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POTENTIOMETRIC AND THERMODYNAMIC STUDY OF Ni(II) COMPLEXES OF THIOGLYCOLIC ACID IN 40% ACETONE MEDIUM

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ABSTRACT

Nickel complexes of Thioglycolic acid have been investigated by potentiometric technique in 40% V/V acetone. It was found that nickel forms colourless 1:2 complexes. The stability constant of the compexes formed have been determined by applying Calvin and Melchior's extension of Bjerrum's method at three different temperature. The values of log K_1, log K_2 at 25º C, 30º C and 35º C have been found to be 8.08, 6.55, at 298 K, 8.28, 6.64 at 303 K, and 8.57, 6.87 at 308 K, in 40% acetone medium respectively. The values of overall changes in ΔG, ΔH and ΔS, at three different temperature accompanying the reaction have also been evaluated at 303 K and the values of ΔG_1, ΔG_2, ΔH, ΔS_1, ΔS_2 are found to be –48.03 KJ mol-1 – 38.52 KJ mol^{-1} and –0.14360 KJ mol^{-1} +158.040 J/K, +126.654 J/K in 40% acetone medium.

Keywords: *Nickel Complexes, Thioglycolic Acid, Potentiometric Technique, Acetone Medium.*

Introduction

There is no reference in the literature regarding the complexing tendency of thioglycolic acid with nickel ion in 40% aqueous-acetone medium. Hence the present investigation has been initiated. The composition and stability constant of the complexes have been studied by potentiometric method. The value of thermodynamic parameters ΔG, ΔH, and ΔS have also been calculated.

Methodology Materials

Thioglycolic acid S.D. fine A.R. (B.D.H) reagents $Ni(NO_3)_2$ etc. were used and their solutions were prepared in doubly distilled air free conductivity water. Freshly prepared solutions of the regents were always used to avoid the effect of ageing.

Equipments

A Systronics – 335 digital pH meter was used for measurements. A saturated calomel electrode and a wide range glass electrode were used for pH measurements and calibrated by using several buffer solutions of pH 4.0, 7.0 and 9.2. Thus the reading gave immediately concentration and not activities of $[H^+]$.

Procedure

Potentiometric Studies

The experimental procedure is similar to that described earlier. A series of potentiometric titration of thioglycolic acid with standard NaOH in the absence and presence of Ni^{+2} at various ligands to metal ratios viz, 1:1, 2:1,3:1 etc. were performed. Titrations were also carried out at different temperatures in 40% acetone. For calculating the values of ΔG, ΔH, and ΔS accompanying the reaction, all the pH titration were performed in 40% V/V acetone. in 0.1 M KNO_3. The results of various titration have been recorded and the relevant curves have been given.

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The values of $\bar{n}$ and free ligand concentration [A] calculated from the titrations of ligand in the absence and presence of nickel ion at rations 5:1 with standard NaOH have also seen tabulated together with the other results obtained.

The experimental observation and the results obtained have been tabulated on the following pages.

Determination of Stoichiometry Potentiometric Titration of TGA in Presence of Ni^{2+} at Ratios (1) 1:0 (2) 1:1 (3) 2:1 (4) 3:1 IN 40% V/V Acetone Medium with 0.1 M NaOH

- **M NaOH V/S $1X10^{-3}$ M TGA +0.1 M KNO_3 (1:0)**

Table 1

S. No.	Mole of NaOH per Mole of Ligand	pH
1	0.00	4.52
2	0.20	4.72
3	0.40	4.90
4	0.60	5.14
5	0.80	5.38
6	0.90	5.52
7	0.95	5.60
8	1.00	7.10
9	1.05	9.26
10	1.10	9.50
11	1.20	10.14
12	1.40	10.56
13	1.60	10.90
14	1.80	11.30
15	2.00	11.52

- **M NaOH V/S $1x10^{-3}$ M TGA +0.1 M KNO_3 + $1x10^{-3}$M (Ni^{2+}) (1:1)**

Table 2

S. No.	Mole of NaOH per Mole of Ligand	pH
1	0.00	4.10
2	0.20	4.26
3	0.40	4.48
4	0.60	4.65
5	0.80	4.98
6	1.00	5.26
7	1.20	5.55
8	1.40	5.90
9	1.60	6.10
10	1.80	6.42
11	2.00	7.40
12	2.20	8.36
13	2.40	8.70
14	2.60	8.92
15	2.80	9.15
16	2.90	9.36
17	2.95	9.80
18	3.00	10.18
19	3.10	10.60
20	3.20	10.95

