

CHAPTER-2

LITERATURE SURVEY

2.1 Hydrazones as spectrophotometric reagents- A brief review

Analytical and Biological applications of hydrazones have been reviewed by Lakshmi Narayana Suvarapu et al². Analytical applications of Hydrazones were reviewed by Singh et al³. D.Vijaya Kumari et al⁴ have reported Hydrazones act as an analytical reagents for catalytic spectrophotometric determination of Hg(II). S.Vidyasagar Babu et al⁵ have reported 2-acetylpyridine thiosemicarbazone was used for the spectrophotometric determination of Hg(II) in Environmental samples. D.Nagarjuna Reddy et al⁶ have reported 3-methoxythiophene-2-carboxaldehyde thiosemicarbazone (3-MTAT) is used for spectrophotometric determination of trace amounts of Cadmium (II) in Environmental and Biological samples. A brief review on spectrophotometric determination of metal ions with different reagents is presented in Table 2.1.

Table 2.1: A review on Spectrophotometric determination of metals with different reagents

Name of the analytical reagents	Metal ion determined	Reference
2-hydroxy 1-naphthaldehyde Isonicotinoyl hydrazone	Hg(II)	4
2-Acetylpyridinethiosemicarbozone	Hg(II)	5
3-methylthiophene-2-carboxaldehyde thiosemicarbazone	Cd(II)	6
Diacetyl Monoxime Isonicotinoyl hydrazone	Hg(II)	7
3,4-Dihydroxy Benzaldehyde Thiosemicarbazone	Hg(II)	8
2,4-Dimethoxybenzaldehyde isonicotinoyl hydrazone	Hg(II)	9
N ² -(1-(pyridine-2-ylethylidene)IsonicotinHydrazide	Hg(II)	10
Diacetylmonoxime Benzoylhydrazone	Hg(II)	11
4-Hydroxy-3,5-DimethoxyBenzaldehyde 4-Hydroxy Benzoyl Hydrazone	Hg(II)	12

2,4-dihydroxypropiophnone benzoic acid hydrazone	Hg(II)	13
P-isopropyl acetophenone phenyl hydrazone	Hg(II)	14
Cinnamaldehyde-4-hydroxybenzoyl hydrazone	Cd(II)	15
2,2-Diquinolyl-2-quinolhydrazone	Cd(II)	16
4-Hydroxy-3,5-dimethoxybenzaldehyde-4-hydroxy benzoyl hydrazone	Cd(II)	17
5-(2-carbomethoxyphenyl)azo-quinolyl	Cd(II)	18
Cinnamaldehyde-4-hydroxybenzoyl hydrazone	Cd(II)	19
Cinnamaldehyde thiosemicarbazone	Cd(II)	20
2-Hydroxy-1-naphthaldehyde Isonicotinoyl hydrazone	Fe(III), Fe(II), Al(III), U(VI)	21-23
Beta-cyclodextrin-o-vanillifurfuralhydrazone	Cd(II)	24
2,2-Dipyridyl ketonehydrazone	Cu(II), Hg(II)	25
Picolinaldehyde-4-nitrophenylhydrazone	Pd(II)	26
Bisacetylazine hydrazone	Cu(I)	27
Pyridine-2-carboxaldehyde-2-Hydroxybenzoyl hydrazone	Zn(II), V(V), Ni(II)	28-30
Benzil quinolyl hydrazone	Cu(II)	31
Benzothiazole-2-aldehydequinolylhydrazone	Cu(II), Pd(II)	32,33
2,2'-Bipyridyl-2-pyrimidylhydrazone	V(V), Zn(II), Fe(II), Ni(II), Cu(II), Cd(II), Rh(III)	34-37
Diacetyl-bis(2-pyridyl)hydrazone	Co(II)	38
Diacetylmonoxime p-Nitro phenol hydrazone	Co(II)	39
Biacetyl(monohydrazone)quinolyl hydrazone	Co(II), Cu(II)	40
Pyridoin phenyl hydrazone	Cu(II), Pd(II)	41,42
2,2'-Pyridyl bis-quinolyl hydrazone	Cu(II), Zn(II), Cd(II), Rh(III), Hg(II), Co(II), Pd(II)	43,44
Di-2-pyridylketone-2-furancarbothiohydrazone	Cu(II), Ni(II), Cd(II), Fe(II), Re(VII)	45
5-Chloro-thiophene-2-aldehyde-2-benzothiazoyl hydrazone	Co(II), Cu(II)	46
Dibenzylidene-thio carbonylhydrazone	Ru(III)	47
6-Methyl-2-pyridaldehyde-2-quinolylhydrazone	Cu(II)	48
Bis(isonicotinoylhydrazone)	Bi(III), Zr(IV)	49-50
Pyruvaldehyde-2-benzothiazoyl hydrazone	Cd(II)	51

