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An overview on the sorption of 3d and 4f metal ions on phenolic resins

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Abstract : Synthesis of benzophenone based phenolic resins and study of its ion exchange efficiency using different electrolytes, pH, time and concentrations.
Keywords : Resins, ion-exchange, adsorption, metal ions.

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Electrochemical behavior and biological aspects of thio-Schiff bases and their copper complexes

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Abstract : The sulfur-nitrogen donor ligands, thiosemicarbazones of 5-nitro-1*H*-indole-2,3-dione, 6-nitro-1*H*-indole-2,3-dione and 5-chloro-1*H*-indole-2,3-dione have been prepared by the condensation of thiosemicarbazide with respective ketones in 1 : 1 molar ratio in the ethanol medium. Copper complexes were prepared by the reaction of hydrated copper dichloride with an equimolar and bimolar amount of ligands. Newly synthesized complexes have been characterized by elemental analysis, melting point determinations and UV, ESR and IR spectral studies. In all the complexes, the monobasic bidentate nature of the ligand is evident. Probable tetrahedral and square planar structures for the 1 : 1 and 1 : 2 complexes, respectively, have been proposed on the basis of spectral data. Antibacterial and antifungal studies of these compounds against various pathogenic bacterial and fungal strains have been carried out. All the ligands and their metal chelates were found active against all microbial strains investigated. However, the chelates were found to be more active than the ligands. One of the ligands (L^3H)) and its metal chelate ($CuCl(H_2O)L_3$) were screened for their antifertility activity. The results indicated that the administration of copper compound in male rats brought about an interference with spermatogenesis which ultimately caused infertility.
Keywords : Thio-Schiff bases, Cu^{II} complexes, synthesis, spectral studies, antifungal, antibacterial and antifertility activity.

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Synthesis and characterization of UO_2^{VI}, ZrO^{IV} and VO^{IV} complexes with a 14-membered macrocyclic tetradentate [N_4] ligand

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Abstract : A series of macrocyclic complexes of the type $[M(L/L')(NO_3)_2].nH_2O$ and $[VO(L/L')(SO_4)].2H_2O$, where L is a Schiff base "2,5,9,12-tetraaza-1,6,8,13-tetramethyl-cyclotetradec-1,5,8,9,12-tetraene (TTCTT)" and L′ is another Schiff base "3,8,14,19-dibenzo-2,5,9,12-tetraaza-1,6,8,13-tetramethyl-cyclotetradec-l,5,8,9,12-tetraene (DTTDT)", M = UO_2^{VI} and ZrO^{IV}, n = 1 or 2 respectively is obtained by *in situ* reaction of ethylene diamine/orthophenylene diamine and acetylacetone with the above oxocations. The coordination template effect governs the steric course of the reaction. The complexes are characterized on the basis of elemental analysis, thermal analysis, molar conductivity, magnetic moment, electronic, infrared and ^1H NMR spectral studies. The results indicate that the VO^{IV} ion is penta coordinated yielding paramagnetic complexes where as UO_2^{VI} and ZrO^{IV} ions are hexa coordinated yielding diamagnetic complexes of above composition.
Keywords : Macrocyclic Schiff base, UO_2^{VI}, ZrO^{IV}, VO^{IV}, electronic, IR and ^1H NMR spectra.

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Spectrophotometric and FT-IR studies of interaction of narcotic drugs (morphine, codeine and thebaine) with acceptors (HQ, BQ, NQ, PA, *o*-Chlo, DNB), their thermodynamics and determination of the vertical ionization potentials of the drugs†

