

CHAPTER III
EXPERIMENTAL TECHNIQUES FOR DETERMINING
CONDUCTIVITY AND SOLUBILITY

3.1 Preparation of Conductivity Solvents and Other Reagents

The measurement of the conductivities of non-aqueous solution is a straightforward matter, the main requirements being careful attention to the purity of materials and the exclusion of atmospheric moisture. Details of the methods employed in the preparation of reagents used in this thesis are given below.

3.1.1. Solvents

Conductivity water. The conductivity water was prepared by first double distilling the tap-water using "Double Distillation Water Still Model 3 DWS" (Figure 3.1) manufactured by James A Jobling Co.Ltd., following by deionisation through the "Elgastat" unit. The specific conductance of the water is usually between 0.55×10^{-6} and 0.95×10^{-6} mho.cm⁻¹

Acetic acid. Unless otherwise mentioned, glacial acetic acid was used as an electrolyte solvent. Except for anhydrous acetic acid, acetic acid used was BDH laboratory grade and BDH Analar grade and they were used without purification.

Anhydrous acetic acid. There are several methods used by former workers in preparation of the anhydrous acetic acid.⁽²¹⁾ In this work, the chromic oxide method is used. Acetic acid (BDH laboratory

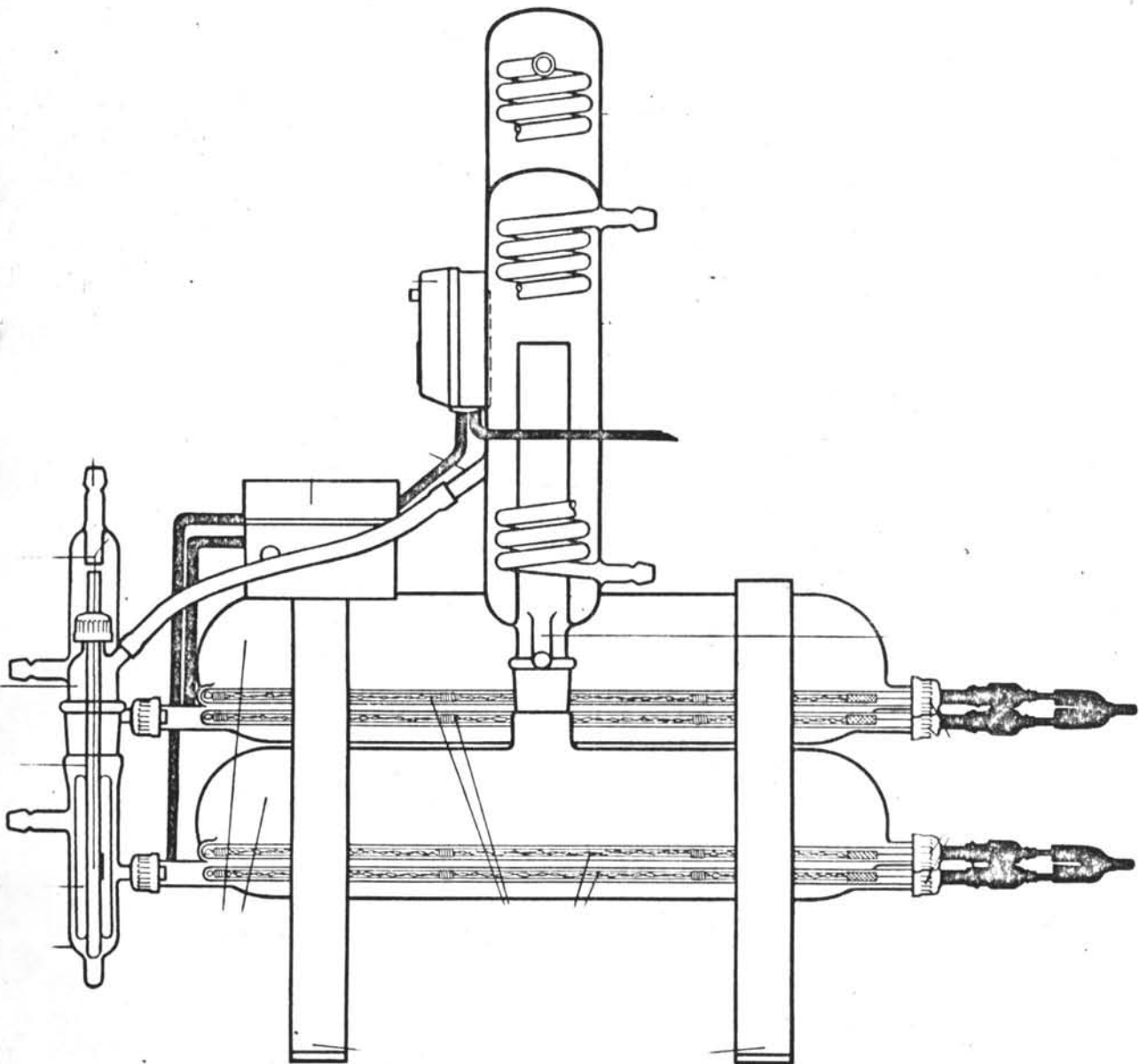


Fig. 3.1 Double Distillation Water Still 3 DWS

grade) was refluxed about ten hours with an amount of chromium trioxide slightly in excess of that calculated to react with the water present to form chromic acid it was then distilled rapidly using all-glass distilling apparatus, followed by a carefully fractional' with a 2 foot-Vigreux column. Freezing point and conductivity measurements were made on each fraction to ensure the purity of the acid. The freezing points and the specific conductance of the three fractions are shown in Table 3.1.

