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Physical Sciences

Pak. J. Sci. Ind. Res. 2004 47(3) 167-175

ENVIRONMENTAL PROBLEMS AND THEIR CONTROL MEASURES OF A GLASS FACTORY AT PESHAWAR (PAKISTAN)

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(Received July 18, 2002; accepted March 25, 2004)

Detailed environmental survey/audit of a glass factory was carried out. Balanced sheets for raw materials and water consumption were prepared. Environmental problems especially associated with the unwise use of raw materials were identified and waste minimization techniques at source as well as at the end of pipe treatment were suggested. With the implementation of these techniques, the industry improved its production and achieved the national and international environmental quality standards.

Key words: Environment survey/Audit of industry, Balance sheet, Air and water pollution control.

ISOLATION AND PHARMACOLOGICAL SCREENING OF 8-O-ACETYL HARPAGIDE FROM AJUGA BRACTEOSA WALL

Nusrat Shafi^a, Gull Akhtar Khan ^a, M Arfan ^b, Kamal-ud-Din Ahmad ^a and N D Gilani ^a*

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(Received August 3, 2002; accepted March 25, 2004)

8-O-Acetyl harpagide was isolated and characterized from *Ajuga bracteosa* Wall, a species indigenous to Pakistan. Pharmacological screening of the compound for antibacterial, antifungal, antispasmodic, cardiotoxic and antipyretic activities was carried out. The compound was found effective against a number of human pathogenic bacteria and fungi. Antispasmodic and cardiotoxic effects elicited by the compound were also found. The compound also exhibited antipyretic activity when administered in the higher doses.

Key words: *Ajuga bracteosa* wall, 8-O-Acetyl harpagide, Pharmacological screening.

ELECTRICAL PROPERTIES OF ANNEALED AND UNANNEALED AL-GE THIN FILM COUPLES

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(Received May 23, 2002; accepted April 29, 2004)

The electrical properties of annealed and unannealed Al-Ge thin films had been investigated at electric field values 0.1 - 0.85V/m. Measurements of current - voltage characteristics were obtained at a room temperature. The results of the study showed linear J - V relationship over the voltage range. Annealing changes the electrical properties of the films. As the conductance and barrier heights of annealed samples increase, the saturation current density reduces. Hence a more conducting junction may be obtained from the same metal-semiconductor contact by annealing the sample to a reasonable temperature without loss of surface parameter. In addition, the thickness of the sample also affected the electrical properties of the films.

Key words: Electrical properties, Al-Ge, Thin films, Conductance, Annealing, Barrier height, Saturation current density.

PRODUCTION OF ALUMINIUM SULPHATE AND UTILIZATION OF CLAY RESIDUE FROM KAOLINITE CLAY

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(Received October 20, 2001; accepted May 19, 2004)

Preparation of aluminium sulphate from Kaolinite clay has been studied by calcinations with sodium chloride followed by sulphuric acid extraction. The calcination was carried out at 850- 900°C for 3 h. The maximum recovery of alumina extracted as aluminium sulphate has been determined both on laboratory and pilot plant scale. The utilization of clay residue as an active puzzolanic material is discussed in this investigation.

Key words: Kaolinite, Aluminium sulphate, Clay residue.

ANALYTICS AND KINETICS OF CRYSTALLIZATION OF MAGNESIUM SULPHATE FROM SEA BITTERN, THROUGH SUPERSATURATION

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(Received February 1, 2003; accepted May 22, 2004)

Experimental part of the studies consist of change in concentration of magnesium sulphate against time of its crystallization from sea bittern during chilling. The said data is represented by characteristic straight lines, the slopes(s) of which give the numerical value of kinetics of reaction (Kinetic constant) suggesting that the reaction is of zero order. It is observed that in case of normal bittern the kinetic constant is influenced by the % magnesium sulphate which in turn depends on quality of raw material/weather conditions. Nevertheless, in case of any treatment such as heating and reconstitution of sea bittern, the kinetics constant indicated to depend on the ratio of magnesium sulphate to magnesium chloride. Statistically, the data found to be normally distributed, consistent and free from systematic errors. The calculated values of (i) intercepts have been observed to be very close to actual values. In case of verification factor, the change in calculated values found to be +8% to -11% of ideal values. The theoretical portion comprises of comprehensive treatment of energy balance/overall energy balance equations(s), their transformation to different standard straight lines consisting of bivariates, namely concentration/temperature, concentration/time and temperature/time. Subsequent manipulated of the intercepts/slopes of the lines led to derive important relationships such as heat of crystallization and overall heat requirement of the process. Further, the significance of the parameters/terminology involved in the process, have also been appropriately elaborated. Furthermore, the relationship amongst the slopes of three combinations of variables has led to conceive a new term being called 'verification factor', which under ideal conditions should be unity and the departure from which would be the indication of different types of errors.

