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ONIUMME THOD FOR EXTRACTION AND SPECTRO PHOTO METRI CDE TERMINATION OF ZN (II) AND CO (II)

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ABSTRACT

UV-Vis.spectrumforcomplexesofZn(II)andCo(II)extractedaccordingtooniumsystemfromacidicHCLsolutionbyuse2,4-dimethylpentan-3-one(2,4-DMP)asoniumcomplexwas(262nm)forZn(II)butoniumcomplexforCo(II)was(243nm),thismethodshowneed0.5MHCLforextractionZn^{2+}and0.8MHCLforCo^{2+},aswellgivingobeytoBeer-Lambertrelationatthe(1-20μg)forZn^{2+}and(1-50μg)forCo^{2+}.Theoniumcomplexextractedhavestructure$H(H_2O)(2,4\text{-}DMP)_3^+$;$HZnCl_4^-$,$H(H_2O)(2,4\text{-}DMP)_3^+$;$HCoCl_4^-$.ThismethodobeytoBeer-Lambertrelationattherange(1-20μg)forZn^{2+}ε=16893.56L.mol^{-1}.cm^{-1},D.L=6.33×10^{-6}μg/Ml,RSD%=0.0069μg/Ml,Sandell'ssensitivity=3.87×10^{-9}μg/cm^{2}and(5-50μg)forCo^{2+},ε=8918.77L.mol^{-1}.cm^{-1},D.L=3.38×10^{-5}μg/Ml,RSD%=0.00664μg/Ml,Sandell'ssensitivity=7.33×10^{-9}μg/cm^{2}.AswellasthisresearchinvolvedmanystudiesandapplyfordeterminationZn^{2+}andCo^{2+}indifferentsamples.

KEYWORDS: OniumSpecies,Zinc,Cobalt,SpectrophotometricDetermination

INTRODUCTION

Oniummethodisanapplicationofsimplecoordinationandionassociationsolventextractionmethod,thisapplicationextractedacidichalometalliccomplex,whereashydratedhydrogenionisthecationparticipatetofromionassociationcomplex,thiscomplexpartitioninwaterbutwhensubstitutedthreewatermoleculesinthehydrationshellofprotonwithorganiccompoundthenthecomplexpartitiontoorganicphase[1].ExtractionofBi(III)withn-octylanilineinchloroformfromHCLandHBRmedia.Theoptimumconditionswereevaluatedsuchasacidity,n-octylanilineconcentration,equilibrationtimeanddiluents,andextractedspecieswas$(RNH_3^+)_2BiCl_5^{=}$[2].ExtractionandseparationofSN,As,Cu,PBandZnfromHCLsolutionbyusingTBPasanextractant,studiesalloptimumconditions[3].DeterminationCo(II)spectrophotometricallybyusing3,5-dicl–PADAT(5-[3,5-dichloro-2-pyridylazo]-2,4-diaminotolueneatpH=3formcomplexwhichisverystable[4].CPEmethodologyappliedforextractionofNi(II)aschloroanionbyusingcrownetherDB18C6,ionpairassociationcomplexextractedhavingλ_{max}=295nm,inpresence0.5MHCland0.25MNaCland1%TritonX-100assurfactant.Theextractedcomplexhasthestructure1:1$[NaDB18C6]^+$;$NiCl_3^-$,$[NaDB18C6]^+$;$HNiCl_4^-$[5].Byusedorganicreagent1-(2-pyridylazo)-4-BenzenenaphtholasreagentforthedeterminationofMg(II)indifferentsamplesafterconversionMg^{2+}cationtoanioncomplexbyreactionwithoxine.Thestudyshow0.5MNaOHfavoritetoproduceoxineanion,theorganicreagentPABNprimaryreactwithNi(II)toformlargecationproduceionassociationcomplexwith$Mg(OX)_3^-$[6].Used1-(2-pyridylazo)-2-naptholfordeterminationofPd(II)inrealsamplesbyCPEmethodinpresenceTritonX-

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114andCPLwasdilutedwithHNO_3(65%w/w)afterphaseseparation,thentheconcentrationsofPdweredeterminedbyGFAAS[7].SolventextractionofGa(III)fromHCLusing2-octylaminopyridinedissolvedinchloroform.Studyallparameterseffectonextractionefficiency.Fromslopeanalysismethodextractedspecieswas[RR’NH_2^+;$GaCl_4^-$][8].CPEmethodforextractionCr(VI)byusing2-[benzenethiazolylazo]-4-benzenenaphtholasreagent.TheCPEefficiencyisoptimizedbyone-factoratatime[9].