Table 3.1
The Freezing Point and Specific Conductance of
Anhydrous Acetic Acid

Fraction	Freezing Point (°C)	Specific Conductance at 25°C (mho.cm ⁻¹)
First	15.68 - 16.15	1.89 X 10 ⁻⁸ - 3.46 X 10 ⁻⁸
Second	16.00 - 16.45	1.15 X 10 ⁻⁸ - 1.53 X 10 ⁻⁸
Third	16.50 - 16.60	0.77 X 10 ⁻⁸ - 1.15 X 10 ⁻⁸

The third fraction (about one half of material) was retained and used in the conductivity measurement. The best literature values of some of physical properties of acetic acid (glacial) are shown in Table 3.2

Table 3.2

Physical Properties of Glacial Acetic Acid

Molecular weight	60.05	Reference 22
Boiling point	118.5°C	Reference 22
Freezing point	16.604°C	Reference 22
Viscosity	1.155 c.p. at 25°C	Reference 22
Specific conductance	1.12 X 10 ⁻⁸ mho.cm ⁻¹ at 25°C	Reference 23
Specific gravity	1.048 at 25°C	Reference 24
Dielectric constant (100% acid)	6.21 at 25°C	Reference 3

The freezing temperatures of several concentrations of acetic acid are shown in Table 3.3.⁽²⁴⁾

Table 3.3

The Freezing Temperatures of Acetic Acid at Various Concentrations

Freezing Temperature (°C)	Per Cent CH ₃ COOH	Freezing Temperature (°C)	Per Cent CH ₃ COOH
11.80	97.0	15.10	99.2
12.50	97.5	15.65	99.5
13.25	98.0	16.05	99.7
14.00	98.5	16.57	99.9
14.80	99.0	16.75	100.0

Whenever various concentrations of acid were used, the dilution method was employed. The exact concentrations were subsequently determined by the method of titration with a standard sodium hydroxide solution using phenolphthalein as an indicator.

3.1.2. Reagents

The Analar grade reagents were used without further purification. Those of reagent grade, however, were recrystallised from the suitable solvent and dried before used. The solutions of acids, bases and salts were made to the desired concentration by weight and were standardised by the conventional methods.

Thallous acetate. In conductivity and solubility measurements, thallous acetate was of BDH reagent grade which was recrystallised from conductivity water⁽²⁵⁾ and properly dried before used.

Thallic acetate. Thallic acetate was prepared by the method described in reference (4). Thallic acetate solutions in acetic acid were prepared with an approximate concentrations, the accurate concentrations of thallic ions were later determined by titration with the standard solution of sodium thiosulfate using the method of dead stop end point.⁽²⁶⁾

Thallous chloride. Thallous chloride was prepared by allowing thallous nitrate to react with hydrochloric acid according to the method developed by Huges and Garner.⁽²⁷⁾

3.2 Apparatus

3.2.1 Conductivity Bridge

The A.C. conductivity bridge, oscillator and detector used in this research are manufactured by Beckmann Instruments, Inc., Type "RC 18A".

3.2.2 Conductivity Cells

Six types of the cells, were used in this work, all of them are Beckmann conductivity cells.

- (1) Cell A, model CEL - 3A.
- (2) Cell B, model CEL - 3D.
- (3) Cell C, model CEL - 3B.
- (4) Cell D, model CEL - 3B.
- (5) Cell E, model CEL - 3G.
- (6) Cell F, model CEL - 6J01

3.2.3 Thermostat Bath

It is very important to have an accurate temperature control within the narrow range required for high precision conductivity and solubility measurements. The temperature of the solution measured was controlled by immersion of the cells or flasks in an electrically operated thermostat bath filled with water. The temperature of

thermostat bath, which remained constant to $\pm 0.01^{\circ}$, was set accurately at $25 \pm 0.01^{\circ}\text{C}$ by means of a Beckman contact thermometer. All measurements were carried out in an air-conditioned room with controlled temperature at about 25°C .

3.3 Conductivity Measurements

3.3.1 Experimental Procedure

All measurements were made in cells held in a thermostat bath maintained at $25 \pm 0.01^{\circ}\text{C}$ at 1000 and 3000 cycles per second. The cells were thoroughly cleaned with dichromic-sulfuric acid mixture, followed by rinsing with distilled water, then with conductivity water, and finally with acetone and dried before use. The cell must be filled with conductivity water when not in use.

In the commencing of the measurement the cell is rinsed at least five times with portions of the desired solutions, using about enough to fill the cell one-fourth full, shake well on each rinsing, care was taken to avoid bubble on the electrodes. After rinsing, the cell was refilled with the appropriate solution and immersed in the thermostat bath, where it attained thermal equilibrium within about fifteen minutes, after which the conductivity is measured at 5 minutes interval in series of 4 - 10 readings.