Monohydrazone quinolyl hydrazone	Zn(II), Cd(II), Hg(II), Rh(III), Pd(II), Fe(II), Co(II), Ni(II)	52-56
Benzil bis(2hydroxy)benzoyl hydrazone	Ti(IV)	57
Salicyladehyde hydrazone	Cu(II), Fe(III), Co(II), Pd(II), Os(VIII)	58-60
Ortho hydroxy acetophenone Isonicotinoylhydrazone	V(IV)	61
2,2'-Dipyridyl-2-benzothiazoyl hydrazone	Fe(II)	62
Diphenylglyoxalbis (2-hydroxy benzoyl hydrazone)	Ca(II)	63
Di-2-pyridylketone benzoyl hydrazone	Fe(II)	64
2-Aceto-1 naphthal-N-salicyhydrazone	Mn(II)	65
2,4-Dihydroxy acetophenone Isonicotinoyl hydrazone	Mo(VI), Al(III), Ni(II), V(V), Hg(II), Ag(I), Mn(II), Co(II)	66-69
2,6-Diacetylpyridinebis(benzylhydrazone) and 2,6-diacetylpyridine bis(2-hydroxybenzoyl) hydrazone	Fe(II), V(V)	70
2,2'-Bipiridyl-2-pyridylhydrazone	Pd(II)	71
2-Pyridyl-3sulphophenymethanone-2- pyrimidylhydrazone	Fe(II)	72
2,2'-Bipyridyl phenol hydrazone	Pd(II)	73
Di-2-pyridyl ketonebenzoyl hydrazone	Pd(II)	74
Thiazole-2-carbaldehyde2quinoylhydrazone	Pd(II)	75
Biacetyl mono2-pyridyl hydrazone	Zn(II)	76
1-(2-Pyridylmethylidene)-5- Salicylidenethiocarbohydrazone	Pd(II)	77
4-Dimethylaminobenzaldehyde Isonicotinoyl hydrazone	Sb(III)	78
Benzyl-2-pyridylketone-2-quinoly hydrazone	Hg(II)	79
2-Thiophenadehyde-2-pyridyl hydrazone	Cu(II)	80
Di-2-pridylketone2-furoyl hydrazone	Ga(III)	81
Di-2-pyridymethanone-1-phthalazinyhydrazone	Ni(II)	82
2,2'-Pyridyl bis(2-quinolyhydrazone)	Zn(II), Cd(II)	83
Salicilaldehyde carbohydrazone	Zn(II)	84
2,6-Diacetylpyridinebis(benzoylhydrazone)	U(VI)	85