TheCPEmethodforextractedCd(II)aschloroanionwithcrystalvioletdyebyusingnonionicsurfactantTritonX-100toformionassociationcomplexwhichhavingλ_{max}=449nm[10].Used3,5-Dimethoxy-4-hydroxybenzaldehydeisonicotinoylhydrazoneasreagentforPb(II),thecomplexextractedhasλ_{max}=430nmwith$\varepsilon=1.82\times10^4$L.mol^{-1}.cm^{-1},thestoichiometryshowthecomplexextractedwas1:1withstabilityconstant8.99×10^6[11].CPEmethodologyusedtoseparationandextractionCo^{2+}ionbyusing2-[4-antybyrenzolylazo]-1,2-dihydroxy-9,10-anthracene-dioneascomplexingagentandnon-ionicsurfactant1%Tritonx-100atpH=8,studyinvolveddeterminationoptimumconditions,thermodynamic,synergismandspectrophotometricdeterminationofCo(II)indifferentsampleswithD.L=1.6559×10^{-5}µg.mL^{-1},Sandell’ssensitivity=7.99×10^{-5}mg.cm^{-2},ε=7374.12L.mol^{-1}.cm^{-1}andRSD%=0.0065.[12].ExtractionofZn(II)accordingtoCPEmethodbyusingneworganicagent2-(4-amino-N-5-methylisoxazol–3-yl)benzenesulfonamideazo-1-Naphthol-BenzenatpH=9andbyusingTritonX-100assurfactant,extractedcomplexhavingλ_{max}=380nm.Additiontostudyeffectiveparameterssuchasthermodynamic,timeofheating,interferences,electrolyte,stoichiometryshowsthatthecomplexextractedwas[Zn(AIBSNB)]$^+$;Cl$^-$or[Zn(AIBSNB$^-$(Cl$^-$)].ThemethodappliedtodeterminationofZn(II)indifferentsampleswithε=13067L.mol^{-1}.cm^{-1},R.S.D=0.0068,D.L=1.55×10^{-5}andSandell’ssensitivity=0.0005µgcm^{-2}[13].

Experimental

- **Apparatus**

ThespectrophotometricmeasurementsweremadebydoublebeamUV-Vis.spectrophotometer,(BiochromLibraS60)(UK)isusedby1cmquartzcells.ForshakingusedHY-4vibratorwithADJustaboutspeedmultiple(Italy).Forthermodynamicstudyusedshakingwaterbath(Galvanothermythermostaticwaterbath(G,Gerhardt,Germany))

- **ReagentandMaterials**

AstocksolutionsofZn(II)in(1mg/mL)preparedbydissolved0.1gmofZn(II)elementinsmallquantityof1:1hydrochloricacidsolutionandcompletethesolutionto100mLwithdistilledwaterinvolumetricflask,aswellasCo(II)solutionin(1mg/mL)preparedbydissolved4.780gmof$CoCl_2.H_2O$indistilledwatercontain2mLofconcentratedHClthendilutethesolutionwithdistilledwaterto1Linavolumetricflask.OtherworkingsolutionforZn(II)andCo(II)preparedbydilutionwithdistilledwater,whereallchemicalusedinexperimentsareofanalyticalgradeandwereusedwithoutfurtherpurification.

- **TheFundamentalMethodforExtraction**

Taken5mLaqueoussolutioncontainafixedquantityofZn^{2+}orCo^{2+}ionandsuitableconcentrationofhydrochloricacidshakingthissolutionfor5min.,afterwardadd5mLof2,4-dimethylpentan-3-onedissolvedinchloroformat1×10^{-4}Mandshakingthesetwophasesfor10min.atlatterseparateorganicphasefromaqueousphase,determinetheabsorbanceoforganicp haseatmaximumabsorbancewavelengthforoniumspeciesagainstblankpreparedatthesamemannerwithoutanalytemetalion,buttheaqueousphasetreatedaccordingtospectrophotometricdeterminationforeachion(dithizonemethodforZn^{2+}and1-nitroso-2-naphtholforCo^{2+})[14]andafterreturntocalibrationcurvesforeachiontodeterminereminderquantityofmetalionafterextraction,afterwardsubtractionthisquantityfromoriginquantityofmetalioninaqueoussolutionbeforeextractiontodeterminetransferquantityofmetalionintoorganicphaseasoniumspecies,andfromthesetwoquantitiescalculatedistributionratio(D).Aswellaswearefoundedthetransferredquantityofmetaliontoorganicphasedeterminedbystrippingmethodaftershakingorganicphasewithtwoportionsof5mLconcentratedNH_4OHwasequaltothesamequantitydeterminedbysubtractionremainingquantity,thenweareusingthesubtractionmethodfordeterminingthedistributionratio(D)becausefasterandeasier.

RESULTSANDDISCUSSIONS

Spectroscopy

InspiteofdeterminemaximumabsorbancewavelengthforoniumspeciesextractedintoorganicphaseforZn^{2+}andCo^{2+},UV-Vis.spectruminFigure1showλ_{max}=262nmforZn^{2+}andλ_{max}=243nmforCo^{2+}.