In general, the conductance of the solvent can be subtracted from the apparent conductance of the solution. This is true of most salt solutions. The solvent's conductivity may be due partly to its

auto-ionisation and partly to dissolve impurities. The normal solvent correction is therefore a simple substraction:

$$L_{\text{solution}} - L_{\text{solvent}} = L_{\text{solute}}$$

$$\text{or } \frac{1}{R}_{\text{solution}} - \frac{1}{R}_{\text{solvent}} = \frac{1}{R}_{\text{solute}}$$

where the second form of the two equations refers to two measurements made in the same cell.

Determination of cell constants. The cell constants were determined by the method of Jones and Bradshaw⁽²⁸⁾ by measuring the conductivity of the potassium chloride standard solution. Table 3.4 was used as a reference in calculating the cell constants of cell A, B, C and D.

Table 3.4

Specific Conductance of Potassium Chloride Solutions

Solution (demal)	g. of KCl per 1000 g of water	Specific Conductance (mho.cm ⁻¹)		
		0°C	18°C	25°C
1.0	76.627	0.06517	0.09783	0.11134
0.1	7.4789	0.007137	0.011166	0.012856
0.01	0.74625	0.0007736	0.0012205	0.0014087

The cell constants were calculated from the relationship:

$$\text{Specific conductance} = (\text{observed conductance})(\text{cell constant})$$

Cells E and F have so small value of cell constants that use could not be made of the data given in Table 3.4. They were determined, however, by intercomparison with the cell whose cell constant is accurately known⁽²⁹⁾ and by the methods mentioned in references (30, 31). The values of the cell constants are shown in Tables 3.5.1 - 3.5.3.

Conductivity of thallos chloride in aqueous solution, and conductivity of acetic acid. For the purpose of testing techniques and instruments used in this work, the conductivities of solutions of thallos chloride at various concentrations in conductivity water and those of acetic acid at various concentrations of acid were measured. The results of measurements are shown in Tables 3.6.1 - 3.6.4, together with those reported by references (32, 33, 34, 35).

Conductivities of thallic acetate and thallos acetate in acetic acid. Solutions of thallic acetate and thallos acetate in acetic acid were prepared. Acetic acid used was of three different grades, i.e., BDH laboratory grade, BDH Analar grade and anhydrous acetic acid. All measurements were carried out in the identical manner. The specific conductances were obtained from which the values of the equivalent conductance of thallic acetate and thallos acetate at various concentrations in acetic acid were computed. Results are shown in Tables 3.7.1 - 3.7.4 and Figures 3.2 - 3.5.

In addition, the conductivities of solutions of sodium acetate trihydrate and potassium acetate in glacial acetic acid were studied. Results of which were used in the following section and collected in Tables 3.8.1 - 3.8.2 respectively and in Figures 3.6 - 3.7.

3.4 Solubility Measurements

3.4.1 Experimental Procedure

In this work the desired equilibrium was approached from above. An excess of salts was suspended in acetic acid in air for 24 hours or longer at room temperature (28° - 30° C) and then at 25° C by placing the content in the bath thermostatically controlled, with regular shaking. Preliminary investigation was carried out in order to get the waiting time for equilibrium to be established. After saturation was ensured, the content was left in the bath at the working temperature (25° C) for another 48 hours before the final analysis took place. The analysis were carried out in duplicate but at different time lapse of 4 - 5 hours during which the solubility should be constant.

Not only must control of temperature be maintained throughout the period of equilibrium, but also during the separation of the saturated solution for the subsequent analysis. This can be seen from the following paragraph.

After being allowed for the precipitate to settle, the clear solution was siphoned off or suctioned off and analysed. In order to avoid the inclusion of any precipitate in the filtrate, the filtration was necessary. Without removing the flasks from the bath, solution was withdrawn by the use of the pipette fitted at the tip with a filter consisting of a short piece of rubber tubing packed with glass wool. The filter was removed before adjusting the level of

the liquid in pipette to mark. A clean, dry filter was used for each sample.

Solubilities of thallic acetate in glacial acetic acid

a) With potassium acetate and sodium acetate trihydrate as added salts. The solubilities of thallic acetate in glacial acetic acid with added KOAc and NaOAc $\cdot 3H_2O$ were measured at various concentrations of KOAc and NaOAc $\cdot 3H_2O$. The thallic ion concentrations in the saturated solution were then determined by titration with standard sodium thiosulfate solution using dead stop end point method. Tables 3.9.1 - 3.9.2 show solubilities of Tl (OAc)₃ as a function of acetate ion concentrations.

b) With various concentrations of acetic acid. The solubilities of thallic acetate in the various concentrations of acetic acid were measured. Table 3.9.3 shows the solubilities of Tl (OAc)₃ as a function of acetate ion concentrations.