Key words: Sea bittern, Supersaturation, Verifaction factor.

PETROGRAPHY, TRACE ELEMENT GEOCHEMISTRY, AND DOLOMITIZATION MODEL - JHIMPIR DOLOMITE, SINDH, PAKISTAN

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(Received May 8, 2002; accepted May 24, 2004)

Dolomites of Jhimpir area have been examined petrographically and geochemically to observe and characterize the process and extent of dolomitization. These are petrographically classified as calcitic dolomite and dolomitic limestones. The texture of dolomite is idiopathic. Most of the dolomite rhombohedrons are fine to medium grained and zoned. The replacement of biomicritic carbonate rocks (Laki Limestone of Early Eocene age) by Mg and Fe-rich solutions is observed in thin section. Major and trace elements have been analyzed in order to assess the compatibility of these elements with dolomite. The average MgO content in the samples close to small fault is between 16 and 17 % and decreases from the fault outwards, down to 5 to 4 %. The Fe, Mn, Na and K contents exhibit a positive correlation with increasing dolomitization, whereas, it correlates inversely with Sr. This paper provides evidence that the dolomites of the Jhimpir area are derived from epigenetic replacement.

Key words: Dolomite, Petrography, Geochemistry, Dolomitization model.

Short Communication

Pak. J. Sci. Ind. Res. 2004 47(3) 205-208

LARGE AMPLITUDE PULSED VOLTAMMETRY OF 4-CHLOROANILINE

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(Received April 7, 2002; accepted March 25, 2004)

The electrodimerization mechanism of 4-chloro and 4-bromoaniline were studied in un-buffered dimethylformamide (DMF) medium. By combined application of conventional and fast voltammetry (100 kV s⁻¹ range), the primary radical cation intermediates, formed by the one electron oxidation of each 4-haloaniline were characterized. The overall reaction path involves a dimerization via an N-C bond formation and de-halogenation at the para position. A detailed mechanistic study demonstrates that this proceeds through a fast reversible deprotonation of the primary radical cation followed by the subsequent N-C bond formation between the resulting radical and its parent radical cation which is the rate determining step of the sequence (e-p-RRC kinetic sequence). The effect of a relatively strong, but weakly nucleophilic base, 2,6-lutidine, was also studied and confirmed the involvement of the fast deprotonation pre-equal. The fast voltammetric experiments, were simulated and the apparent rate constants. For the overall deprotonation dimerization sequence obtained from peak potential shift analysis were confirmed (Amatore *et al* 1999).

Short Communication

Pak. J. Sci. Ind. Res. 2004 47(3) 209-211

FEASIBILITY OF REDOX REACTIONS THROUGH FORMAL REDOX POTENTIAL VALUES

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(Received November 11, 2001; accepted May 15, 2004)

In a complexation reaction, where one or more of the components of the redox couple are involved, it is very difficult to have the exact knowledge of the activities to determine the standard redox potential values. Therefore, at specified concentration Nerst equation may be modified to calculate the formal potential by replacing the activities to concentrations (Braun 1985). The various parameters exploited for facilitating such reactions have been complexation of the reacting species, nature of acid or base and pH, formation of hydroxo complexes with metal ions, formation of hydronium salt of anionic metal complexes (Bailer *et al* 1973; Farrukh and Naqvi 2002; Kimura 1999). In addition to that, the factors described below also alter the respective standard redox potential values. (1) E° decreases with increasing the oxidation number of an element due to an increase in ionization potential. (2) E° also decreases within a period as ionization potential increases with increasing atomic number. (3) Ionization potential values of the transition metal series increase with increasing atomic number, accordingly E° values get decreased within a period.

Biological Science

Pak. J. Sci. Ind. Res. 2004 47 (3) 212-213

PROXIMATE COMPOSITION, MINERALS CONTENT AND FUNCTIONAL PROPERTIES OF CRICKET (*ACHETA* spp.)