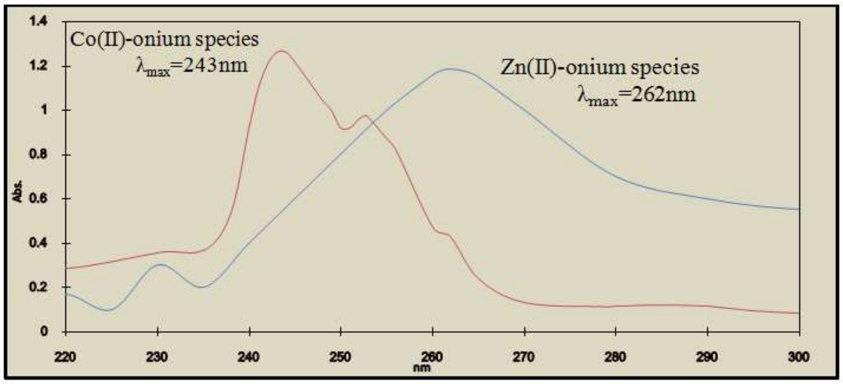


Figure1:UV-Vis-SpectrumforZn^{2+}andCo^{2+}OniumSpecies

VariationofHydrochloricAcidConcentration

Aqueoussolutions5mLinvolumecontain20μ gZn^{2+}or50μ gCo^{2+}withdifferentconcentrationsofHClintherange(0.05-1.0M),shakingthesesolutionsfor5min.,thenadding5mLof1×10^{-4}Msolutionof(2,4-DMP)dissolvedinchloroformandshakingthesetwolayersfor10min.atlatterseparatetheorganicphasefromtheaqueousphaseanddeterminetheabsorbanceoforganicphaseat462nmforZn^{2+}and243nmforCo^{2+}againstblankpreparedatthesamemannerinabsenceofanalytemetalionaswellastreatedtheaqueousphaseaccordingtospectrophotometricmethods[14]foreachmetalionasdetailedinthemainmethodtocalculatedistributionratio(D)valuesafterreturntocalibrationcurveinFigures(2,3)andtheresultswereasinFigures(4,5).

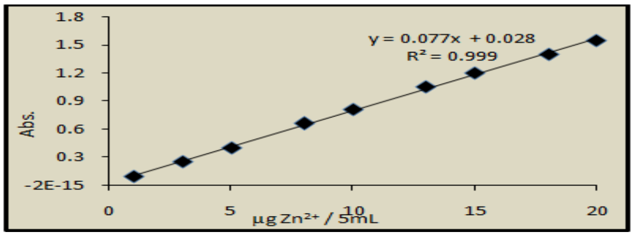


Figure2:CalibrationCurveforZn^{2+}IonbyDithizoneMethod

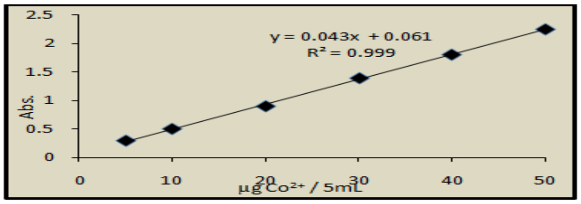


Figure3:CalibrationCurveforCo^{2+}ionby1-Nitroso-2-NaphtholMethod

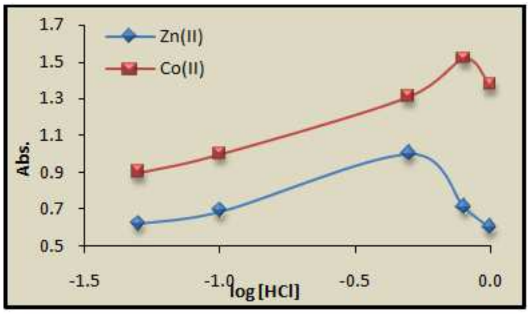


Figure4:EffectofHCLConcentrationonOnium SpeciesforMationandExtraction

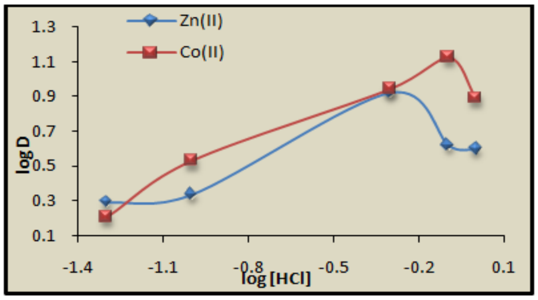


Figure5:F(Log[HCL])

TheresultsshowanoptimumHClconcentrationwas0.5MforZn^{2+}butforCo^{2+}was0.8M,attheseconcentrationsreachtofavorablethermodynamicequilibriumforformationoniumcomplexwiththreemoleculesof(2,4-DMP)replacedwatermoleculesinthehydratedhydrogenionascation,anyconcentrationlessthanoptimumvaluenotenoughtoreachequilibriumforformationandextractiononiumspecies.AswellasHClconcentrationmorethanoptimumvaluecausingdeclineextractionefficiencybyeffectoftheLechatlierprincipleandmassactionlawandincreasedissociationanddecreaseformationofoniumspeciesaswellincreaseformationstablecompounds$ZnCl_2$and$CoCl_2$.