Solubilities of thallos acetate. In this case, solubilities were obtained in glacial acetic acid, in acetic acid at various acid concentrations, in glacial acetic acid with added KOAc and in glacial acetic acid with added NaOAc $\cdot 3H_2O$. The thallos ion concentrations in the saturated solution were determined by titration with standard potassium iodate solution using iodine monochloride end point method. (36, 37, 38)

It should be noted that owing to the large solubility of thallos acetate in the above mentioned solvents and to the high cost of thallos salt itself, only a few points of solubility as a function of acetate ion concentration were recorded. (See Tables 3.10.1-3.10.3)

Table 3.5.1

Cell Constants of Cells A,B,C and D

Cell Type	KCl (demal)	$\frac{1}{R_{corr}} \times 10^6$ (mho)		$L \times 10^6$ (mho.cm ⁻¹)	Cell Constant (cm ⁻¹)	
		1 KC/S*	3 KC/S		1 KC/S	3 KC/S
A	0.01	-	6928.40	0.0014088	-	0.203337
B	0.1	2974.30	2981.50	0.012856	4.32236	4.31192
C	0.01	645.71	647.27	0.0014088	2.18178	2.17650
D	0.01	-	667.31	0.0014088	-	2.11116

* 1KC/S = 1kilocycle per second



Table 3.5.2

Cell Constant of Cell E by the Intercomparison Method

KCl (equi/l)	$\frac{1}{R} \times 10^6$ (mho) corr				$L \times 10^6$ (Cell C) (mho.cm. ⁻¹)		Cell Constant (Cell E) (cm. ⁻¹)	
	Cell C		Cell E		1KC/S	3KC/S	1KC/S	3KC/S
	1KC/S	3KC/S	1KC/S	3KC/S				
0.000975	64.72	65.06	1834.75	1835.96	141.2048	141.6031	0.076961	0.077128
0.001133	76.38	76.65	2165.40	2166.55	166.6444	166.8287	0.076958	0.077002
0.001414	93.84	94.31	2686.15	2687.83	204.7382	205.2657	0.076220	0.076369
0.001588	105.78	106.41	2998.48	3000.53	230.7887	231.6041	0.076969	0.077187
0.002033	134.95	135.25	3813.71	3817.16	294.4312	294.3716	0.077203	0.077118
0.002387	159.19	159.50	4480.11	4485.16	347.3176	347.1518	0.077524	0.077400
Average							0.076973	0.077034

Table 3.5.3

Cell Constants of Cells E and F by the Method of Reference (30,31)

Cell Type	KCl (equi/l)	$\frac{1}{R} \times 10^6$ (mho)		Cell Constant* (cm. ⁻¹)		Cell Constant** (cm. ⁻¹)	
		1KC/S	3KC/S	1KC/S	3KC/S	1KC/S	3KC/S
E	0.000896	1729.30	1731.64	0.076210	0.076107	0.076224	0.076121
F	0.000896	1198.34	1194.40	0.109977	0.109880	0.109998	0.109901

* Calculation by the method of reference (30)

** Calculation by the method of reference (31)



Table 3.6.1

Conductivity of Thallous Chloride in Aqueous Solution by Using Cells A And D

TlCl (equi/l)	Cell A			Cell D		
	$\frac{1}{R_{\text{corr}}} \times 10^6$ (mho)	$L \times 10^6$ (mho.cm. ⁻¹)	Λ (cm ² .mho.equi. ⁻¹)	$\frac{1}{R_{\text{corr}}} \times 10^6$ (mho.)	$L \times 10^6$ (mho.cm. ⁻¹)	Λ (cm ² .mho.equi. ⁻¹)
0.001094	804.72	163.6293	149.5697	76.74	162.0104	148.0899
0.002446	1755.98	357.0557	145.9753	-	-	-
0.004174	2954.02	600.6615	143.9054	283.16	597.7961	143.2189
0.005598	3926.94	798.4921	142.6388	374.84	791.3472	141.3624
0.008078	5552.10	1128.9473	139.7557	533.20	1125.6705	139.3501

Table 3.6.2

Conductivity of Thallous Chloride in Aqueous Solution by Using Cell B and C

TlCl ₁ (equi/l)	Cell B			Cell C		
	$\frac{1}{R}_{\text{corr}} \times 10^6$ (mho.)	$L \times 10^6$ (mho.cm. ⁻¹)	Λ (cm ² .mho.equi. ⁻¹)	$\frac{1}{R}_{\text{corr}} \times 10^6$ (mho.)	$L \times 10^6$ (mho.cm. ⁻¹)	Λ (cm ² .mho.equi. ⁻¹)
0.001094	37.75	163.1691	149.1490	74.70	162.9790	148.9753
0.001958	66.44	287.1776	146.6688	131.16	286.1623	146.1503
0.003216	108.44	468.7167	145.7452	-	-	-
0.004998	166.39	719.1775	143.8970	328.84	717.4565	143.5487
0.006000	197.58	854.0119	142.3353	391.21	853.5342	142.2557
0.008078	261.76	1131.4210	140.0620	518.00	1130.1620	139.9061

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Table 3.6.3

Conductivity of Thallous Chloride in
(32,33,34)
Aqueous Solution.