Salicylaldehyde guanoylhydrazone	Mn(II)	86
Di-2-pyridylketone benzoyl hydrazone	Fe(II), Fe(III)	87
2-Pyridinecarbaldehyde-2-(5-nitropyridyl) hydrazone	Ni(II)	88
2-Hydroxy-1-naphthaldehyde guanoyl hydrazone	Ce(IV)	89
2-Oximinodimedone monoGuanoyl hydrazone	Fe(III)	90
2-Hydroxy-1-naphthaldehyde Isonicotinoyl hydrazone	Th(IV), U(VI)	91
Pyridine-2-carboxaldehyde Isonicotinoyl hydrazone	Zn(II)	92
2,6-Diactalpyridine bis(arylhydrazone)	U(VI)	93
3,5-Dichlorosalicylaldehyde-2-Benzothiazoyl hydrazone	V(V)	94
N-Cyanoacetaldehyde hydrazone	Mo(VI)	95
1,2-Cyclohexanedione bis benzoyl hydrazone)	Ti(IV)	96
Di-2-pyridylketone-2pyridylhydrazone	Pd(II)	97
2(3-Sulfobenzoyl) pyridinebenzoyl hydrazone	Fe(III)	98
Di-2-pyridylmethanone-2-(5-nitro) pyridylhydrazone	Pd(II)	99
1-[Di-(2-pyridyl)methylidene-5-(salicylidene) thiocarbohydrazone	Zn(II)	100
Salicylaldehyde-4-aminobenzoyl hydrazone	Ga(III)	101
5-Methylsalicylaldehyde guanoyl hydrazone	Fe(III)	102
3,4-Dihydroxybenzaldehyde guanoyl hydrazone	Fe(III), V(V)	103
1,2-Cyclohexanone-2-oxime-1-guanohydrazone	Cu(II)	104
Salicylaldehyde carbhydrazone	Ga(III), Al(III)	105
Bis(thiophene-2-aldehyde)thiocarbohydrazone	Ru(III), Ir(III)	106
2-Benzimidazolyl-3-sulphophenylmethanone-5-nitro-2-pyridylhydrazone	Co(II)	107
Di-2pyridyl ketone thiophenylhydrazone	U(VI)	108
Phenyl-2-picolylketone-2-pyridylhydrazone	Pd(II)	109
Pyridine-2-acetaldehyde salicyloylhydrazone	Ni(II)	110
2-Pyridinecarbaldehyde-3,5-dinitro-2-pyridyl hydrazone	Ni(II)	111
Pyridine-2-acetaldehyde salicyloylhydrazone	Pb(II)	112

Isoniazid-P-diethylaminosalicylaldehyde hydrazone	Fe(II)	113
Di-2-pyridylketone benzoylhydrazone	Ni(II)	114
N,N-Oxalylbis(salicylaldehyde)hydrazone	Cu(II)	115
Res-acetophenone guanoyl hydrazone	Ru(III)	116
2-Pyridylketone benzoyl hydrazone	Fe(II), Fe(III)	117
Salicylaldehyde guanoyl hydrazone	Fe(II)	118
2-Hydroxy naphthaldehyde guanoylhydrazone	Cu(II)	119
Pyridine-2-acetaldehyde salicyloyl hydrazone	Pd(II)	120
2-Hydroxy acetophenone benzoylhydrazone	Mo(VI)	121
Resacetophenone guanoylhydrazone	Ag(I)	122
5-Chloro salicylaldehyde guanoyl hydrazone	Mn(II)	123
2,3-Dihydroxybenzaldehyde isonicotinoyl hydrazone,	Fe(II)	124
1-[Di-(2-pyridyl)methylidene-5-(salicylidene) thiocarbohydrazone	Bi(III)	125
1-(Phenyl-2-pyridyl)carbylidene-5-esorcyldenethiocarbohydrazone	Ga(III)	126
Di-2-pyridylmethanone-2-(5-nitro)Pyridylhydrazone	Fe(II)	127
2,2'-Dipyridylketone picolinol hydrazone	Ni(II), Co(II), Fe(II)	128
Disulfonated(2-benzimidazol)(phenyl) methanone-5-nitro-2-pyridylhydrazone	Ni(II)	129
Isoniazid-p-diethylaminosalicylaldehyde hydrazone	Fe(III)	130
5-Chlorosalicylaldehyde guanoylhydrazone	Pd(II)	131
Salicylaldehyde furfuralhydrazone	Pd(II)	132
5-Methyl salicylaldehyde guanoylhydrazone	Mn(II)	133
Di-2-pyridylketone benzyl hydrazone	Co(II)	134
Isoniazid-2-hydroxybenzaldehyde hydrazone in acetyl trimethylammonium bromide	Al(III)	135
2,4-Dihydroxy benzaldehyde isonicotinoyl hydrazone	Mo(VI)	136
Pyridoxal-4-hydroxybenzyl hydrazone	Zr(IV)	137
o-Hydroxypropiophenone isonicotinoyl hydrazone	U(VI)	138
p-methyl isonitrosoacetophenone hydrazone	Co(II)	139
2-Acetyl thiophene guanoylhydrazone	Pd(II)	140