VariationofMetalionConcentration

Aqueoussolutions5mLinvolumecontaindifferentquantitiesofunderstudymetalionsintherange(1-22µgZn^{2+})and(5-60µgCo^{2+})and0.5MHClforZn^{2+}and0.8MforCo^{2+},aftershakingthesesolutionsfor5min.added5mLof1×10^{-4}Msolutionof(2,4-DMP)dissolvedinchloroformandshakingthesetwolayersfor10min.atlatterseparatetheorganicphasefromtheaqueousphaseanddeterminetheabsorbanceandthedistributionratio(D)valuesateachconcentrationofmetalion.TheresultswereasinFigures(6,7):

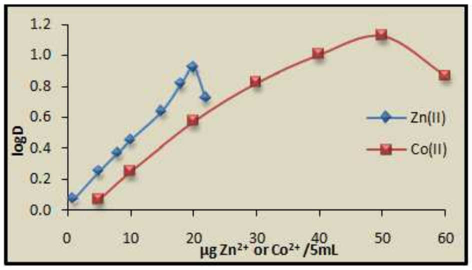


Figure6:EffectofMetalionConcentrationon OniumComplexFormationandExtraction

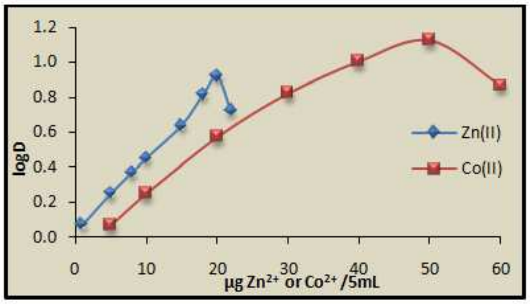


Figure7:D=F[MetalIon]

Theresultsshowtheoptimumconcentrationwas20µ gZn^{2+}and50µ gCo^{2+},theseconcentrationssuitabletoreachthermodynamicequilibrium:

$$Cl^- + H_9O_4^+ + 3(2,4\text{-}DMP) \rightleftharpoons H(H_2O)(2,4\text{-}DMP)_3^+;Cl^-$$

$$4\,H^+ + 4Cl^- + Zn^{2+} \rightleftharpoons HZnCl_4^- + 3H^+$$

$$H^+(H_2O)(2,4\text{-}DMP)_3;Cl^- + HZnCl_4^- \rightleftharpoons H^+(H_2O)(2,4\text{-}DMP)_3;HZnCl_4^- + Cl^-$$

$$4\,H^+ + 4Cl^- + Co^{2+} \rightleftharpoons HCoCl_4^- + 3H^+$$

$$H^+(H_2O)(2,4\text{-}DMP)_3;Cl^- + HCoCl_4^- \rightleftharpoons H^+(H_2O)(2,4\text{-}DMP)_3;HCoCl_4^- + Cl^-$$

Whereasmetalionconcentrationintertothermodynamicequilibriumforformationacidichalometalliccomplex,whichisgivenbythermodynamicequilibriumforexchangeoniumionpaircomplexextractedintotheorganicphase,anyconcentrationnotenoughtoreachfavorableequilibriumanddecreasedabsorbanceandthedistributionratio(D)values.Ofconcentrationmorethanoptimumeffecttoincreasetherateofbackwardreactionandincreasedissociationoftheacidichalometaliccomplex,accordingtomassactionlawandLechatlierprinciple.

Variationof2,4-DMPConcentration

ExtractedmetalionsZn^{2+}andCo^{2+}from5mLaqueoussolutionscontain20µ gZn^{2+}or50µ gCo^{2+},and0.5MHClforZn^{2+}and0.8MforCo^{2+},shakingfor5min.andthenadded5mLof(2,4-DMP)dissolvedinchloroformatdifferentconcentration(1×10^{-5}-3×10^{-1}M)andshakingthetwolayersfor10min.atlatterseparatetheorganicphasefromtheaqueousphaseanddeterminetheabsorbanceandt hedistributionratio(D)valuesaccordingtothefundamentalmethodateachconcentrationof2,4-DMP.TheresultswereasinFigures(8,9).

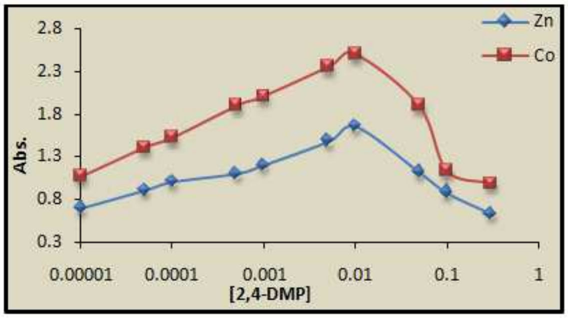


Figure8:Effectof(2,4-MP)ConcentrationonOnium ComplexFormationandExtraction

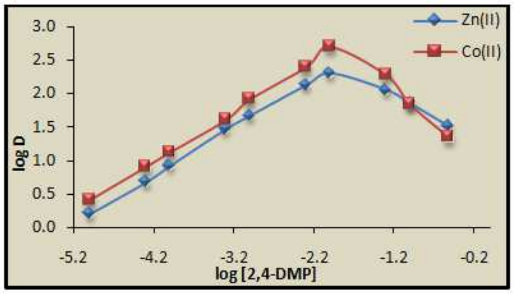


Figure9:D=F[2,4-DMP]

Theresultsshowabsorbanceaswelldistributionratioincreasingasastraightlinewithincreasing2,4-DMP1×10^{-2}Mforbothmetalions,thusincreasinginabsorbanceanddistributionratiovaluesreflecttheincreasinginoniumspeciesformation,buttheconcentrationmorethanoptimumvalueatconstantothervariableseffecttoincreasetherateofdissociationanddecreaseabsorbanceanddistributionratiovaluesaccordingtoLechatlierprinciple.