TlCl (equi./l.)	κ ² ₁ (cm.mho.equi.)	References
0.00507	143.10	34
0.00604	142.25	
0.01000	139.00	
0.01108	138.35	
0.01607	135.40	
0.002	146 (extrapolated)	35
0.005	142.9	
0.010	138.8	
0.0167	135.3	
0.00150	148.40	33
0.00750	141.13	
0.01501	136.03	

Table 3.6.4

Conductivity of Acetic Acid at Various
Concentrations

Per Cent HOAc	Present Work			Reference 35
	$\frac{1}{R_{\text{corr}}} \times 10^6$ (mho)	$L \times 10^6$ (mho cm.)	$[OAc^-] \times 10^4$ (equi/l)	L (mho cm.)
100	0.71	0.05438	0.001392	1.4×10^{-8}
95	18.06	1.38336	0.035406	-
90	147.96	11.33344	0.290073	-
85	475.57	36.42771	0.932346	-
80	1064.61	81.54699	2.087149	0.000077
75	1914.91	146.67827	3.754147	0.000136
70	4177.11	319.95827	8.189150	-
65	4460.91	341.69678	8.745535	-
64	-	-	-	0.000346
60	7576.11	580.31487	14.852828	-
56.2	-	-	-	0.000537
51.2	-	-	-	0.000700
50	10010.11	766.75440	19.621642	-

Table 3.7.1

Conductivity of Thallic Acetate in Glacial
Acetic Acid

c (equi/l)	\sqrt{c}	$\frac{1}{R} \times 10^6$ corr (mho)	$L \times 10^6$ (mho cm)	$\Lambda \times 10^3$ (cm.mho.equi)
0.002162	0.04650	0.69	0.052853	24.446345
0.006380	0.07987	1.55	0.118727	18.609248
0.008952	0.09461	1.78	0.136344	15.230563
0.012914	0.1136	2.23	0.170814	13.227040
0.017698	0.1330	2.19	0.167750	9.478450
0.021970	0.1482	2.57	0.196857	8.960264
0.027886	0.1670	2.23	0.170814	6.125439
0.039316	0.1982	3.34	0.255837	6.507198
0.039796	0.1995	3.26	0.249710	6.274751
0.049916	0.2234	3.56	0.272689	5.462957
0.050898	0.2256	4.00	0.306392	6.019725
0.058178	0.2412	4.07	0.311764	5.358795

Table 3.7.2

Conductivity of Thallic Acetate in Anhydrous
Acetic Acid

c (equi/l)	\sqrt{c}	$\frac{1}{R} \times 10^6$ (ρ)	$L \times 10^6$ $^{-1}$ (ρ cm.)	$\Lambda \times 10^3$ $^{-1}$ (cm. ρ equi)
0.002884	0.05371	0.95	0.072768	25.231657
0.008124	0.09013	1.90	0.145536	17.914327
0.012268	0.1108	2.48	0.189963	15.484431
0.013958	0.1182	2.29	0.175409	12.566915
0.016903	0.1300	2.55	0.195325	11.555635
0.028626	0.1692	3.30	0.252773	8.830203
0.036586	0.1912	3.67	0.281115	7.683677
0.040239	0.2006	3.72	0.284945	7.081314
0.049836	0.2233	4.14	0.317116	6.363191
0.053871	0.2321	4.65	0.356181	6.611739
0.056542	0.2378	5.25	0.402140	7.112235
0.066793	0.2585	5.34	0.409033	6.123890
0.076176	0.2760	6.66	0.510143	6.696899

Table 3.7.3

Conductivity of Thallous Acetate in Glacial
Acetic Acid

c (equi/l)	\sqrt{c}	$\frac{1}{R} \times 10^6$ corr (nho)	$L \times 10^6$ ⁻¹ (nho.cm)	$\Lambda \times 10^2$ ² (cm.nho.equi)
0.000087	0.009343	0.64	0.049023	56.154639
0.000091	0.009539	0.68	0.052087	57.175631
0.000266	0.01627	1.33	0.101875	38.342115
0.000516	0.02273	2.25	0.172346	33.380980
0.000930	0.03050	2.88	0.220985	23.761828
0.000968	0.03111	3.23	0.247412	25.559091
0.002030	0.04506	4.51	0.345460	17.017734
0.002999	0.05476	6.16	0.472227	15.746149
0.003003	0.05480	6.58	0.504015	16.783716
0.003837	0.06195	7.15	0.548059	14.283529
0.005015	0.07082	8.80	0.674062	13.440917
0.005975	0.07730	10.12	0.775555	12.980000
0.006943	0.08333	10.30	0.789342	11.368890
0.008013	0.08952	12.03	0.921857	11.504518
0.008799	0.09380	12.77	0.978540	11.121036

Table 3.7.3 (Continue)

c (equi/l)	\sqrt{c}	$\frac{1}{R} \times 10^6$ corr (rho)	$L \times 10^6$ -1 (rho.cm.)	$\Lambda \times 10^2$ 2 (cm.rho.equ)
0.010010	0.1000	14.10	1.080415	10.793357
0.011126	0.1055	14.94	1.144374	10.285583
0.011988	0.1095	15.99	1.225185	10.220095
0.013096	0.1144	17.07	1.307528	9.984178
0.013837	0.1177	17.58	1.346976	9.734595
0.014938	0.1223	19.73	1.511279	10.117010
0.015955	0.1264	20.33	1.557620	9.762582
0.016957	0.1303	20.90	1.601281	9.443185