Salicylaldehyde benzylhydrazone and 2-hydroxy-1-naphthaldehyde benzol hydrazone	Fe(II)	141
Difurfuraldehyde thiocarbohydrazone	Rh(III), Pd(II)	142
2-Hydroxyacetophenone benzoyl hydrazone	V(V)	143
2,4-Dihydroxybenzaldehyde isonicotinoyl hydrazone	Ti(IV)	144
2,4-Dihydroxyacetophenone benzoyl hydrazone	Mo(VI), V(V)	145
Glyoxal-bisisonicotinoyl hydrazone	U(VI), Fe(III)	146
2-Hydroxybenzaldehyde 5-nitro-pyridylhydrazone	Co(II)	147
Salicylaldehyde benzoylhydrazone	Ca(II), Mg(II)	148
2,4-Dihydroxyacetophenone benzoylhydrazone	V(V)	149
2,2'-Dipyridyl-2-pyridylhydrazone	Pd(II)	150
O-vanillin furoylhydrazone	Cd(II)	151
α -(-Benzimidazolyl)- α' , α'' -(N-5-nitro-2-pyridyl hydrazone)toluene	Cu(II)	152
Di-2-pyridylketone salicyloyl hydrazon	Zn(II)	153
2-Pyridylcarboxaldehyde isonicotinoyl hydrazone	Fe(II)	154
2-Hydroxy-1-naphthaldehyde benzoyl hydrazone	Cu(II), V(V)	155

2.2 Review on spectrophotometric determination of Mercury (II)

G. Chandra Sekhar Reddy et al⁷ have reported Diacetyl Monoxime Isonicotinoyl Hydrazone is used for the spectrophotometric determination of Hg (II) The complex show maximum absorbance at 351nm in acidic medium and molar absorptivity is $2.23 \times 10^4 \text{ L.mol}^{-1}\text{cm}^{-1}$. M.Mogalali raju et al⁸ have reported 3,4-dihydroxy Benzaldehyde thio semicarbazone (DHBTS) is used for the spectrophotometric determination of mercury(II) in presence of micelle medium the complex show maximum absorbance at 375nm, Beer's law in the range of 5.01 to 50.14 ng/ml and molar absorptivity of the complex found to be $3.25 \times 10^5 \text{ L.mol}^{-1}\text{cm}^{-1}$. K.Rama Krishna Reddy et al⁹ have reported the spectrophotometric determination of mercury(II) indifferent liver samples, soil samples and water samples by using 2,4-Dimethoxy benzaldehyde Isonicotinoyl hydrazone(DMBHIIH), the complex show maximum absorbance at 390 at pH 7.0-9.0. Beer's law obeyed range is 1.0029-5.0147 mg/ml and molar absorptivity and sandell's sensitivity for the complex found to be $2.8 \times 10^4 \text{ L.mol}^{-1}\text{cm}^{-1}$ and $0.00571 \mu\text{g.cm}^{-2}$ respectively. P. Nityananda Kumar Reddy et al¹⁰ have reported N-(1-(pyridine-2-yl)ethylidne) Isonicotinohydrazide is employed for the spectrophotometric determination of Hg(II) in environmental samples. K. Rama Krishna Reddy et al¹¹ is reported Diacetyl monoxime Benzoyl hydrazone(DMBM) is used for the spectrophotometric determination of Hg(II), D. Gopala Krishna et al¹² is reported for the spectrophotometric determination of Mercury(II)4-Hydroxy-3,5Dimethoxy Benzaldhyde 4-Hydroxy Benzoylhydrazone is used. A Raghavendra Guru Prasad et al¹³ have reported Resacetphenone benzoic acid hydrazone (2,4-dihydroxy propiophenone benxoichydrazone) is employed for the spectrophotometric determination of Mercury(II), D. Vijaya Kumari et al have reported 2hydroxy1-naptaldehyde Isonicotinolhydrazone (2-HNAINH) is used for the spectrophotometric determination of Mercury (II), Battula Sreenivasa Rao et al¹⁴ have reported Isonitriso P-Isopropyl Acetophenone phenyl Hydrazone is employed for the spectrophotometric determination of Mercury(II), S.Vidya sagar Babu et al have reported 2-Acetylpyridine Thiosemicarbazone is employed for the spectrophotometric determination of Hg(II),the complex shows the maximum absorptivity at 351 nm in