ShakingTimeEffect

Extracted20µgZn^{2+}or50µgCo^{2+}in5mLaqueoussolutionsinpresence0.5MHClforZn^{2+}and0.8MforCo^{2+},shakingfor5min.afterwardadded5mLof(2,4-DMP)dissolvedinchloroformat1×10^{-4}Mandshakingthesetwolayersfordifferentshakingtime(2-20min.),aswellasdeterminedabsorbanceanddistributionratiovaluesateachshakingtimeaccordingtothemainmethoddetailed.TheresultsobtainedwereasinFigures(10,11).

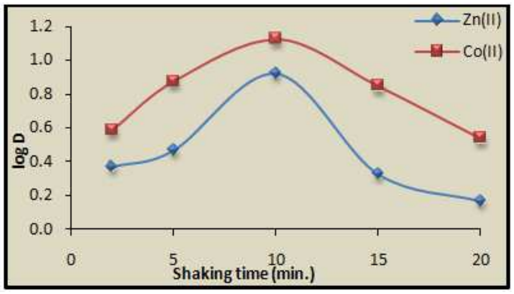


Figure10:ComplexFormationandExtraction=F[ShakingTime]

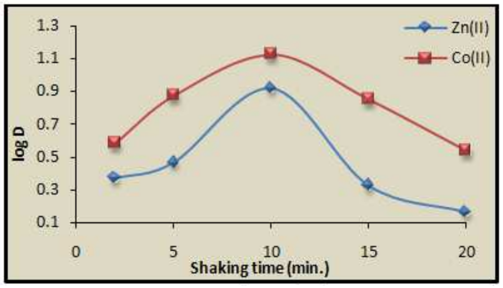


Figure11:D=f[ShakingTime]

Theresultsdemonstrateoniumcomplexformedandextractedincreasewithshakingtimeincreasingtillreachedtheoptimumshakingtime10min.forbothmetalions,atthistimereachedfavorablethermodynamicequilibriumandgivingamaximumconcentrationofoniumspeciesextracted,whereasshakingtimereflectthekineticsideofextractiontocompletereachedforhigherextractionefficiencyanyshakingtimelessthanoptimumnotallowtoreachequilibriumofextractionsothatshakingtimemorethanoptimumcausingincreaserateofbackwarddirectionofequilibrium.

EffectofOrganicSolvent

Aqueoussolutions5mLinvolumetricflaskcontain20µgZn^{2+}or50µgCo^{2+}atoptimumconditionsshakingfor5min.afterwardadded5mLsolutionof2,4-DMPdissolvedindifferentorganicsolventsat1×10^{-4}Mconcentrationandshakingfor10min.,thenseparateorganicphasefromaqueousphase,andtakenUV-Vis.spectrumfororganicphaseagainstblankpreparedatthesamemannerwithoutmetalion,aswellastreatedaqueousphasesaccordingtospectrophotometricmethodforeachmetalion[14].TheresultswereinFigure(12a,12b)andTables(1,2).

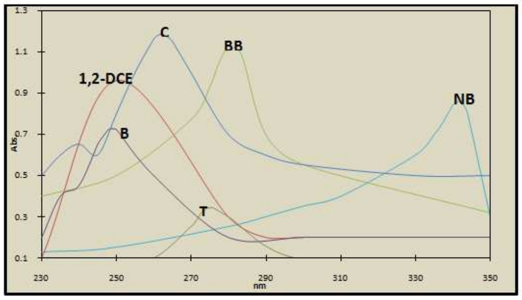


Figure 12a:UV-VisSpectrumfor Organic Solvent EffectonExtractionActivityofZn(II)

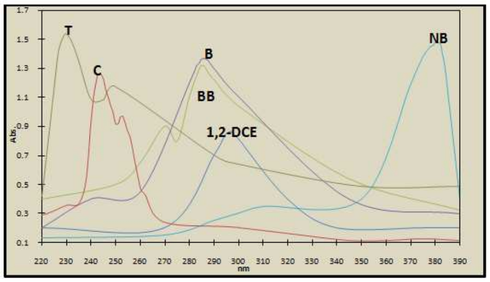


Figure 12b:UV-VisSpectrumforOrganicSolvent EffectonExtractionActivityofCo(II)