- **M NaOH V/S $1x10^{-3}$ M TGA +0.1 M KNO_3 + $5x10^{-4}$ M (Ni^{2+}) (2:1)**

Table 3

S. No.	Mole of NaOH per Mole of Ligand	pH
1	0.00	4.20
2	0.20	4.38
3	0.40	4.60
4	0.60	4.82
5	0.80	5.10
6	1.00	5.35
7	1.20	5.70
8	1.40	6.16
9	1.50	6.65
10	1.60	6.88
11	1.80	7.32
12	2.00	9.30
13	2.10	9.55
14	2.20	9.74
15	2.40	10.05
16	2.60	10.38
17	2.80	10.45
18	3.00	10.80

- **0.1 M NaOH V/S $1x10^{-3}$ M TGA +0.1 M KNO_3 + $3.33x10^{-4}$ M (Ni^{2+}) (3:1)**

Table 4

S. No.	Mole of NaOH per Mole of Ligand	pH
1	0.00	4.30
2	0.20	4.52
3	0.40	4.74
4	0.60	4.90
5	0.80	5.16
6	1.00	5.48
7	1.20	6.00
8	1.40	6.72
9	1.50	7.02
10	1.60	8.00
11	1.65	9.04
12	1.70	9.32
13	1.80	9.50
14	2.00	10.00
15	2.20	10.36
16	2.40	10.75

Determination of Stability Constant Potentiometric Titration of TGA in the Presence of Ni^{2+} at Ratios (1) 1:0 (2) 5:1 with 0.2 M NaOH in 40% Acetone

Temperature – 25ºC

- **0.2 M NaOH V/S 01. M KNO_3 + $2x10^{-3}$ M TGA + $4x10^{-3}$ M $HClO_4$ (1:0)**
- **0.2 M NaOH V/S 01. M KNO_3 + $2x10^{-3}$ M TGA + $4x10^{-3}$ M $HClO_4$ + $4x10^{-4}$ M (Ni^{2+}) (5:1)**

Table 5

S. No.	Mole of NaOH per Mole of Ligand	pH	
		Curve 1 (1:0)	Curve 2 (5:1)
1	0.00	3.40	3.40
2	0.20	3.45	3.45
3	0.40	3.55	3.55
4	0.60	3.61	3.61

5	0.80	3.70	3.70
6	1.00	3.81	3.81
7	1.20	3.96	3.96
8	1.40	4.12	4.12
9	1.60	4.22	4.22
10	1.80	4.36	4.36
11	2.00	4.52	4.52
12	2.20	4.60	4.55
13	2.40	4.90	4.72
14	2.60	5.12	4.86
15	2.80	5.48	5.12
16	2.90	6.08	-
17	3.00	8.42	5.30
18	3.10	9.06	5.40
19	3.20	9.36	5.52
20	3.30		5.71
21	3.40	9.74	6.00
22	3.50		6.30
23	3.60	10.04	8.76

Temperature – 30ºC

- **0.2 M NaOH V/S 01. M KNO_3 + $4x10^{-3}$ M $HClO_4$ + $2x10^{-3}$ M TGA (1:0)**
- **0.2 M NaOH V/S 01. M KNO_3 + $4x10^{-3}$ M $HClO_4$ + $2x10^{-3}$ M TGA + $4x10^{-4}$ M (Ni^{2+}) (5:1)**

Table 6 (Curve -1,2)

S. No.	Mole of NaOH per Mole of Ligand	pH	
		Curve 1 (1:0)	Curve 2 (5:1)
1	0.00	3.75	3.75
2	0.20	3.80	3.80
3	0.40	3.85	3.85
4	0.80	3.92	3.92
5	1.00	4.01	4.01
6	1.20	4.06	4.06
7	1.60	4.22	4.22
8	1.80	4.31	4.31
9	1.90		4.36
10	2.00	4.45	4.42
11	2.20	4.58	4.55
12	2.40	4.86	4.67
13	2.60	5.08	4.81
14	2.80	5.42	5.06
15	2.90	6.56	5.27
16	3.00	8.63	5.40
17	3.10	8.98	
18	3.20	9.20	6.03
19	3.40	9.70	6.75
20	3.50		7.62
21	3.60	10.03	8.41
22	3.70		9.02
23	3.80	10.18	9.54
24	3.90		9.92
25	4.00	10.20	10.10

