ammonium supplemented medium and minimum in 6mM nitrate.

Key words: *Thiobacillus ferrooxidans*, Ammonium nitrate, Ammonium phosphate, Oxidation

Technology

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LOCAL DEVELOPMENT OF PEG ASSISTED DOUBLE ANTIBODY T_4 -RADIOIMMUNOASSAY

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In order to replace expensive ready-made commercial radioimmunoassay (RIA) kits with high quality local techniques a local *Throxine* (T_4) RIA was developed and evaluated. Four basic components of immunoassay system, antibody, radiotracer, standards and precipitating solutions were locally prepared. Twelve rabbits were immunized to produce primary antibodies against T_4 using T_4 conjugated with human serum albumin (HSA) and emulsified with Freund's adjuvant as immunogen. Results showed that 4 out of 12 rabbits responded well to the immunogen and a maximum titre of 1:9700 was achieved with a working dilution from 1:1000 to 1:10000. Radiodination of Triiodothyronine (T_3) to produce radiotracer, ^{125}I - T_4 (and ^{125}I - T_3) by chloramine-T method showed that 31% of radioactivity was bound to T_3 and 50% to T_4 with specific activities of (11.1-14.8 MBq/ μg) and (1.85-2.22 MBq/ μg) respectively. Second antibody against T_4 was raised in two sheep. Results of optimization of second antibody showed a working dilution 1:60 for T_4 -RIA. Precipitating solution to separate antigen antibody complex was prepared by mixing sheep anti-rabbit serum (SARS) with phosphate buffer containing 4% polyethylene glycol (PEG) at working dilution. PEG assisted double antibody T_4 -RIA showed more than 7% error in the concentrations below 10 nmol/l with high precision at higher concentrations. The results of quality control samples showed that the values were within expected limits. The values correlated well with the commercial techniques (ICN; Corr. Coeff=0.99) and the values of patient samples determined in commercial as well as in house techniques did not differ significantly ($p<0.5$). The sensitivity of T_4 assay system was 2.5nmol/l. It is, therefore, concluded that in house assay technique has acceptable quality and fits on all standards of good quality.

Key words: Local development, Radioimmunoassay, Separation.