NB=Nitrobenzene,1,2-DCE=1,2-Dichloroethane,BB=Bromobenzene,

C=Chloroform,B=Benzene,T=Toluene

Table 1:MolarAbsorptivityandΛ_{MAX}forSpectrums

Organic Solvents	ε	λ_{max} nm		Absorbance		Molarabsorptivity (ε)L.mol^{-1}.cm^{-1}	
		Zn(II)	Co(II)	Zn(II)	Co(II)	Zn(II)	Co(II)
NB	35.74	342	381	0.857	1.48	8570	14800
1,2-DCE	10.65	250	297	0.959	0.864	9590	8640
BB	5.400	281	285	1.121	1.32	11210	13200
C	4.806	262	243	1.187	1.26	11870	12600
B	2.804	249	286	0.728	1.37	7280	13700
T	2.438	275	230	0.342	1.54	3420	15400

Table 2:EffectofOrganicsolventonExtractionEfficiency

Organic Solvents	ε	D		$-\Delta G_t$		K_A*10^4		K_{ex}		$-\Delta G_{ex}$	
		Zn(II)	Co(II)	Zn(II)	Co(II)	Zn(II)	Co(II)	Zn(II) $*10^9$	Co(II) $*10^8$	Zn(II)	Co(II)
NB	35.74	2.69	15.67	0.04	0.03	6.04	9.82	1.19	144.38	47.23	52.87
1,2-DCE	10.65	3.76	11.82	0.22	0.20	7.78	7.56	2.31	82.19	48.73	51.59
BB	5.400	4.88	13.97	0.47	0.43	9.61	8.82	3.89	114.80	49.91	52.35
C	4.806	8.30	13.33	0.53	0.49	15.20	8.44	11.26	104.47	52.31	52.14
B	2.804	2.37	14.65	0.93	0.86	5.51	9.21	0.92	125.82	46.65	52.56
T	2.438	1.57	18.23	1.08	0.99	4.21	11.33	0.40	195.51	44.79	53.56

Theresultsdemonstratethereisnotanylinearrelationbetweendielectricconstantfororganicsolventsanddistributionratio(D)aswellabsorbanceofcomplexextractedintotheorganicphase,thatismeanthereisnotanyeffectofpolarityanddielectricconstantoforganicsolventonextractionefficiency,butthereisaneffectoforganicsolventstructureonextractionefficiencyandparticipatetheionpaircomplexextracted.

EffectofTemperature

Extracted20µgZn^{2+}or50µgCo^{2+}accordingtooniumsystematoptimumconditionsexcepttemperature(5-45°C)andaccordingtothemainproceduredetailedateachtemperature.TheresultswereasinFigures(13,14):

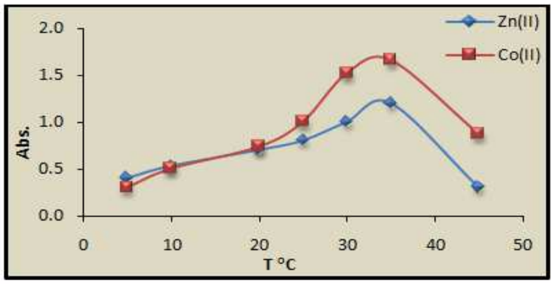


Figure 13:Absorbance=f[T°C]

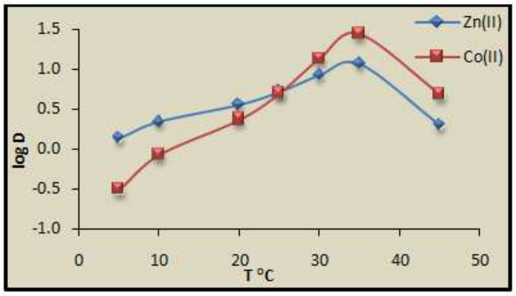


Figure 14:D=f[T°C]

TheresultsinFigures(13,14)demonstratethat(35°C)wastheoptimumtemperatureforeachions.AndcalculateextractionconstantK$_{ex}$fromdistributionratioaccordingtorelationbelow:

$$K_{ex} = \frac{D}{[M^{2+}]_{aq.}[2,4-DMP]_{org.}}$$ WhereM^{2+}=Zn^{2+},Co^{2+}

TheresultswereasinFigure15:

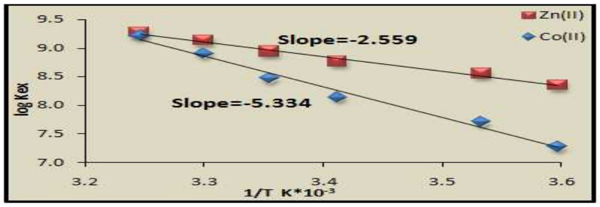


Figure15:ExtractionConstantKEXasaFunctionofTemperature

FromtheslopeofstraightlinerelationsinFigure15andmathematicalthermodynamicrelationsdeterminethermodynamic data:

Table3:ThermodynamicData

M^{2+}	ΔH_{ex} KJ.mol^{-1}	ΔG_{ex} KJ.mol^{-1}	ΔS_{ex} J.mol^{-1}.K^{-1}
Zn^{2+}	0.049	-53.79	177.68
Co^{2+}	0.102	-53.41	176.60

Theresultsshowextractionaccordingtooniumsystemisendothermicbehavioraswellasthehighvalueofentropyreflectthedependenceofoniumsystemmethodonentropicregiontoformoniumspecieswithhighstabilityextractedtoorganicphase.