Temperature – 35ºC

- **0.2 M NaOH V/S 01. M KNO_3 + $4x10^{-3}$ M $HClO_4$ + $2x10^{-3}$ M TGA (1:0)**
- **0.2 M NaOH V/S 01. M KNO_3 + $4x10^{-3}$ M $HClO_4$ + $2x10^{-3}$ M TGA + $4x10^{-4}$ M (Ni^{2+}) (5:1)**

Table 7 (Curve -1,2)

S. No.	Mole of NaOH per Mole of Ligand	pH	
		Curve 1 (1:0)	Curve 2 (5:1)
1	0.00	3.32	3.32
2	0.20	3.40	3.40
3	0.40	3.46	3.46
4	0.60	3.52	3.52
5	0.80	3.64	3.64
6	1.00	3.67	3.67
7	1.20	3.75	3.75
8	1.40	3.80	3.80
9	1.60	3.98	3.98
10	1.80	4.16	4.16
11	1.90		4.20
12	2.00	4.35	4.25
13	2.20	4.56	4.46
14	2.40	4.80	4.62
15	2.60	5.04	4.85
16	2.80	5.36	5.06
17	2.90	5.65	
18	3.00	7.80	5.37
19	3.10	8.74	5.51
20	3.20	9.00	5.76
21	3.30	9.48	6.02
22	3.40	9.65	6.57
21	3.50	9.80	7.54
22	3.60	10.02	8.57
23	3.70	10.10	9.00
24	3.80	10.16	9.66
25	3.90	10.25	10.01
26	4.00	10.32	10.20

Determination of Dissociation constant pKa_1 of TGA IN 40% Acetone from first Buffer Region
Temperature – 25ºC

Table 8

S. No.	Mole of NaOH per mole of ligand	Stoichiometric Concentration			$\frac{[HA]}{[A]}$	$\frac{\log[HA]}{[A]}$	$pKa_1 = pH + \log[HA]/[A]$
		pH	[HA]	[A]			
1	0.20	4.60	0.0016	0.0004	4.00	0.6021	5.2021
2	0.40	4.90	0.0012	0.0008	1.50	0.1761	5.0761
3	0.60	5.12	0.0008	0.0012	0.67	-0.1739	4.9461
4	0.80	5.48	0.0004	0.0016	0.25	-0.6021	4.8779

pKa_1 = 5.02055
Ka_1 = $0.793x10^{-5}$

Temperature – 30ºC

Table 9

S. No.	Mole of NaOH per mole of ligand	Stoichiometric Concentration			$\frac{[HA]}{[A]}$	$\frac{\log[HA]}{[A]}$	$pKa_1 = pH + \log[HA]/[A]$
		pH	[HA]	[A]			
1	0.20	4.58	0.0016	0.0004	4.00	0.6021	5.1821
2	0.40	4.86	0.0012	0.0008	1.50	0.1761	5.0261
3	0.60	5.08	0.0008	0.0012	0.67	-0.1739	4.9161
4	0.80	5.42	0.0004	0.0016	0.25	-0.6021	4.8379

$pKa_1 = 4.98555$

$Ka_1 = 1.03 \times 10^{-5}$

Temperature – 35ºC

Table 10

S. No.	Mole of NaOH per mole of ligand	Stoichiometric Concentration			$\frac{[HA]}{[A]}$	$\frac{\log[HA]}{[A]}$	$pKa_1 = pH + \log[HA]/[A]$
		pH	[HA]	[A]			
1	0.20	4.56	0.0016	0.0004	4.00	0.6021	5.1621
2	0.40	4.80	0.0012	0.0008	1.50	0.1761	5.9761
3	0.60	5.04	0.0008	0.0012	0.67	-0.1739	4.8661
4	0.80	5.36	0.0004	0.0016	0.25	-0.6021	4.7579

$pKa_1 = 4.93805$

$Ka_1 = 1.153 \times 10^{-5}$

Determination of pKa_2 from Second Buffer Region in 40% Acetone

Temperature – 25ºC

Table 11

S. No.	Mole of NaOH per mole of ligand	Stoichiometric Concentration			$\frac{[HA]}{[A]}$	$\frac{\log[HA]}{[A]}$	$pKa_1 = pH + \log[HA]/[A]$
		pH	[HA]	[A]			
1	0.20	9.36	0.0016	0.0004	4.00	0.6021	9.9621
2	0.40	9.74	0.0012	0.0008	1.50	0.1761	10.9161
3	0.60	10.04	0.0008	0.0012	0.67	-0.1739	9.8661
4	0.80	10.20	0.0004	0.0016	0.25	-0.6021	9.5979

