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Short Communication

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(E)-N′-(2, 4-dihydroxybenzylidene)nicotinohydrazide and its Metal Complexes: Synthesis, Characterisation and Antitubercular Activity

Kehinde Olurotimi Ogunniran[a]*, Joseph Adeyemi Adekoya[a], Cyril Ehi-Eromosele[a], Olayinka Oyewale Ajani[a], Akinlolu Kayode[a] and Tadigoppula Narender[b]

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(received April 15, 2015; revised August 6, 2015; accepted August 7, 2015)

Abstract. Nicotinic acid hydrazide and 2,4-dihydoxylbenzaldehyde were condensed at 20 °C to form an acylhydrazone (H_3L^1) with ONO coordination pattern. The structure of the acylhydrazone was elucidated by using CHN analyzer, ESI mass spectrometry, IR, ^{1}H NMR, ^{13}C NMR and 2D NMR such as COSY and HSQC. Thereafter, five novel metal complexes [Mn(II), Fe(II), Pt(II) Zn(II) and Pd(II)] of the hydrazone ligand were synthesized and their structural characterization were achieved by several physicochemical methods namely: elemental analysis, electronic spectra, infrared, EPR, molar conductivity and powder X-ray diffraction studies. An octahedral geometry was suggested for both Pd(II) and Zn(II) complexes while both Mn(II) and Fe(II) complexes conformed with tetrahedral pyramidal. However, Pt(II) complex agreed with tetrahedral geometry. *In vitro* antitubercular activity study of the ligand and the metal complexes were evaluated against *Mycobacterium tuberculosis*, H37Rv, by using micro-diluted method. The results obtained revealed that (PtL^1) (MIC = 0.56 mg/mL), (ZnL^1) (MIC = 0.61 mg/mL), (MnL^1) (MIC = 0.71 mg/mL) and (FeL^1) (MIC = 0.82 mg/mL), exhibited a significant activity when compared with first line drugs such as isoniazid (INH) (MIC = 0.9 mg/mL). $H3L^1$ exhibited lesser antitubercular activity with MIC value of 1.02 mg/mL. However, the metal complexes displayed higher cytotoxicity but were found to be non-significant different ($P > 0.05$) to isoniazid drug.

Keywords: hydrazones, metal complexes, electron spin resonance, thermogravimetry, powder X-ray diffraction, antitubercular agents

Pak. j. sci. ind. res. Ser. A: phys. sci. 2016 **59**(2) 76-82

Quantification of Cr(VI)-Thymoquinone Complex Using Cyclic Voltammetry

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(received December 23, 2014; revised August 10, 2015; accepted August 24, 2015)

Abstract. Quantitative studies of Cr(VI)- thymoquinone complex have been performed by cyclic voltammetry. For this purpose glassy carbon, platinum and saturated calomel electrodes were used as working, auxiliary and reference electrodes, respectively. The effects of concentrations and metal-ligand ratios on Cr(VI)-thymoquinone complex were investigated. Effect of concentration was found to follow Randles-Sevcik equation. Calibration curve method with linear regression line confirms that cyclic voltammetry can be used for quantification of Cr(VI)-thymoquinone complex for pharmaceutical assay. Complete complex formation seems to occur at metal ligand ratio 1:1. Results indicate quasi-reversible electron transfer mechanism. E° and diffusion coefficient of complex at different concentrations and metal ligand ratios were also calculated and found to be 0.244±0.01 V and 3.45×10^{-5} cm^2s^{-1}, respectively. The values of transfer coefficients, α and β, were found to be 0.716±0.02-1.231±0.01 and 0.814±0.01-0.906±0.01, respectively.

Keywords: Cr(VI)-thymoquinone complex, quantitative studies, cyclic voltammetry

Pak. j. sci. ind. res. Ser. A: phys. sci. 2016 **59**(2) 83-89

Effect of Processing on Physicochemical Properties and Fatty Acid Composition of Fluted Pumpkin (*Telfairia occidentalis*) Seed Oil

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(received February 17, 2015; revised August 18, 2015; accepted August 19, 2015)

Abstract. This paper reports the physicochemical properties and fatty acid composition of the seed oil extracted from fluted pumpkin (*Telfairia occidentalis*). The extracted oil was degummed, neutralised and bleached. The oil yield was 42.26±0.20%. The specific gravity (at 25 °C) of the oil was 0.923±0.003 and the refractive index (at 25 °C) was 1.475±0.002. Processing of the crude oil resulted in progressive decrease in turbidity, colour, free fatty acid, acid value, peroxide value and saponification value. However, there was increase in smoke point (243.00±0.03 to 253.00±0.03 °C), flash point (285.00±1.20 to 304.00±1.10 °C) and fire point (345.00±1.10 to 358.00±1.55 °C) as well as iodine value (113.00 to 121.50 g/100 g) and fatty acid composition during the processing of the oil. The fatty acids detected in the oil samples were myristic, palmitic, stearic, oleic, arachidic, behenic, linoleic and linolenic acids. The predominant fatty acid was oleic acid (47.40-47.90%) followed by linoleic acid (26.36-30.44%) while the least fatty acid was linolenic acid (0.01-0.05%).