EffectofInterferences

ExtractionZn^{2+}andCo^{2+}atoptimumconditionsandinpresenceofmanyanionsasinterferencesaccordingtothemainmethoddetailed,theresultswereasinTable4:

Table4:InterferencesEffect

Electrolytesalt	Zn(II)			Co(II)		
	D	%E	Abs.	D	%E	Abs.
$KMnO_4$	2.70	73.00	0.069	3.03	75.20	0.76
$Na_2C_2O_4$	1.94	66.00	0.031	3.17	76.04	0.87
Table 4: Contd.,						
KH_2PO_4	1.53	60.50	0.045	2.45	71.00	0.72

tartrate	2.70	73.00	0.081	3.17	76.00	0.801
picrate	3.08	75.50	0.033	1.87	65.20	0.55
$K_2Cr_2O_2$	4.13	80.50	0.070	2.01	66.80	0.68

Theresultsdemonstratethereisinterferenceforallanionsusedindifferentactivity.

EffectofElectrolyte

ExtractionZn^{2+}andCo^{2+}atoptimumconditionsforeachanalyzemetalioninpresencedifferentelectrolytes,accordingtothe mainproceduredetailed,theresultswereinTable5:

Table5:EffectofElectrolyte

Electrolytesalt	Zn(II)			Co(II)		
	D	%E	Abs.	D	%E	Abs.
LiCl	99.00	99.00	0.282	61.50	98.40	1.34
NaCl	22.81	95.80	0.193	58.52	98.32	1.25
KCl	19.20	95.05	0.123	49.51	98.02	1.11
RbCl	13.29	93.00	0.155	34.71	97.20	0.86
CsCl	10.56	91.35	0.131	27.90	96.54	0.75
$MgCl_2$	27.57	96.50	0.142	50.02	98.04	1.2
$CaCl_2$	18.05	94.75	0.126	46.62	97.90	0.903
$SrCl_2$	12.16	92.40	0.112	31.89	96.96	0.82
$BaCl_2$	9.58	90.55	0.101	25.45	96.22	0.74

TheresultsshowpresenceelectrolytesaltsinaqueoussolutioneffecttoincreaseextractionefficiencyandthisincreasingappearasafunctiontotheionicdiameterandchargedensityofcationandaccordingtothisphenomenaLiClgivinghigherextractionbecauseLi^{+}hassmallerionicdiameterandhigherchargedensity,whichiseffecttomoredestroyedhydrationshellofZn^{2+}orCo^{2+}bypullingmorewatermoleculestoitshydrationshell.

EffectofMethanol

Extracted20µgZn^{2+}or50µgCo^{2+}eachonealonefromaqueoussolutions,containoptimumconcentrationofHClandinpresencedifferentpercentageofmethanol(5%-50%)andshakingthesesolutionsfor5min.andthenadded5mLorganicsolutionof2,4-DMPdissolvedinchloroformat1×10^{-4}Mconcentrationandshakingfor10min.,afterwardsseparateaqueousphasefromorganicphase,thenmeasuretheabsorbanceoforganicphaseatλ_{max}=262nmforZn^{2+}andλ_{max}=243nmforCo^{2+}againstblankpreparedatthesamemannerwithoutmetalion,butaqueousphasetreatedbyspectrophotometricmethod[14]foreachionandcalculatedistributionratioDvaluesforeachionaccordingtoproceduredetailedinthemainmethod.TheresultswereasinFigures(16,17).