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Abstract : Morphine, codeine and thebaine formed charge transfer complexes with acceptors like hydroquinone, benzoquinone, naphthaquinone, picric acid, chloranil and dinitrobenzene as evidenced from the shifting of absorption maxima and change in optical densities in the UV regions. The evidence of complex formation was observed from the optical densities of the complex in the visible region when D>>A and where D and A do not absorb. The evidence of complex formation was also adduced from FT-IR measurements for morphine + naphthaquinone, codeine + naphthaquinone and thebaine + naphthaquinone complexes. The formations of CT complexes with those acceptors are confirmed from the plots of $h\nu_{CT}$ against I_D^V (vertical ionization potential) of the drugs. From the values CT transition energies, the vertical ionization potentials (I_D^V) of morphine, codeine and thebaine were estimated to be 7.228 ± 0.396, 7.236 ± 0.399 and 7.233 ± 0.405 eV respectively. The almost equal values are due to structural similarities of the drugs. The degrees of overlap in the ground state of the complexes were also calculated. The association constants and thermodynamics of the complexes (e.g. ΔG^0, ΔH^0 and ΔS^0) were determined spectrophotometrically from the o.d measurements at 298, 303, 306 and 310 K using D and A in stoichiometric ratios, a condition necessary for the accurate determination of the association constants. The complexes are fairly stable.
Keywords : Complex, degree of charge transfer, drugs, FT-IR, spectrophotometry, thermodynamics, vertical ionization potential.

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Naturally occurring "*Sesmum indicum*" oil as corrosion inhibitor for zinc in hydrochloric acid

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Abstract : Corrosion behavior of zinc in hydrochloric acid solution was studied using weight loss as well as galvanostatic polarization measurement with and without *Sesmum indicum* oil. The percentage inhibition efficiency increases with increasing *Sesmum indicum* oil concentration. All the data reveal that the oil acts as an excellent inhibitor for corrosion of zinc in HCl solution. Thermodynamic, kinetic parameters and equilibrium constant for adsorption process were calculated from the experimental data. The adsorption of *Sesmum indicum* oil on zinc was found to follow the Langmuir adsorption isotherm at all the concentration study.
Keywords : Corrosion, weight loss, galvanostatic polarization, *Sesmum indicum*.

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Kinetics and mechanism of electron-transfer reactions: Oxidation of dimethyl sulfoxide by iodine monochloride in acid aqueous medium

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Abstract : The kinetics of oxidation of dimethyl sulfoxide by iodine monochloride has been studied in acid aqueous medium. The reaction stoichiometry is represented by

The reaction exhibits first order kinetics with respect to the oxidant but a complex order with the substrate. The rate law is given by

$$-\frac{d[\mathrm{ICl}]}{dt} = \frac{kKK_h[\mathrm{ICl}][\mathrm{DMSO}]}{K_h + [\mathrm{H}^+] + KK_h[\mathrm{DMSO}]}$$

Thermodynamic parameters have also been evaluated.
Keywords : Iodine monochloride, kinetics, electron transfer reaction, oxidation, dimethyl sulfoxide, mechanism.

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Thermodynamics of molecular association of biomolecules with iodine : A study of molecular complex formation

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Abstract : Studies, on donor-acceptor systems in acetone solutions at 30, 40 and 50 °C with a precision of ±0.1 °C have been made using a calibrated pyknometer and viscometer. Two series of biomolecules viz. adenine, adenosine and adenosine-5-phosphate and guanine, guanosine and guanosine-5-phosphate have been chosen as donors while iodine has been selected as an acceptor for the present studies. Thermodynamic functions viz. ΔG^*, ΔH^* and ΔS^* have been calculated to interpret the mechanism of association and solvation of 1 : 1 molecular complex. Coefficient and constant of Vand's equation have been evaluated to support the molecular interactions.
Keywords : Molecular association, molecular interaction, donor-acceptor, charge transfer complex, thermodynamic parameters.

