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Studies on Dielectric Behaviour of Some Long Chain Alcohols and Their Mixtures With a Non-Polar Solvent at Various Concentrations

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Abstract. Dielectric constant, refractive index and the Kirkwood linear correlation factor of 1-propanol, 1-butanol and 1-pentanol in mixtures with carbon tetrachloride at various concentrations have been measured at fixed frequency (100 KHz) at 303.15 K. For the study of dielectric properties of polar molecules in a non-polar solvent at different concentrations, polarization per unit volume and excess free-energy of mixing were evaluated at this temperature. In order to study the association of polar molecules in such a non-polar solvent, the Kirkwood correlation factor (g) between molecular pairs, which exists due to the hydrogen bond association suggesting the presence of some dimensions in the liquid phase with a number of dimmers, was determined. The refractive index and dielectric constant measurements are expected to shed some light on the configuration of molecules in various mixtures, and give some idea about the specific interactions between components, which decrease with the increase in the concentrations of alcohol. All the three mixtures showed different behaviour for the value of correlation factor (g) as a function of concentration. The response of 1-pentanol was broadly identical to that of small chain alcohols. The different behaviour of the correlation factor (g) was interpreted in terms of the Kirkwood-Frohlich theory, as it takes into account, explicitly, such types of short and long range interactions of a mixture of polar molecules with non-polar solvents.

Keywords: polar and non-polar molecules, polarization, KF linear correlation factor, short range dipolar interaction, binary mixture, long range dipolar interaction

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Role of Nucleosides on Nickel Electroplating from a Formamide Bath

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Abstract. The outwardly growth mechanism during electrocrystallization results in appreciable thickness and reflectivity, whereas lateral growth leads to thin and inferior reflectivity. Outward growth deposits essentially depend upon the operating conditions. They also depend upon the release of cations in the catholyte from the metal-non-aqueous complex. The nucleoside additive has a large number of coordinating centres for complexation. In formamide medium, the availability of large number of such centres leads to better electrodepostion than those additives having a lesser number. Deoxyguanosine, having a maximum number of coordinating centres, and "N" and "O", leads to electrodeposits having no peeling effect and better reflectivity. However, this peeling effect diminishes if a comparatively large concentration of nucleosides is used. The presence of nucleosides in a non-aqueous electroplating bath not only improves the quality of electrodeposits but improves the thickness too.

Keywords: nickel electrodeposits, nucleosides as additives, metal electrodeposition, electrocrystallization, formamide electrodeposition bath

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Absorption Mechanism of Sulfur Dioxide into Alcoholic Sodium Hydroxide Solutions

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(received July 15, 2004; revised August 10, 2006; accepted August 28, 2006)

Abstract. The chemical absorption of sulfur dioxide into alcoholic solution of sodium hydroxide was studied by simultaneous mass transfer and multiple instantaneous irreversible reaction. The experimental data showed the values of mass transfer enhancement factor to be much higher in the alcoholic sodium hydroxide solution. The results of present studies are compared with reversible and irreversible models over a wide range of sodium hydroxide solution concentrations, reported previously.

Keywords: mass transfer enhancement factor, SO_2 absorption mechanism, SO_2 absorption in alcoholic NaOH, SO_2 absorption in aqueous NaOH, sulfur salts

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Investigations on Indigenous Fuller's Earth and its Evaluation After Acid Activation

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Abstract. Indigenous Fuller's earth from Dera Ghazi Khan district, Pakistan was investigated for its physical characteristics, specific to bleaching palm oil. Properties such as swelling index, surface area and thermal behaviour were determined. The results showed that the studied samples had the desirable large surface area, low swelling index, and consisted of illite and montmorillonite. These were then activated by giving treatment with 4 N hydrochloric acid at 100 °C for 3 h. Raw palm oil was bleached by adding 3% activated earth and the bleaching activity was determined by Lovibond tintometer. Out of the 15 replicate specimens, more than 90% red pigment was bleached in 7 samples, whereas more than 60% red pigment bleaching was noted in 12 samples. However, bleaching of the yellow pigment was not as effective as was observed in the case of red pigment.