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(Received February 11, 2002; accepted March 25, 2004).

Proximate composition, minerals content and functional properties of field cricket (*Acheta* spp) were analyzed using standard methods. The result of the proximate content (%) was as follows: crude protein (39.9 ± 0.40), crude fibre (5.2 ± 0.1), carbohydrate by difference (39.9 ± 0.1) and energy (46.7Kcal). The predominant mineral was potassium and zinc was the least. The functional properties (%) ranged as follows: Water absorption capacity (100), oil absorption capacity (205.6), oil emulsion capacity (75), foaming capacity (28), least gelation capacity (10). Foaming stability was low and collapsed after 240 min. Emulsion stability was high. The result suggests that cricket is a good food formulation medium.

Key words: Minerals, *Acheta* spp, Crude protein, Crude fibre, Foaming stability

SINGLE-DOSE PHARMACOKINETIC STUDY OF CIPROFLOXACIN AFTER ORAL ADMINISTRATION TO THE HEALTHY FEMALE VOLUNTEERS

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(Received October 15, 2002; accepted April 21, 2004)

The disposition kinetic of ciprofloxacin was evaluated in 10 adult healthy female volunteers. Appropriate mathematical model was applied for the estimation of the basic pharmacokinetic parameters because the statistical tests and profiles formed the basis for accepting or rejecting a proposed model. After single oral dose of 500 mg, the blood samples were collected and ciprofloxacin concentrations were determined in serum by High Performance Liquid Chromatography. The mean value of plasma elimination half life ($t_{1/2}$) was estimated as 4.08 ± 1.3 h, maximum plasma concentration (C_{max}) was 1.56 ± 0.49 mg/l obtained at mean value of (T_{max}) 2.11 ± 1.9 h. The average value of area under the curve was 8.96 ± 7.70 h-mg/l and is calculated from t_0 to t_{α} , while the average absorption rate constant was 1.56 ± 1.84 l/h. The average value for clearance was 78.08 ± 41.36 l/h. Volume of distribution and mean resident time showed an average value of 197.0 ± 98.88 litre and 4.82 ± 4.22 h, respectively. There was a significant deviation from the literature trends in respect to V_d and clearance. So this study supports the need for comprehensive evaluation of drug under indigenous conditions to obtain pharmacokinetic parameters on which the rational dosage regimens of drug could be based.

Key words: Ciprofloxacin, Pharmacokinetics, HPLC.

PREPARATION AND SHELF LIFE STUDIES OF *EUGENIA JAMBOLANA* (JAMUN) LEATHER

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(Received July 12, 2003; accepted May 12, 2004)

Eugenia jambolana (Jamun) leathers were made from jamun pulp with and without jamun seeds using solar with electric drying. Comparative investigation of jamun pulp and its products were conducted in terms of moisture, total soluble solids as degree brix, pH and pectin. Shelf life of the products were monitored for more than six months. Very slight change in color, flavor and texture in two of the products during storage at 15°C was observed. The Microbiological study revealed the absence of molds and coliforms. The total bacterial counts were 5-15 Cfug and 15-50 Cfug values for initial and at the end of shelf life, respectively.

Key words: *Eugenia jambolana*, Product, Shelf life, Antidiabetic candy.

INFLUENCE OF SOME PLANT WATER EXTRACTS ON THE GERMINATION AND SEEDLING GROWTH OF BARNYARD GRASS (*ECHINOCHOLA CRUS-GALLI* (L.) BEAUV)

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(Received February 06, 2002; accepted May 15, 2004)

Water extracts of rice husk (*Oryza sativa* L.), above ground foliage of barnyard grass (*Echinochola crus-galli* (L.) Beauv) and sorghum stalk (*Sorghum bicolor* L.) were used to investigate their allelopathic effects on the germination and seedling growth of barnyard grass in a laboratory study. All the water extracts exhibited suppressive effects on the germination and seedling growth of barnyard grass. The order of suppression was rice > sorghum barnyard grass. Regression analysis showed that better germination had the beneficial effect on the later growth of the seedling.

Key words: Allelopathy, Rice husk, Barnyard grass, Sorghum.