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Synthesis of substituted 3-chloro-1-(3-(trifluoromethyl)-5-methoxy-4*H*-1,2,4-triazol-4-yl)-4-phenylazetidin-2-ones

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Abstract : An efficient and extremely fast procedure to synthesize novel biologically active substituted trifluoro-2-azetidones heterocycles was discussed. Reaction of trifluoroacetic hydrazide 2 with hydrazine hydrate and then cyclization with tetramethoxy methane yields *N*-(3-(trifluoromethyl)-5-methoxy-4*H*-1,2,4-triazol-4-yl)amine 3. Condensation of the *N*-(3-(trifluoromethyl)-5-methoxy-4*H*-1,2,4-triazol-4-yl)amine 3 with corresponding aldehydes yields Schiff base (4a-k). Reaction of Schiff base with chloroacetyl chloride yields the corresponding substituted 3-chloro-1-(3-(trifluoromethyl)-5-methoxy-4*H*-1,2,4-triazol-4-yl)-4-phenylazetidin-2-one (5a-k).
Keywords : 2-Azetidones, Schiff base, triazoles.

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Friedel-Crafts alkylation of benzene with 1,2-diphenyl-2-propanol, 1-chloro-2,3-diphenylpropane and 2-methyl-1-phenyl-2-butanol†

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Abstract : The alkylation of benzene with 1,2-diphenyl-2-propanol (1) using $AlCl_3/CH_3NO_2$ catalyst gave a mixture of 1,2,2- (4) and 1,1,2-triphenylpropane (5) as product alkylates. With 85% H_2SO_4 catalyst, the product consisted of *E*-1,2-diphenylpropene (6) after 2 h of a mixture of 5 and 6 after 18 h. Similar alkylation of benzene with 1-chloro-2,3-diphenylpropane (2) using $AlCl_3$ catalyst gave a mixture consisting of 4, 5 and 6. Finally, alkylation of benzene with 2-methyl-1-phenyl-2-butanol (3) using $AlCl_3/CH_3NO_2$ gave 2-methyl-1,1-diphenylbutane (10) as sole product alkylate. The identities of the products were confirmed spectroscopically and by comparison with unequivocally prepared samples. Mechanisms are proposed to rationalise the observed results.
Keywords : Friedel-Crafts alkylation, triphenylpropanes, carbocation rearrangement, dimerisation.

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Thermoanalytical investigations of non-oxovanadium(IV) complexes of biphenylphenols

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Abstract : Thermal behaviour of non-oxovanadium(IV) complexes of composition $(VCl_{2-n}(acac)_2(OAr^{1,2})_n]$ (where $OAr^1 = OC_6H_4C_6H_5$-2; $OAr^2 = OC_6H_4C_6H_5$-4; acac = acetylacetonate ion $(CH_3COCHCOCH_3)^-$; n = 1 and 2) synthesized by the reaction of $VCl_2(acac)_2$ with the sodium salt of the respective phenols has been studied using thermogravimetric (TG) and differential thermal analysis (DTA) techniques. Thermograms indicate that the complexes undergo decomposition mainly in two steps to yield VO_2 as the final product of decomposition. From initial decomposition temperatures (IDT), the order of thermal stability for complexes has been inferred as $VCl(acac)_2(OAr^1) > V(acac)_2(OAr^1)_2 > VCl(acac)_2(OAr^2) > V(acac)_2(OAr^2)_2$. From the mathematical analysis of TG data, kinetic and thermodynamic para-meters viz. energy of activation, frequency factor, order of reaction, entropy of activation etc. at the first and second decomposition stages employing Coats-Redfern, Freeman-Carroll and Horowitz-Metzger equations have been evaluated.
Keywords : Biphenylphenols, Coats-Redfern equation, Freeman-Carroll equation, Horowitz-Metzger equation, kinetic parameters, non-oxovanadium(IV) complexes, TG and DTA.