Keywords: fluted pumpkin, seed oil, degumming, neutralisation, bleaching, fatty acid composition

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Liberation Studies of Padhrar Coal By Using Fractionation Method, XRD Analysis and Megascopic and Microscopic Techniques

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(received October 2, 2014; revised September 14, 2015; accepted December 31, 2015)

Abstract. This research study aims to establish liberation characteristics of Padhrar coal by using various methods including fractionation method, megascopic and microscopic analysis and X-ray diffraction (XRD) technique. Sieve analysis revealed that more than 83% of the coal lied in the medium particle size range of -26.670+6.680 mm. The results of fractionation analysis indicated that most of the sulphur was found in the smaller sized fractions having particle size less than 6.680 mm while most of the ash was found to be associated at larger particle size (+26.670 mm) and at relatively smaller particle size (-6.680 mm). It was found that Padhrar coal consisted of three major minerals namely; quartz, pyrite and kaolinite. These minerals were found to be associated with organic matter at different particle size levels, thus making the nature of the Padhrar coal more complex for its cleaning.

Keywords: liberation study, Padhrar coal, fractionation method, XRD of coal**,** megascopic analysis, microscopy of coal

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Modeling the Land Suitability using GIS and AHP for Cotton Cultivation in Punjab, Pakistan

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(received October 29, 2014; revised September 10, 2015; accepted October 19, 2015)

Abstract. The main goal of this research was to establish a spatial model for identification of suitable land for cotton in Punjab, Pakistan through evaluation of multidisciplinary variables by applying geographic information system (GIS) and analytical hierarchy process (AHP) approach. In this model, rivers were used as constraint and seven factors were temperature, soil physical and chemical properties, soil pH, aridity classes, agro-ecological zones, and river command area. On the basis of these parameters suitability maps were generated. By pair-wise comparison matrix (PWCM) of AHP, weights were extracted by means of principal Eigen vector by Saaty's method, with accepted consistency ratio of 0.09. Multi-criteria evaluation (MCE) employing weighted linear combination aggregates all suitability maps to generate final suitability map. It was found that more potential sites exist along with existing cotton practiced area. The result provided important information for farmers to establish linkage between policy decisions and regulatory actions and to improve agricultural land management.

Keywords: cotton, multi criteria evaluation, analytic hierarchy process, land suitability, geographic information systems, pair-wise comparison matrix

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Quality Variation Minimizer: A New Approach for Quality Improvement in Textile Industry

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(received March 24, 2014; revised September 4, 2015; accepted October 9, 2015)

Abstract. The main theme of this research is to introduce a new technique for quality improvement in industries and services environment. The technique is called as quality variation minimizer (QVM), which is used to test and compare product quality among multiple data groups, i.e. machines, operators, and material etc. For the significant application, QVM is applied at Card department in spinning industry to determine yarn grains quality by different machines. Then comparison of QVM is made with other already developed techniques, i.e., coefficient variation (CV), sigma level etc. to determine yarn grains quality. From the results determined by t-test and chi square test, it has been found that QVM is an effective method to determine yarn grains quality with sample average near the target/demanded value as well as minimum variation.

Keywords: coefficient of variation, quality variation minimizer, sigma level, yarn grains quality

Pak. j. sci. ind. res. Ser. A: phys. sci. 2016 **59(2)** 114-117

Effect of Different Processing Stages on the Crystallinity % and Tensile Strength of 100% Cotton Fabric

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(received August 31, 2015; revised October 14, 2015; accepted October 15, 2015)

Abstract. In this study, 100 % cotton fabric was used to check the impact on fabric crystallinity and tensile strength at different processing stages. Desizing, scouring, bleaching, mercerization and resin (only resin & resin+softener) application were the processes performed on the fabric. X-Ray diffractometer and tensile strength tester were used to determine the crystallinity index (CI) and tensile strength, respectively. Results revealed that from scouring to mercerization crystallinity (CI) decreased while desizing and resin application treatments showed no significant impact on the crystallinity (CI). In case of tensile strength, a decreasing trend from desizing to resin application was observed.

Keywords: cotton fabric, tensile strength, crystallinity index, X-ray diffraction

Pak. j. sci. ind. res. Ser. A: phys. sci. 2016 **59**(2) 118-120

Short Communication

Biosorption Characteristics of Water Hyacinth (*Eichhornia crassipes*) in the Removal of Nickel (II) Ion under Isothermal Condition

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(received March 30, 2015; revised August 14, 2015; accepted August 19, 2015)

Abstract. This study was taken to investigate the potentiality of water hyacinth (*Eichhornia crassipes*) as an alternative biosorbent for the removal of Ni (II) ion from aqueous solution. The optimum pH, contact time and concentration were found to be 6.0, 40 min and 1.0 mg/L under isothermal condition. The biosorption of Ni (II) ion was found to decrease with increasing pH, initial concentration and contact time. Results obtained were analysed with Langmuir and Freundlich biosorption models. The equilibrium data fitted well to the Langmuir biosorption model with correlation coefficient (R^2) value of 0.98. The monolayer adsorption capacity was 0.29 mg/g. The removal of Ni (II) ion from aqueous solution using water hyacinth biomass followed a monolayer biosorption.

Keywords: monolayer biosorption, water hyacinth, nickel removal