ECO-PHYSIOLOGICAL AND CONSERVATION STUDIES ON *VERNONIA AMYGALINA* IN EKITI STATE, NIGERIA

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(Received November 15, 2002; accepted May 17, 2004)

The study examined some aspects of the ecology, physiology, utilization and conservation of *Vernonia amygalina*. The seeds were found to be positively photoplastic with a pre-exposure time of 20 min to illumination required for its optimum germination. The seeds thrive well in slightly acidic soils with low organic matter and high water holding capacity. These characteristics suggest that the species could easily be cultivated in the area studied. The ethnobotanical uses of the species were valued against some socio-economic features of respondents in the study area. These include household size, farm size holdings, educational and economic status of the communities. Results obtained revealed that these features were not regarded as pre-requisites to the consciousness of the respondents to the utilization of this plant. At present, households' homesteads and farms constituted the major primary and secondary sources of the species to the respondents, respectively. The relative abundance test carried out at these sources, however, indicated that the species were of rare occurrence in the locality, hence it is presently endangered in the study area. The need for its conservation was considered as inevitable. Strategies toward the attainment of this goal were proposed.

Key words: Eco-physiology, Conservation, *Vernonia amygalina*.

ANTIMICROBIAL DRUG RESISTANCE EVALUATION AND MONITORING IN *ESCHERICHIA COLI* ISOLATED FROM POULTRY ENVIRONMENT AT DIFFERENT TIME INTERVALS

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(Received September 17, 2001; accepted May 19, 2004)

A high prevalence of multiple drug resistance was observed in populations of *E. coli* isolated in 1992-93 from poultry carcasses, fluff, hatchery environment and water at different broiler farms in Karachi, Pakistan. Five hundred isolate of *E. coli* were made of which 375 were tested for their sensitivity to five antimicrobials using the tube dilution method. Similarly, during 1995-96, 430 *E. coli* isolates were made (from the same farms) of which 315 were tested for their sensitivity to the same antimicrobials studied in 1992-93. *E. coli* isolates during 1992-93 and 1995-96 showed increase in resistance from 50 to 56% against amoxycillin, from 62 to 71% against neomycin, from 97 to 100% against oxytetracycline, from 95 to 100% against tetracycline and from 95 to 98% against trimethoprim. It appears that exposure of *E. coli* of poultry origin in Pakistan to the five studied antimicrobials could well be the cause of increasing antimicrobials resistance. This data supports the growing contention that subtherapeutic doses of antimicrobials should be eliminated as a means of promoting rapid growth.

Key words: Antibiotics, Antimicrobials, Drug resistance, Sensitivity.

SUITABILITY OF DURUM WHEAT VARIETIES FOR THE PRODUCTION OF DOUGHNUTS

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(Received November 17, 2001; accepted May 20, 2004)

Two durum wheat varieties D-97 and WDK-85 and one bread wheat variety Inqlab-91 were tested to assess the suitability for the production of doughnuts. Doughnuts are fermented bakery products, fried in hot oil/fat to form sweet snacks. Doughnuts of good quality has a dry crust and are crispy. The chemical characteristics of wheat grains such as moisture, ash, protein, fat and fiber contents varied from 8.90 to 9.45%, 1.40 to 1.55%, 11.50 to 12.25%, 1.14 to 1.81% and 2.32 to 2.73%, whereas, the chemical characteristics of patent flours varied from 13.31 to 14.95%, 0.35 to 0.54%, 11.02 to 11.81%, 0.57 to 0.96% and 0.36 to 0.41%, respectively. The interactions were found to be highly significant in case of crumb and overall acceptability. Thus, it is concluded that doughnuts made from D-97 are more acceptable to the consumers as they obtained maximum score followed by Inqlab-91. Therefore, this study indicated that good quality doughnuts could be prepared from durum wheat varieties.

Key words: Durum wheat, Doughnuts, Bakery.

Technology

Pak. J. Sci. Ind. Res. 2004 47(3) 240-246

APPLICATION OF GEOGRAPHIC INFORMATION SYSTEM (GIS) TO SOLID MINERAL RESOURCES INFORMATION MANAGEMENT

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(Received September 17, 2002; accepted August 21, 2003)

In this paper, a typical GIS information retrieval model for topographical, geological, minerals and land use maps developed. A 5-layer data topographical and geological information modelling and retrieval for a typical mineral region (Niger Delta, Nigeria) was also designed, for the use of government agencies and prospective investors. We also examined how GIS can be used to select reclamation plan options; from land use and land cover maps.

Key words: Information, Topographical maps, Geological maps, Mineral resources, Land-cover, Degradation, Environment.
