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Preparation and Characterisation of Some Transition Metal Complexes of Niacinamide (Vitamin B₃)

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(received September 18, 2013; revised June 27, 2014; accepted July 9, 2014)

Abstract. Niacinamide forms metal complexes of general formula $[M(C_6H_6N_2O)_2]Cl_2$; where M = Mn(II), Co(II), Ni(II), Cu(II) and Zn(II) in the aqueous medium. The complexes were formulated by comparing the experimental and calculated data for C, H, N and metal. The prepared complexes were characterised by different physicochemical methods. The UV-vis, FTIR spectral analysis and thermo gravimetric analysis (TGA). TGA of these complexes have been discussed. Magnetic susceptibility values indicate that all complexes except Zn complex are paramagnetic in nature. The redox properties of the metal ions in the Mn, Cu and Zn complexes have been discussed from the cyclic voltammetric studies. In all cases the systems are quasi reversible.

Keywords: niacinamide, magnetic susceptibility, metal complexes, thermo gravimetric analysis

Electroless and Electrodeposition of Silver from a Choline Chloride-Based Ionic Liquid

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(received June 26, 2013; revised March 24, 2013; accepted May 20, 2014)

Abstract. The electroless and electrolytic deposition of silver from a solution containing silver nitrate in either an ethylene glycol (EG)-choline chloride based or a urea-choline chloride based ionic liquids has been carried out onto steel and copper cathodes by simple immersion, constant current and constant potential methods at room temperature. It has been found that electroless silver deposits of up to several microns have been obtained by dip coating from both urea and EG based ionic liquids without the use of catalysts. The influences of various experimental conditions on electrodeposition and morphology of the deposited layers have been investigated by scanning electron microscopy (SEM) and X-ray diffraction (XRD). It has been observed that crack free bright metallic coloured silver coatings can be obtained from both EG and urea based ionic liquids at the applied deposition potentials up to -0.40 V and applied deposition current densities up to -5.0 A m^{-2} at room temperature. The cathodic current efficiency for the deposition of Ag is about 99%.

Keywords: cyclic voltammetry, electrodeposition, electroless deposition, ethaline, reline, silver

An Assessment of Cleaning Amenability of Salt Range Coal Through Physical Cleaning Methods

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(received November 12, 2013; revised May 13, 2014; accepted July 1, 2014)

Abstract. Representative coal samples from the eastern salt range (Modern Engineering and Kishor coal mines, Pakistan) and the central salt range (Punjmin coal mine, Pakistan) were collected and examined for their chemical composition. The chemical characteristics indicate that the salt range coal belongs to sub-bituminous category. Washability analysis on selected coal samples (6.70×0.212 mm) using zinc chloride solution with a specific gravity from 1.3 to 1.7 were executed. The results classify the central salt range coal as easily washable while, the Eastern salt range coal as moderately difficult to wash. Jigging, shaking table and spiral techniques were applied to check the cleaning amenability of the salt range coal through these techniques. Among these techniques, shaking table revealed the most promising results for all the three coals. Punjmin coal showed the maximum rejection of ash of 55% and that of total sulphur of 74% with a recovery of 46%.

Keywords: coal washability, physical processing, gravity concentration, salt range coal, coal cleaning

Variability in Foliar Phenolic Composition of Several *Quercus* Species in Northern Mexico

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Abstract. Quantitative and qualitative composition of the foliar phenolic compounds were investigated in 81 individual specimens of several white oak species (*Quercus* spp.). The trees were growing in twelve locations in Durango, Mexico. The phenol profiles were determined by HPLC-DAD and a Folin-Ciocateu procedure. The results revealed that: (i) the foliar phenol profiles of all species analysed were complex and formed by 6 to 30 compounds, (ii) the flavonols mostly quercetin glycoside, isorhamnetin glycoside, kaempferol glycoside and phenolic acids were the main identified compounds, (iii) there was a high intra and inter-specific variability in the foliar phenol profiles both at the quantitative and qualitative levels, and (iv) the foliar phenol profiles indicated a slight species-specific tendency for phenols to be accumulated, although this was not clearly distinguished. Significant differences ($P < 0.05$) in the content and composition of the foliar flavonoids between species were observed due to the large environmental and soil conditions variability between localities.