Table 3.7.4

Conductivity of Thallous Acetate in
Anhydrous Acetic Acid

c (equi/l)	\sqrt{c}	$\frac{1}{R} \times 10^6$ (mho)	$L \times 10^6$ (mho.cm.) ⁻¹	$\Lambda \times 10^2$ (cm.mho.equi) ⁻¹
0.000118	0.01086	1.26	0.096514	81.791525
0.000300	0.01732	2.00	0.153196	51.065333
0.000505	0.02247	2.60	0.199155	39.436634
0.000767	0.02768	3.52	0.269625	35.153194
0.001000	0.03162	3.89	0.297966	29.796600
0.001549	0.03935	4.93	0.377628	24.378825
0.002969	0.05449	7.83	0.599762	20.200808
0.004032	0.06350	8.25	0.631934	15.672966
0.006000	0.07746	10.41	0.797385	13.289750
0.007600	0.08718	12.32	0.943687	12.416934
0.008000	0.08944	11.91	0.912282	11.403525
0.010288	0.1014	14.51	1.111437	10.803236
0.012171	0.1103	17.69	1.355019	11.133177
0.018093	0.1345	21.30	1.631537	9.017504
0.018419	0.1357	23.82	1.824564	9.905879
0.020538	0.1433	27.10	2.075806	10.107147
0.021889	0.1479	26.13	2.001506	9.143889
0.024303	0.1559	30.41	2.329345	9.584598
0.026657	0.1633	32.63	2.499393	9.376122
0.028289	0.1682	34.48	2.641099	9.336134

Table 3.8.1

Conductivity of Sodium Acetate Trihydrate in Glacial Acetic Acid

$c \times 10^4$ (equi/l)	$\sqrt{c} \times 10^2$	$\frac{1}{R_{\text{corr}}} \times 10^6$ (mho)	$L \times 10^6$ (mho.cm. ⁻¹)	$\Lambda \times 10^2$ (cm ² .mho.equi. ⁻¹)	$[\text{OAc}^-] \times 10^4$ (equi/l)
0.529101	0.7274	0.52	0.039831	75.280523	0.419274
1.46972	1.212	1.08	0.082726	56.286911	0.870800
7.86302	2.805	2.71	0.207581	26.399653	2.185063
15.50558	3.938	4.38	0.335499	21.637307	3.531568
32.03998	5.660	7.10	0.543846	16.973980	5.724695
62.16931	7.884	11.29	0.864791	13.910255	9.103063
118.16578	10.87	18.50	1.417063	11.992160	14.916452
166.00529	12.88	29.16	2.233598	13.454980	23.511558

Table 3.8.2

Conductivity of Potassium Acetate in Glacial Acetic Acid

$c \times 10^4$ (equi/l)	$\sqrt{c} \times 10^2$	$\frac{1}{R_{\text{corr}}} \times 10^6$ (mho)	$L \times 10^6$ ($\mu\text{mho}\cdot\text{cm}^{-1}$)	$\Lambda \times 10^2$ ($\text{cm}^2\cdot\text{mho}\cdot\text{equi}^{-1}$)	$[\text{OAc}^-] \times 10^4$ (equi/l)
2.54738	1.596	2.48	0.189963	74.571913	1.478311
6.52130	2.553	3.75	0.287243	44.046892	2.235354
15.08050	3.883	6.72	0.514739	34.132754	4.005751
26.39087	5.137	8.69	0.665637	25.222245	5.180055
49.21541	7.015	13.30	1.018753	20.699878	7.928039
72.44752	8.511	17.52	1.341997	18.523712	10.443556
142.85714	11.96	28.95	2.217512	15.522584	17.256903
180.76217	13.45	37.39	2.863999	15.844017	22.287930
195.43509	13.97	41.80	3.201796	16.382912	24.916700
402.18055	20.05	74.11	5.676678	14.114750	44.176482
807.11228	28.41	189.98	14.552088	18.029818	113.245821

Table 3.9.1

Solubility of Thallic Acetate in Glacial
Acetic Acid with Added Potassium Acetate

$*c \times 10^4$ (equi/l)	$[OAc^-] \times 10^4$ (equi/l)	Solubility (equi/l)
0	0	0.271592
59.81251	9.01	0.267742
99.14408	13.50	0.276832
192.98960	24.00	0.289226
402.38434	44.22	0.338188
732.93250	85.01	0.408636

*c = concentration of potassium acetate in

glacial acetic acid

Table 3.9.2

Solubility of Thallic Acetate in Glacial
Acetic Acid with Added Sodium Acetate Trihydrate

$*c \times 10^4$ (equi/l)	$[OAc^-] \times 10^4$ (equi/l)	Solubility (equi/l)
0	0	0.271592
7.86302	2.19	0.274940
15.50558	3.53	0.270884
32.03998	5.73	0.273076
62.16931	9.10	0.277634
118.16578	14.92	0.281984
166.00529	23.51	0.285922