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Electrochemical behaviour of cobalt(II) L-amino acids in aqueous dimethyl formamide, *N*-methylformamide and formamide media at dropping mercury electrode

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Abstract : Polarographic technique has been used to evaluate the kinetic parameters and formation constants of cobalt(II) complexes with L-arginine, L-lysine, L-tryptophan, L-tyrosine, L-aspartic acid and L-glutamic acid at pH 8.40 ± 0.20 and at a constant ionic strength (μ = 0.1) in aqueous dimethylformamide (DMF), *N*-methylformamide (NMF) and formamide mixture (v/v) at d.m.e. The reduction of all these complexes is found to be irreversible. The kinetic parameters (K^0_{fh}, αn, ξ) for these complexes were calculated using Meites-Israel method and its modification by Gaur and Bhargava. In all these cases a single reduction wave is obtained and i_d value decreases with increase in the percentage of solvent (20–60% v/v). Further it was observed that $E_{1/2}$ value shifted towards more negative side in all Co^{II} complexes in NMF medium possibly due to high dielectric constant and viscosity of the medium.
Keywords : NMF, DMF, DME, amino acid, cobalt(II).

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The photogalvanic conversion of solar energy into electrical energy in thiazine dye – anionic surfactant system

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Abstract : Photogalvanic effect in a photogalvanic cell containing Dioctyl Sulfosuccinate Sodium Salt (DSSS) as surfactant, EDTA as a reductant and Azur A as a photosensitizer is studied. The effect of surfactant (DSSS), photosensitizer, reductant, pH, diffusion length electrode area and temperature on electrical output of the cell are studied.

The observed photogalvanic potential and photocurrent are 638 mV and 220 μA respectively. The observed conversion efficiency is 0.8723%, fill factor 0.2794. The cell performance is 85.0 min in dark (the storage capacity of cell in dark). The effect of different parameters on the electrical output

of the cell are observed, current voltage characteristics of the cell have also been studied and mechanism has been proposed for the generation of photocurrent in photogalvanic cell.
Keywords : Azur A, DSSS, EDTA, fill factor, conversion efficiency, photogalvanic cell.

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Syntheses and characterization of citronelloloxy dichloro phosphine derivatives of dialkyl ammonium dithiophosphates and dialkyl phosphonates

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Abstract : Dialkyl ammonium dithiophosphates and sodiodialkylphosphite derivatives of citronellol (2-methyl-5-prop-1-en-2-yl)cyclohex-2-enone have been synthesized by treating a benzene solution of phosphorus trichloride with sodium salt of citronellol and then with corresponding dithiophosphate and phosphonate ligand in 1 : 1 and 1 : 2 molar ratios. The complexes isolated are light yellow coloured viscous liquids soluble in common organic solvents and are characterized by elemental analysis and spectroscopic (IR, PMR and ^{31}P NMR) measurements.
Keywords : Citronellol, dialkyl ammonium dithiophosphate, dialkyl phosphonate.

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Synthesis, characterization and *in vivo* anthelmintic activity of some novel *N*-Mannich bases of benzimidazoles

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Abstract : As a part of ongoing efforts towards finding novel anthelmintic agents, *N*-Mannich bases of benzimidazole were obtained by condensation of substituted secondary amines and aldehyde in ethanol. These compounds were identified on the basis of melting point range, R_f values, elemental analysis, IR and ^{1}H NMR spectral analysis. The synthetic work is fruitless without performing biological activities, so the newly synthesized compounds were screened for pharmacological activity. Anthelmintic activity was carried out against *Eudrilus* species of earthworms.
Keywords : Mannich bases, benzimidazole, anthelmintic activity.

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Diterpenoid quinones and other constituents from the roots of *Clerodendron tomentosum* R. Br.

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Abstract : Chemical investigation of combined pet. ether and benzene fractions from the ethanolic extract of *Clerodendron tomentosum* R. Br. afforded three diterpenoid quinones, viz. 12-acetylroyleanone, royleanone and 6,7-dehydroroyleanone along with *n*-hexacosane, eicosanoic acid, (24*S*)-ethylcholesta-5,22,25-triene-3β-ol, α-amyrin and oleanolic acid. This is the first report of the isolation of diterpenoid quinones from this plant, also 12-acetylroyleanone has been obtained for the first time from a natural source.