Keywords: Fuller's earth, palm oil bleaching, swelling index, illite, montmorillonite

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Synthesis and Spectral Studies of Some Magnesium Complexes of Aromatic Hydrazones

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Physical Characteristics, Inorganic Constituents and Trace Metals Determination in the Street-Vended Samples of Heroin

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Abstract. Samples of heroin collected from different parts of NWFP (North-West Frontier Province, Pakistan) were analyzed for physical characteristics, inorganic constituents (Na, K, Mg, Fe), and quantification of trace metals such as Pb, Cd, Cr, Zn, Co, Mn, Ni, Ag and Al. The analytical results of the samples were compared with those of a pure heroin sample taken as standard (marked as P). The sodium content was much higher than other inorganic adulterants in almost all the samples, which might be due to the adulteration by common salt (NaCl) and other sodium bearing materials. The calcium and magnesium contents were noted to be higher in the samples from the D. I. Khan (D-1, D-2, D-3), which is an indication of the addition of marble, dolomite and calcite as the heroin adulterants. All the samples contained trace metals in varying concentrations. Samples collected from Peshawar city were found to be highly contaminated and, therefore, contained the least quantity of heroin being 84.97% and 54.54% for samples P-2 and P-3, respectively.

Keywords: heroin determination, physical characteristics of heroin, inorganic adulterants in heroin, trace metals in heroin, heroin adulteration

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Traffic Noise in Lahore City, Pakistan. Part II. Vehicular Contribution to Traffic Noise

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Abstract. A traffic noise survey conducted in Lahore city, Pakistan showed that the prevailing traffic noise levels were excessively high and much above the community annoyance limits. Therefore, in order to have an assessment of the level of noise emitted by different types of vehicles plying on the roads in Lahore city, measurement of the level of noise emitted from individual cars, motorcycles, vans, buses, autorickshaws and trucks was carried out in their normal running condition. The data collected have been analyzed for the range of noise emission levels, L_{V99}, L_{V90}, L_{V50}, L_{V10} and L_{V1} values for each category of vehicles. Due to the lack of proper regulatory laws to limit emission of high level noise from individual vehicles in Pakistan, the results are discussed with reference to the vehicular noise emission limits recommended by the Council of European Economic Community, and some other individual countries. Some means and ways to limit the emission of high-level noise from individual vehicles are also suggested.

Keywords: noise pollution, traffic noise, motor vehicle noise, noise pollution in Lahore city, community noise annoyance

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Environmental Study of a Pulp and Paper Mill in NWFP, Pakistan

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Abstract. A detailed environmental study of a pulp and paper mill was carried out, which included effluent flow measurements and sample collection from some selected points. Stack gas analysis was carried out on the spot. The quantity of raw materials used and their wastage in the production processes were identified. The data obtained were fed into environmental balance sheets, already developed for the mill, which showed excessive use of water per ton production of paper, as compared to a European paper mill. The biological oxygen demand, chemical oxygen demand, and total soluble solids were above the permissible level of National Environmental Quality Standards specified by the Government of Pakistan. Control measures for preventing raw materials wastage, both at in-plant and end-of-pipe treatment, were recommended, which included water conservation, spill control, recovery of valuable fibre, reduction in chlorinated compounds, waste heat recovery, solid waste recovery and its safe disposal for the in-plant controls, while options for the end-of-pipe treatment were discussed with the factory management.

Keywords: pollution control, paper pulp recovery, pulp and paper mill, effluent discharge, stock gas analysis, environmental balance sheet, wastewater effluents

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Short Communication

Removal of Phenolic Compounds from Industrial Wastewater by Activated Carbon

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Abstract. Phenol and its derivatives were removed by the physical treatment process of adsorption from pharmaceutical industrial wastewaters at the laboratory scale. The adsorption relationship between different doses of activated carbon and the concentrations of the phenolic compounds adsorbed was studied with respect to time. Determination of phenol concentration was carried out before and after adsorption on activated carbon by the red colour reaction spectrophotometerically. In this reaction, 4-aminoantipyrine acted as a colouring agent, potassium ferricyanide as an oxidant, and ammonium hydroxide-ammonium chloride as the buffer solution. During the present studies, the adsorption process using activated charcoal resulted in the reduction of phenol from 315 mg/l to 0.1 mg/l.