$pKa_2 = 9.8555$

$Ka_2 = 1.460 \times 10^{-10}$

Temperature – 30ºC

Table 12

S. No.	Mole of NaOH per Mole of Ligand	Stoichiometric Concentration			$\frac{[HA]}{[A]}$	$\frac{\log[HA]}{[A]}$	$pKa_1 = pH + \log[HA]/[A]$
		pH	[HA]	[A]			
1	0.20	9.20	0.0016	0.0004	4.00	0.6021	9.8021
2	0.40	9.70	0.0012	0.0008	1.50	0.1761	9.8761
3	0.60	10.03	0.0008	0.0012	0.67	-0.1739	9.8561
4	0.80	10.18	0.0004	0.0016	0.25	-0.6021	9.5779

$pKa_2 = 9.77805$

$Ka_2 = 1.667 \times 10^{-10}$

Temperature – 35ºC

Table 13

S. No.	Mole of NaOH per mole of ligand	Stoichiometric Concentration			$\frac{[HA]}{[A]}$	$\frac{\log[HA]}{[A]}$	$pKa_1 = pH + \log[HA]/[A]$
		pH	[HA]	[A]			
1	0.20	9.00	0.0016	0.0004	4.00	0.6021	9.6021
2	0.40	9.65	0.0012	0.0008	1.50	0.1761	10.8261
3	0.60	10.02	0.0008	0.0012	0.67	-0.1739	9.8461
4	0.80	10.16	0.0004	0.0016	0.25	-0.6021	9.5579

$pKa_2 = 9.70805$

$Ka_2 = 1.958 \times 10^{-10}$

Summary of Dissociation Constant of Tga in 40% Acetone at Different Temperature

Temperature – 25ºC

Table 14

S. No.	Temperature	Dissociation Constants of TGA	
		Ka_1	Ka_2
1	25º C	0.793×10^{-5}	1.460×10^{-10}
2	30º C	1.03×10^{-5}	1.667×10^{-10}
3	35º C	1.153×10^{-5}	1.958×10^{-10}

Value of $\bar{n}$ and –log[A] at Different pH Value Corresponding to (Curve – 1,2) in 40% Acetone

Temperature – 25ºC

Table 15 (Curve -1)

S. No.	pH	Concentration of Ligand Bound x 10^{-3}	$\bar{n}$	–log[A]
1	4.5	0.05	0.125	8.74
2	4.6	0.10	0.250	8.57
3	4.7	0.15	0.375	8.41
4	4.8	0.20	0.500	8.25
5	5.0	0.22	0.562	7.94
6	5.4	0.25	0.625	7.36
7	5.5	0.27	0.687	7.24
8	5.6	0.30	0.750	7.12
9	5.7	0.40	1.000	7.05
10	5.8	0.45	1.125	6.67
11	6.0	0.50	1.250	7.01
12	6.2	0.60	1.500	6.52
13	6.5	0.62	1.562	6.21

Value of $\bar{n}$ and –log[A] at Different pH Value Corresponding to (CURVE -1,2), in 40% Acetone

Temperature – 30ºC

Table 16 (Curve -2)

S. No.	pH	Concentration of Ligand Bound x 10^{-3}	$\bar{n}$	–log[A]
1	4.4	0.05	0.125	8.77
2	4.5	0.10	0.250	8.60
3	4.6	0.20	0.500	8.45
4	5.0	0.25	0.625	7.82
5	5.2	0.30	0.750	7.55
6	5.4	0.32	0.812	7.29
7	5.5	0.35	0.875	7.17
8	5.6	0.40	1.000	7.06
9	5.7	0.45	1.125	6.96

10	5.8	0.50	1.250	6.86
11	6.0	0.60	1.500	6.64
12	6.5	0.62	1.562	6.15

Value of $\bar{n}$ and –log[A] at Different pH Value Corresponding to (CURVE -1, 2), in 40% Acetone Temperature – 35ºC

Table 17 (Curve -3)

S. No.	pH	Concentration of Ligand Bound x 10^{-3}	$\bar{n}$	–log[A]
1	4.20	0.10	0.250	9.04
2	4.40	0.15	0.375	8.68
3	4.50	0.20	0.500	8.52
4	4.60	0.25	0.625	8.36
5	4.80	0.30	0.750	8.05
6	5.00	0.35	0.875	7.76
7	5.20	0.40	1.000	7.49
8	5.40	0.45	1.125	7.24
9	5.50	0.50	1.250	7.13
10	5.60	0.55	1.375	7.03
11	5.70	0.60	1.500	6.93