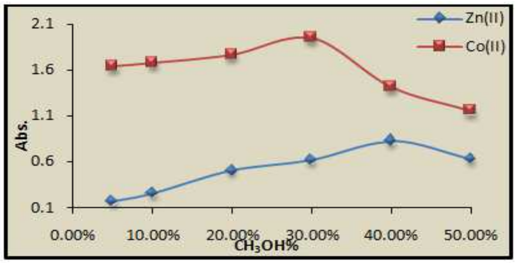


Figure16:EffectofMethanolonExtractionEfficiency

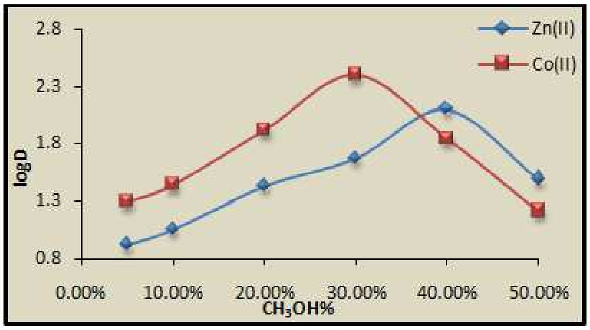
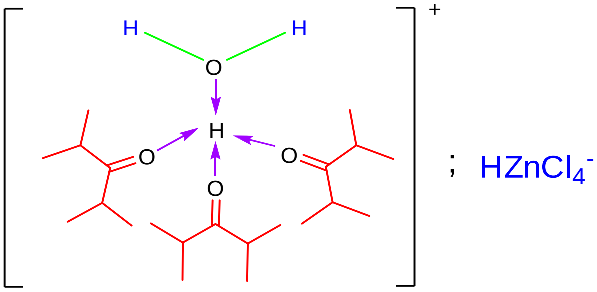
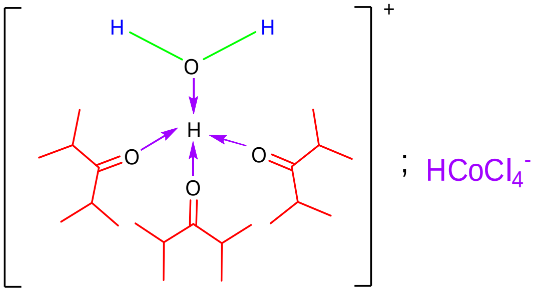


Figure17:EffectofMethanolonFormationand PartitionComplexintoOrganicPhase

Theresultsshowenhancementinextractionefficiencyinpresencemethanolinaqueoussolutionaswellasthisenhancement increasebyincreasingmethanol,tillreachedoptimumpercentageofmethanolinaqueoussolutionswhichis40%withZn^{2+}and30%withCo^{2+},themethanolhelptodestroyhydrationshellofmetalionandincreaseformationsexmetalionwhichincreaseformationonium productandthiseffectincreasewithincreaseconcentrationofCH_3OHtillreachedoptimumanyconcentrationofmethanolmorethan optimumdecreaseextractionefficiencybecauseeffecttopartition2,4-DMPtotheaqueousphasebyreasonofdeclinepolarityofwater.

ThesuggestedstructureofoniumspeciesextractedforZn^{2+}andCo^{2+}suchasbelow:





SpectrophotometricDetermination

ForspectrophotometricdeterminationanalytemetalionsweareneedtopreparingcalibrationcurvebyapplicationthefundamentalmethodatoptimumconditionforaqueoussolutioncontaindifferentconcentrationsofanalytemetalionZn^{2+},Co^{2+}.Theresults intheFigures(18,19):

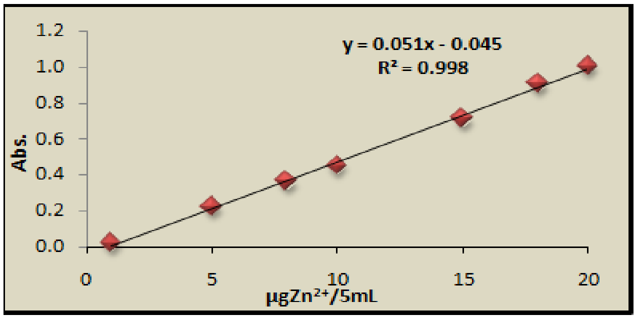


Figure18:CalibrationcurveforspectrophotometricdeterminationofZn^{2+}

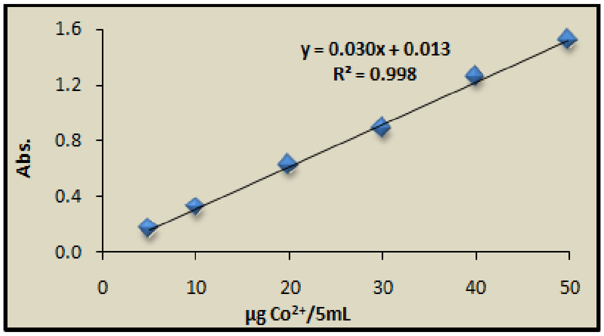


Figure19:CalibrationCurveforSpectrophotometricDeterminationofCo^{2+}

ThismethodusedforspectrophotometricdeterminationofZn^{2+},Co^{2+}ionsindifferentsamples,wheresamplessolutionpreparedaccordingtowetdigestionmethod[15],andaqueoussolutionofsampletreatedasfundamentalmethodforextractionandusedthesuitablemaskingagentforeachion.TheresultswereasinTable6:

Table6:Applications

Samplename	Zn(II) ppm	%RSD	Co(II) ppm	%RSD
Al-SalamValley	112.11	0.63	45.62	0.15
AgriculturesoilAl-Shwati	182.23	0.39	26.00	0.27
AgriculturesoilAl-Mishkhab	175.09	0.40	30.47	0.23
NonagriculturesoilAl-Mishkhab	135.00	0.52	55.77	0.13
Whitemeatofchicken(breast)	26.60	0.27	0.08	0.12
Cowmeat(beef)	35.24	0.20	0.07	0.14
ChickenLivers	21.33	0.34	0.52	0.19
FarmsFish	42.91	0.17	0.43	0.23
Gardencress	22.01	0.32	0.02	0.50
Leek	20.00	0.35	0.09	0.11
Celery	51.16	0.14	0.11	0.09

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