Keywords: *Quercus chihuahuensis*, *Quercus arizonica*, *Quercus grisea*, *Quercus undata*, *Quercus convallata*, foliar phenol profiles

Automated Method for Delineating Watershed, Drainage Pattern and Calculation of Flow Accumulation in Punjab Province using Digital Elevation Model

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(received November 26, 2013; revised June 1, 2014; accepted June 25, 2014)

Abstract. Delineation of the watershed and drainage is among the prior requirement of any organised hydrological study. Delineating watershed is important for elucidating the geo-hydrological conditions of any geographical space. This study aims to explore the vitality of Digital Elevation Model (DEM) data in calculating the flow accumulation, flow length, drainage pattern and watershed basin delineation of Punjab as well as elevational profiling district wise and delineating the catchment density. The potential hydrological system developed is based on 1 arc second Aster GDEM data. Depression less DEM is developed by filling process. Furthermore flow accumulation, drainage pattern and watershed is demarcated on the basis of derived stream channels. This study presents the effectiveness of DEM data for hydrological studies and introduces a better method of water management in Punjab province of Pakistan.

Keywords: DEM, watershed, flow accumulation, drainage pattern

DSC Cure Kinetics of an Unsaturated Polyester Resin Using Empirical Kinetic Model

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(received May 25, 2013; revised February 15, 2014; accepted February 20, 2014)

Abstract. In this paper, the kinetics of curing of unsaturated polyester resin initiated with benzoyl peroxide was studied. In case of unsaturated polyester (UP) resin, isothermal test alone could not predict correctly the curing time of UP resin. Therefore, isothermal kinetic analysis through isoconventional adjustment was used to correctly predict the curing time and temperature of UP resin. Isothermal kinetic analysis through isoconversional adjustment indicated that 97% of UP resin cures in 33 min at 120 °C. Curing of UP resin through microwaves was also studied and found that 67% of UP resin cures in 1 min at 120 °C. The crosslinking reaction of UP resin is so fast at 120 °C that it becomes impossible to predict correctly the curing time of UP resin using isothermal test and the burial of C=C bonds in microgels makes it impossible to be fully cured by microwaves at 120 °C. The rheological behaviour of unsaturated polyester resin was also studied to observe the change in viscosity with respect to time and temperature.

Keywords: isothermal kinetic, unsaturated polyester resin, microwave curing, rheology

Amenability of Carboxylic Acids Adsorption on Surface of Activated Carbon

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(received December 11, 2013; revised July 11, 2014; accepted July 18, 2014)

Abstract. The objective of the present study was to investigate the adsorption of benzoic acid (BA), valeric acid (VA), propionic acid (PA) and butyric acid (BUA) from aqueous solutions at different dosing rate on the surface of activated carbon. Different trials were taken in order to determine the interaction between the carbon surface and adsorbent species. The residual concentration of acids was calculated by the titrimetric method. Maximum adsorption capacity was found to be 93.37% at dosing rate of 8.75 g for BUA and minimum adsorption capacity was measured as 41.47% at dosing rate of 0.69 g for VA. Keeping the same contact time and mass of activated carbon (2.8 g), the adsorption capacity increases with increasing dosing rate.

Keywords: activated carbon, benzoic acid, titrimetric method, adsorption capacity, dose rate

Evaluation of Pesticide Residues in Drinking Water in Different Areas of Khyber Pakhtunkhwa, Pakistan

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(received February 4, 2014; revised April 22, 2014; accepted May 6, 2014)

Abstract. Flood in 2010 severely effected different areas of Khyber Pakhtunkhwa, Sindh, lower Punjab as well as some parts of Balochistan, Pakistan. After the flood, samples of drinking water were collected from the affected areas i.e. Akora Khattak and Buner, Khyber Pakhtunkhwa and pesticides residues were determined quantitatively in these samples employing GC-MS technique. Among the samples collected from Akora Khattak, chlorpyrifos was found in high amounts i.e. 0.040 ppm, in sample no. 6 while methamidophos and methiocarb were found in appreciable quantities i.e. 0.026 ppm and 0.038 ppm, respectively, in sample no. 4. Methamidophos and methiocarb were found in appreciable amounts i.e. 0.039 ppm and 0.034 ppm, respectively, in sample no. 17 among the samples obtained from Buner. Concentrations were found at the level below 0.01 ppm in most of the pesticides under study. From the results it appears that drinking water sources in the area under study have been contaminated with pesticides which is a health hazard and may be a source of various diseases in these areas.

Keywords. flood hit area, drinking water, pesticides, GC-MS technique