*c = concentration of sodium acetate trihydrate
in glacial acetic acid

Table 3.9.3

Solubility of Thallic Acetate in Acetic
Acid at Various Concentrations

Per Cent HOAc	$[\text{OAc}^-] \times 10^4$ (equi/l)	Solubility (equi/l)
100 (glacial)	0.001	0.271592
95	0.035	0.320674
90	0.290	0.501104
85	0.932	0.699580
80	2.087	0.899284
75	3.754	1.083204
70	8.189	1.231030
65	8.745	1.427998
60	14.853	1.532506
50	19.625	1.846332

Table 3.10.1
Solubility of TlOAc in Glacial Acetic Acid with
Added KOAc

* $[\text{OAc}^-] \times 10^4$ (equi/l)	Solubility (equi/l)
0	3.584
4.01	3.616
24.92	7.068

Table 3.10.2
Solubility of TlOAc in Glacial Acetic Acid with
Added NaOAc $3\text{H}_2\text{O}$

** $[\text{OAc}^-] \times 10^4$ (equi/l)	Solubility (equi/l)
0	3.584
3.53	3.336

Table 3.10.3
Solubility of TlOAc in Acetic Acid at Various
Concentrations

*** $[\text{OAc}^-] \times 10^4$ (equi/l)	Solubility (equi/l)
0.001	3.584
8.19	6.284
14.85	6.488

- * $[\text{OAc}^-]$ = ionic concentration of KOAc in glacial HOAc
 ** $[\text{OAc}^-]$ = ionic concentration of NaOAc $3\text{H}_2\text{O}$ in glacial HOAc
 *** $[\text{OAc}^-]$ = ionic concentration of HOAc