Keywords: phenol adsorption, industrial effluents, activated carbon, wastewater treatment, pharmaceutical effluents

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Anticonvulsant Activity of *Emilia sonchifolia* Leaf Extracts

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Abstract. Anticonvulsant effect of the leaf extracts of *Emilia sonchifolia* is reported for the first time. The ethanol, chloroform and aqueous extracts, especially the aqueous extract, showed marked anticonvulsant effect (ED_{50} of 4 mg/kg and 8 mg/kg in chicks and mice, respectively). This research finding gives scientific justification to the traditional healers in Nigeria for the use of aqueous leaf extract of the plant for treating infantile convulsion. The extracts of *E. sonchifolia* showed concentration-dependant protective effect against maximal electroshock (MES) and strychnine-induced seizures (SIS). The potent anticonvulsant effect exhibited by the extracts of *E. sonchifolia* (especially the aqueous extract) is an indication of its promising anticonvulsant application as a possible new clinical drug. Further studies on the principal anticonvulsant compounds of the aqueous extract are in progress.

Keywords: *Emilia sonchifolia*, anticonvulsant drug, epilepsy, maximal electroshock seizure (MES), strychnine induced seizure (SIS)

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The Nutritional Value of *Sorghum bicolor* Stem Flour Used for Infusion Drinks in Nigeria

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Abstract. The black purple sheath (stem) of *Sorgum bicolor*, used locally as colour additive in cooked meals and infusion drinks taken as beverages, was examined for its nutritive value. The stem made into flour, was found to be rich in energy (1121.3 kJ/100 g), and in some micronutrients (mg/100 g), such as Mg (185.33), Ca (151.70), K (138.87), Na (127.61), and Fe (10.98). High Mg content of stem may be useful for overcoming Mg deficiency. The Fe content was sufficient to meet the daily-required intake (DRI) value for human beings. The presence of Cu, Zn and Mn was also observed. The content of crude fibre (32.0%) and carbohydrates (44.50%) were useful for making the stem a fodder for animal consumption. However, the protein content of the stem was low (3.20%). The functional properties observed for the stem compared favourably with those already reported for some other plants such as pigeon pea flour, African yam bean, and wheat flour.

Keywords: functional properties, Nigerian infusion drinks, sorghum mineral content, nutritive value, sorghum stem flour, *Sorghum bicolor*

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Some Factors Affecting the *In Vitro* Culture of Banana

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Abstract. Factors affecting *in vitro* regeneration of shoots in shoot tip explant cultures of banana cultivar 'Basrai', such as solid and liquid media, growth regulators, vitamins, and antioxidants were studied. Three-quarters strength of MS liquid medium supplemented with 17.75 µM 6-benzyladenine (BA), 11.42 µM indole-3-acetic acid (IAA) and 205 µM adenine sulphate induced the formation of mean number of 12.3 shoots, with the mean length of 3.0 cm, after three weeks of culture. Maximum shoot multiplication (14.33) occurred in liquid medium containing 22.19 µM BA. Addition of 2.0% activated charcoal (AC) to the liquid medium improved quality of the regenerated plants with expanded and glossy leaves, though the number of shoots was reduced (13.66). Profuse formation of roots was characteristically induced by AC. Addition of citric acid (CA) to the medium caused decline in morphogenetic expression of the cultures.