Summary of log K_1, log K_2, K_1, K_2 & $[A]_{\bar{n}-1/2}$ $[A]_{\bar{n}-3/2}$ in 40% Acetone Different Temperature

Table 18

S. No.	Temp.	log K_1	log K_2	K_1	K_2	$[A]_{\bar{n}-1/2}$	$[A]_{\bar{n}-3/2}$
1	25ºC	8.25	6.52	$1.778x10^8$	$3.311x10^6$	$0.5528x10^{-8}$	$0.2997x10^{-6}$
2	30ºC	8.45	6.64	$2.818x10^8$	$4.365x10^6$	$0.3474x10^{-8}$	$2.129x10^{-7}$
3	35ºC	8.52	6.93	$3.311x10^8$	$8.511x10^6$	$0.2978x10^{-8}$	$1.1725x10^{-7}$

Determination of Stability Constant by Least Square Method in 40% Acetone at Different Temperature

Temperature – 25ºC

Table 19

S. No.	pH	$\bar{n}$	[A]	$Y = \frac{\bar{n}}{(\bar{n}-1)[A]}$	$X = \frac{(2-\bar{n})[A]}{(\bar{n}-1)}$	X^2x10^{-16}	XY
1	4.6	0.25	$0.583x10^{-8}$	$1.258x10^{8}$	$0.618x10^{-8}$	0.3819	0.7774
2	4.7	0.378	$1.162x10^{-8}$	$-1.558x10^{8}$	$1.009x10^{-8}$	1.001	1.589
3	4.8	.050	$0.4157x10^{-7}$	$-1.808x10^{8}$	$1.6584x10^{-8}$	275.0	2.998
4	5.0	0.5625	$0.547x10^{-7}$	$-1.121x10^{8}$	$-3.764x10^{-8}$	14.16	4.219
5	5.5	0.6875	$1.190x10^{-7}$	$-3.863x10^{7}$	$-2.391x10^{-7}$	271.00	9.237
6	5.6	0.75	$1.94x10^{-7}$	$-3.997x10^{7}$	$-3.752x10^{-7}$	1408	14.99
7	5.8	1.125	$0.310x10^{-6}$	$18.90x10^{7}$	$3.332x10^{-7}$	1110	62.97
8	6.0	1.25	$0.488x10^{-6}$	$5.151x10^{7}$	$2.906x10^{-7}$	844.00	15.00
9	6.2	1.50	$0.577x10^{-6}$	$10.01x10^{7}$	$0.2997x10^{-6}$	898.00	2.997
10	6.5	1.5625	$1.129x10^{-6}$	$4.570x10^{6}$	$0.4727x10^{-6}$	2234	2.160

Σxy	=	116.907	a	=	5.6465×10^{7}
Σx	=	7.114×10^{-2}	b	=	2.2169×10^{14}
Σy	=	40.7054×10^{-7}	log K_1	=	7.75
Σx^2	=	7355.54×10^{-16}	log K_2	=	6.59
n	=	10	log β	=	14.34

Determination of Stability Constant by Least Square Method in 40% Acetone at Different Temperature

Temperature – 30ºC

Table 20

S. No.	pH	$\bar{n}$	[A]	$Y=\frac{\bar{n}}{(\bar{n}-1)[A]}$	$X=\frac{(2-\bar{n})[A]}{(\bar{n}-1)}$	X^2x10^{-16}	XY
1	4.50	0.25	$0.2461x10^{-8}$	$-1.355x10^{8}$	$-0.5741x10^{-8}$	0.3295	0.7779
2	4.60	0.50	$0.347x10^{-8}$	$-2.878x10^{8}$	$-1.042x10^{-8}$	1.0861	2.999
3	5.00	0.625	$1.481x10^{-8}$	$-1.125x10^{8}$	$-5.429x10^{-8}$	29.47	6.107
4	5.20	0.750	$0.2785x10^{-7}$	$-10.77x10^{7}$	$-1.3924x10^{-8}$	1938	14.99
5	5.40	0.8125	$0.5071x10^{-7}$	$-8.552x10^{7}$	$-3.211x10^{-7}$	10311	27.46
6	5.50	0.875	$0.6658x10^{-7}$	$-10.516x10^{7}$	$-5.992x10^{-7}$	3590	63.01
7	6.70	1.125	$1.085x10^{-7}$	$8.296x10^{7}$	$7.594x10^{-7}$	5966	62.99
8	6.00	1.50	$2.129x10^{-7}$	$1.409x10^{7}$	$2.129x10^{-7}$	4532	2.999