Keywords : *Clerodendron tomentosum*, diterpenoid quinones, 12-acetylroyleanone, triterpenoids.

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Isolation and characterization of isoquinoline alkaloids from methanolic extract of *Berberis chitria* Lindl.

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Abstract : An isoquinoline alkaloid palmatine was isolated along with six other previously reported isoquinoline alkaloids, from the methanolic extract of root bark of *Berberis chitria* Lindl. and characterized.

Keywords : *Berberis chitria* Lindl., isoquinoline alkaloids, palmatine, methanolic extract.

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Synthesis and antibacterial activity of some chalcones

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Abstract : The chalcones derived from quinoline aldehyde were (2*E*)-3-(2-chlorobenzo[*h*]quinolin-3-yl)-1-(4-methoxyphenyl)prop-2-en-1-one (RM-1), (2*E*)-3-(2-chlorobenzo[*h*]quinolin-3-yl)-1-(4-methylphenyl)prop-2-en-1-one (RM-2), (2*E*)-3-(2-chlorobenzo[*h*]quinolin-3-yl)-1-(4-chlorophenyl)prop-2-en-1-one (RM-3), (2*E*)-1-(4-bromophenyl)-3-(2-chlorobenzo[*h*]quinolin-3-yl)prop-2-en-1-one (RM-4), (2*E*)-3-(2-chlorobenzo[*h*]quinolin-3-yl)-1-(4-nitrophenyl)prop-2-en-1-one (RM-5), (2*E*)-1-(4-aminophenyl)-3-(2-chlorobenzo[*h*]quinolin-3-yl)prop-2-en-1-one (RM-6), (2*E*)-3-(2-chlorobenzo[*h*]quinolin-3-yl)-1-(3-nitrophenyl)prop-2-en-1-one (RM-7), (2*E*)-3-(2-chlorobenzo[*h*]quinolin-3-yl)-1-(2-hydroxyphenyl)prop-2-en-1-one (RM-8), (2*E*)-3-(2-chlorobenzo[*h*]quinolin-3-yl)-1-(4-hydroxyphenyl)prop-2-en-1-one (RM-9), (2*E*)-3-(2-chlorobenzo[*h*]quinolin-3-yl)-1-phenylprop-2-en-1-one (RM-10).

Chalcones were evaluated for their potential as antibacterial agents against three Gram-positive bacteria *Bacillus cereus, Staphylococcus aureus, Micrococcus flavus* and three Gram-negative bacteria *Proteus mirabilis, Escherichia coli, Klebsiella pneumoniae*. The antibacterial assay was evaluated by agar disc diffusion method in DMF solvent.

Keywords : Quinoline aldehyde, chalcones, antibacterial activity, DMF.

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Studies on the compositions of nutmeg and mace (*Myristica fragrans* Houtt.) from Tellicherry and Kannur region, Kerala

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Abstract : Studies on the fruits of the nutmeg tree, *Myristica fragrans* Houtt. (family : Myriticaceae) were carried out for the two different parts of the fruit, that is nutmeg and mace collected from Tellicherry and Kannur area (Kerala). The dried material was studied using HPLC and other laboratory techniques. The major compounds identified were carbohydrate, starch, reducing sugars, protein, phenol, fat and fatty acids and minerals like K, Ca, Fe, Cu, Zn and Mn. Essential oils were also identified. The chemical composition obtained was compared with the information already available in literature for other parts of the country. The results obtained are promising due to the quality and quantity of the various chemical compounds present in the nutmeg and mace available in Tellicherry and Kannur area. The study also revealed the importance of the area of cultivation. Due to the medicinal importance the study is very much interesting.

Keywords : Nutmeg, mace, *Myristica fragrans* Houtt., area of cultivation, chemical composition.