Keywords: activated charcoal, ascorbic acid, citric acid, *in vitro* plant culture, gelling agent, growth regulators, multiple shoots, banana culture

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Quality Evaluation of Some Sindh (Pakistan) Wheat Varieties. II. Correlation Among Various Quality Traits

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Abstract. Some physicochemical and rheological properties of five commercial wheat varieties cultivated in Sindh, Pakistan, namely, Mehran-89, Kiran-95, TJ-83, Anmol-91 and Sarsabz were analyzed. These wheat varieties were obtained from Wheat Research Institute, Sakrand, Sindh, Pakistan in August 2004. The results revealed that the shriveled and broken grains ranged between 0.5 to 9.0%, test weight 75 to 79kg/hectoliter, thousand grain mass 31.8 to 42.2 g, moisture content 10.3 to 10.8%, protein content 11.9 to 15.5%, wet gluten 23 to 39.7%, dry gluten 7 to 12%, gluten index 36.6 to 85.8%, near-infrared (NIR) hardness score 53 to 61, farinograph water absorption 69.1 to 73.3%, dough development time 2 to 4.5 min, dough stability 2 to 11 min, and degree of softening 30 to 100 Brabender unit. The coefficients of correlation (r) between various quality parameters were also calculated. A significantly positive correlation existed between the hardness score and test weight (r = 0.886). The degree of softening was found to be significantly correlated with moisture content (r = 0.943) and gluten index (r = $^{-}$ 0.886). It was also observed that the capacity of gluten to bind water was positively correlated with farinograph water absorption (r = 0.891).

Keywords: wheat varieties, wheat quality traits, wheat variety correlations, wheat rheology, wheat physicochemical characteristics, baking properties, dough rheology

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Contribution of Cereal-Legume Association to the Yield and Grain Quality of Cereals

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Abstract. A study on the mixed cereal-legume cultivation in different planting patterns was undertaken for two consecutive years. The aim was to investigate the contribution of the association of legumes towards yield and grain quality of cereal crops. The data indicated that the association of legumes in different planting pattern with sorghum affected the yield and grain quality of sorghum. During both the years of study, the double row strips (30/90 cm) planting pattern significantly increased the grain yield of sorghum, as compered with single rows (60 cm apart) and triple row strips (30/120 cm). The grain yield of sorghum decreased when sorghum was associated with mungbean or guar, but the additional harvest of intercrops increased the total productivity. The difference in grain yield between the treatment means of interaction was non-significant. Moreover, in the first year of study, protein content of sorghum grain was not significantly affected by the planting pattern, but in the second year of study, double and triple row strips planting pattern significantly increased the grain protein content (respectively, 9.41% and 9.34%) of sorghum, as compared with single row planting pattern (protein content of 9.19%). Sorghum grain protein content of 9.51 and 9.49% produced in association with mungbean was significantly more than the grain protein content of sorghum alone or sorghum grown in the association with guar during 1999 and 2000, respectively. Increase in grain protein content of sorghum, when associated with mungbean, was attributed to the N transfer from companion mungbean to sorghum. It may be concluded from the results obtained that sorghum + mungbean association in the double row strips (30/90 cm) planting pattern can efficiently utilize the available resources to improve the grain quality and overall production of sorghum-based cropping system.

Keywords: *Sorghum bicolor,* crop planting pattern, cereal-legumes association, grain yield, sarghum protein content

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Short Communication

The Effect of Aqueous Extracts from Leaf Leachates and the Soil Beneath *Chromoleana odorata* and *Euphorbia heterophylla* on the Germination of Cowpea Seeds

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Abstract. This study examines the allelopathic effect of different concentrations of aqueous extracts obtained from the decomposed leaves and soil beneath *Chromoleana odorata* (siam weed) and *Euphorbia heterophyalla* (wild poinsettia) on the elongation of radicle and plumule of cowpea. All the extracts were found to retard the elongation of both radicle and plumule when compared to the control. Statistical analyses at 5% level, however, revealed that the degree of retardation was not significantly different. Extracts from the decomposed leaves of *C. odorata* and *E. heterophylla* brought about considerable slowing down of the rates of radicle elongation in cowpea. Also, while the extracts derived from soil beneath *C. odorata* resulted in mere reduction in the elongation of cowpea plumule, those derived from soil beneath *E. heterophylla* resulted in delayed germination of the plumule in addition to slowing down the rate of elongation.

Keywords: *Chromoleana odorata*, *Euphorbia heterophylla*, plant aqueous extracts, allelopathic effect, cowpea seed germination, leaf leachate inhibition