Σxy = 181.35 a = 0.899×10^{8}

Σx = 15.7713×10^{-8} b = 0.3649×10^{16}

Σy = -6.6323×10^{8} $\log K_1$ = 7.95

Σx^2 = 5357.64×10^{-16} $\log K_2$ = 6.61

n = 8 $\log \beta$ = 14.56

Determination of Stability Constant by Least Square Method in 40% Acetone at Different Temperature

Temperature – 35ºC

Table 21

S. No.	pH	$\bar{n}$	[A]	$Y=\frac{\bar{n}}{(\bar{n}-1)[A]}$	$X=\frac{(2-\bar{n})[A]}{(\bar{n}-1)}$	X^2x10^{-16}	XY
1	4.2	0.250	$0.0910x10^{-8}$	$-3.676x10^{8}$	$-0.2122x10^{-8}$	0.045	0.7800
2	4.9	0.375	$0.2043x10^{-8}$	$-2.938x10^{8}$	$-0.5310x10^{-8}$	0.2819	1.560
3	4.5	0.500	$0.2978x10^{-8}$	$-3.357x10^{8}$	$-0.8934x10^{-8}$	0.7981	2.999
4	4.6	0.625	$0.4296x10^{-8}$	$-3.879x10^{8}$	$-1.575x10^{-8}$	2.480	6.10
5	4.8	0.750	$0.8840x10^{-8}$	$-3.393x10^{8}$	$-4.42x10^{-8}$	19.53	14.99
6	5.0	0.875	$1.730x10^{-8}$	$-4.047x10^{8}$	$-15.56x10^{-8}$	242.11	62.97
7	5.4	1.125	$0.5666x10^{-7}$	$15.88x10^{7}$	$3.966x10^{-8}$	1572	62.98
8	5.5	1.250	$0.7292x10^{-7}$	$6.856x10^{7}$	$2.187x10^{-8}$	478	14.99
9	5.6	1.375	$0.9285x10^{-7}$	$3.94x10^{7}$	$1.547x10^{-7}$	239	6.095
10	5.7	1.500	$1.1725x10^{-7}$	$2.558x10^{7}$	$1.172x10^{-7}$	1373	2.997

Σxy = 176.46 a = 48.043×10^{7}

Σx = 11.191×10^{-7} b = 26.5196×10^{14}

Σy = -183.66×10^{7} $\log K_1$ = 8.68

Σx^2 = 3927.24×10^{-16} $\log K_2$ = 6.74

n = 10 $\log \beta$ = 15.42

Summary of Stability Constant Calculated by Least Square Method in 40% Acetone Medium at Different Temperature

Table 22

S. No.	Temp.	log K_1	log K_2	Log β
1	25º C	7.75	6.59	14.34
2	30º C	7.95	6.61	14.56
3	35º C	8.68	6.74	15.42

Summary of Stability Constant Calculated by Schroder's Convergence Formulas Method in 40% Acetone Medium at Different Temperature

Table 23

S. No.	Temp.	log K_1	log K_2	Log β
1	25º C	8.24	6.53	14.77
2	30º C	8.44	6.68	15.12
3	35º C	8.50	6.95	15.45

Summary of Stability Constant Calculated by Different Methods in 40% Acetone at Different Temperature

Table 24

S. No.	Method	25º C			30º C			35º C		
		log K_1	log K_2	log β	log K_1	log K_2	log β	log K_1	log K_2	log β
1	Extension of Bjerrum's	8.25	6.52	14.77	8.45	6.64	15.09	8.52	6.93	15
2	Least Square	7.75	6.59	14.34	7.95	6.61	14.56	8.68	6.74	15
3	Schroder's Convergence formula	8.24	6.53	14.77	8.44	6.68	15.12	8.50	6.95	15
	Mean Value	8.08	6.55	14.63	8.28	6.64	14.92	8.57	6.87	15

Conclusion

The study reveals the formation of two complex species (NiSA) and $[Ni(SA)_2]^{-2}$. The logarithms value of successive stability constant were found to be 8.08, 6.55 (at 25ºC), 8.28, 6.64 (at 30º C), 8.57, 6.87 (at 35º C) in 40% V/V Acetone medium. ΔG_1, ΔG_2, ΔH, ΔS_1, ΔS_2, evaluated at 30º C –48.03.

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