acidic medium, Beer's law range is 0.240-2.407 $\mu\text{g/ml}$, Molar absorptivity and Sandell's sensitivity are $5.4 \times 10^4 \text{ lit.mole}^{-1}.\text{cm}^{-1}$ and $0.0037 \mu\text{g/cm}^2$ respectively.

2.3 Review on spectrophotometric determination of Cadmium (II)

Dr.G.Gopala Krishna et al¹⁵ have reported Cinnamaldehyde thiosemicarbazone is used for the spectrophotometric determination of Cadmium (II) in the presence of Micellar medium samples. The complex show the maximum absorbance at 420nm in basic medium, Beer's law range of $0.168\text{-}10686\mu\text{g.ml}^{-1}$, molar absorptivity and sandell's sensitivity for the complex found to be $3.88 \times 10^4 \text{ L.mol}^{-1}\text{cm}^{-1}$ and $0.0028 \mu\text{g.cm}^{-2}$. D.Nagarjuna reddy et al⁶ has reported 3-methylthiophene-2-carboxaldehyde thiosemicarbazone is employed for the spectrophotometric determination of Cadmium (II) in Environmental and Biological samples. At 360nm the complex show the maximum absorbance in acidic medium, Beer's law range of $0.2248\text{-}2.2482 \mu\text{g/ml}$, molar absorptivity and sandell's sensitivity for the complex found to be $4.0 \times 10^4 \text{ L.mol}^{-1}\text{cm}^{-1}$ and $0.0029 \mu\text{g/cm}^2$. Makoto Otomo et al¹⁶ have reported 2,2-Diquinoyl-2-quinolyldiazine is employed for the spectrophotometric determination of Cd (II). D. Gopal Krishna et al¹⁷ have reported 4-Hydroxy 3,5 dimethoxy benzaldehyde 4-hydroxy benzoyl hydrazone is used for the spectrophotometric determination of Cadmium(II). R.Saran et al¹⁸ have reported 5-(2-carboxyethoxy-Phenyl) azo-8-quinolinol is employed for the spectrophotometric determination of Cadmium(II) in the presence of dodecylsulphate as surfactant, D. Gopala Krishna et al¹⁹ have reported Cinnamaldehyde-4-Hydroxy Benzoylhydrazone is employed for the spectrophotometric determination of Cd(II) in the presence of Micellar medium in Biological samples, Sunil Kulkarni et al have reported a review on spectrophotometric determination of Heavy metals with emphasis on Cadmium and Nickel determination by U.V spectrophotometry. Dr.D. Gopala Krishna et al²⁰ have reported Cinnamaldehyde thiosemicarbazone is employed for spectrophotometric determination of Cadmium(II),in basic medium the complex show the maximum absorbance at 420 nm, Beer's law range is $0.168\text{-}1.686 \mu\text{g.ml}^{-1}$, molar absorptivity and sandell's sensitivity for the complex found to be $3.88 \times 10^4 \text{ L.mol}^{-1}\text{cm}^{-1}$ and $0.0028\mu\text{g.cm}^{-2}$ respectively.