$$\Lambda^{\circ} = 33.75 \times 10^3 \text{ mho. cm}^2 \text{ eq}^{-1}$$

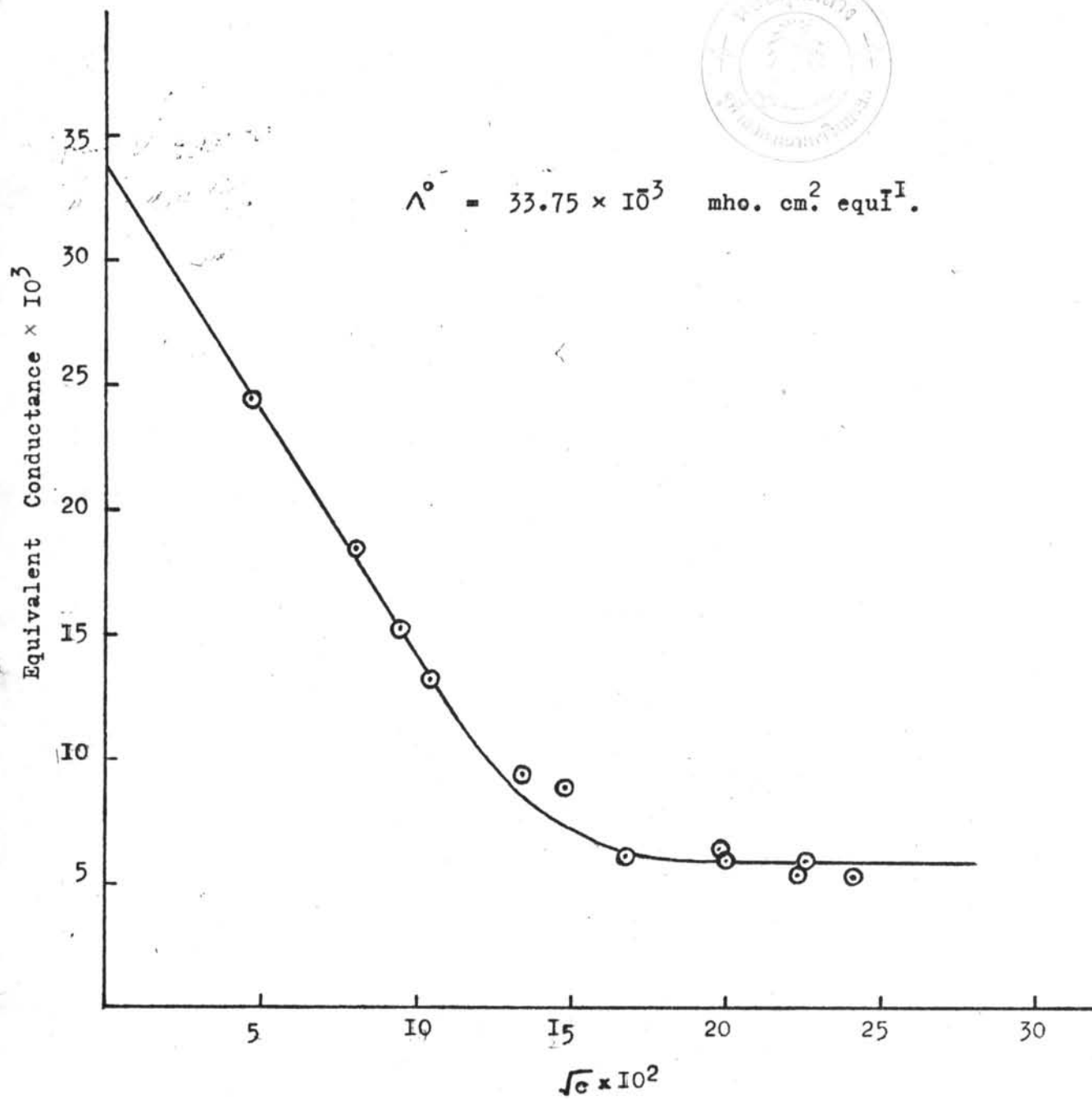


Fig. 3.2 Conductivity of Thallous Acetate in Glacial Acetic Acid.

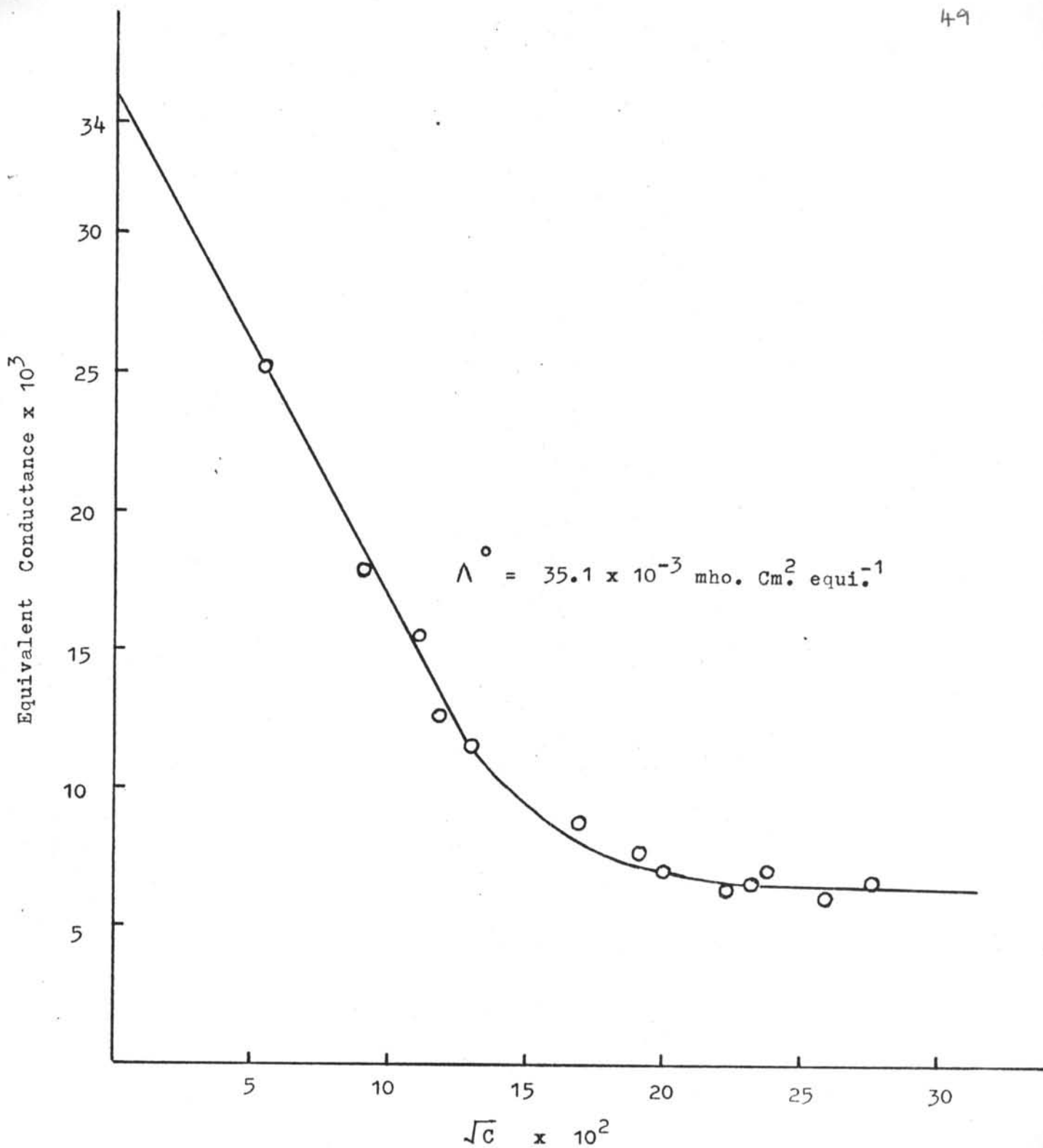


Fig.3.3 Conductivity of Thallous Acetate in Anhydrous Acetic Acid.

Fig. 3.4 Conductivity of Thallous Acetate in Glacial Acetic Acid.

$$\Lambda^{\circ} = 105.4 \times 10^{-2} \text{ mho. cm}^2 \text{ equi}^{-1}$$

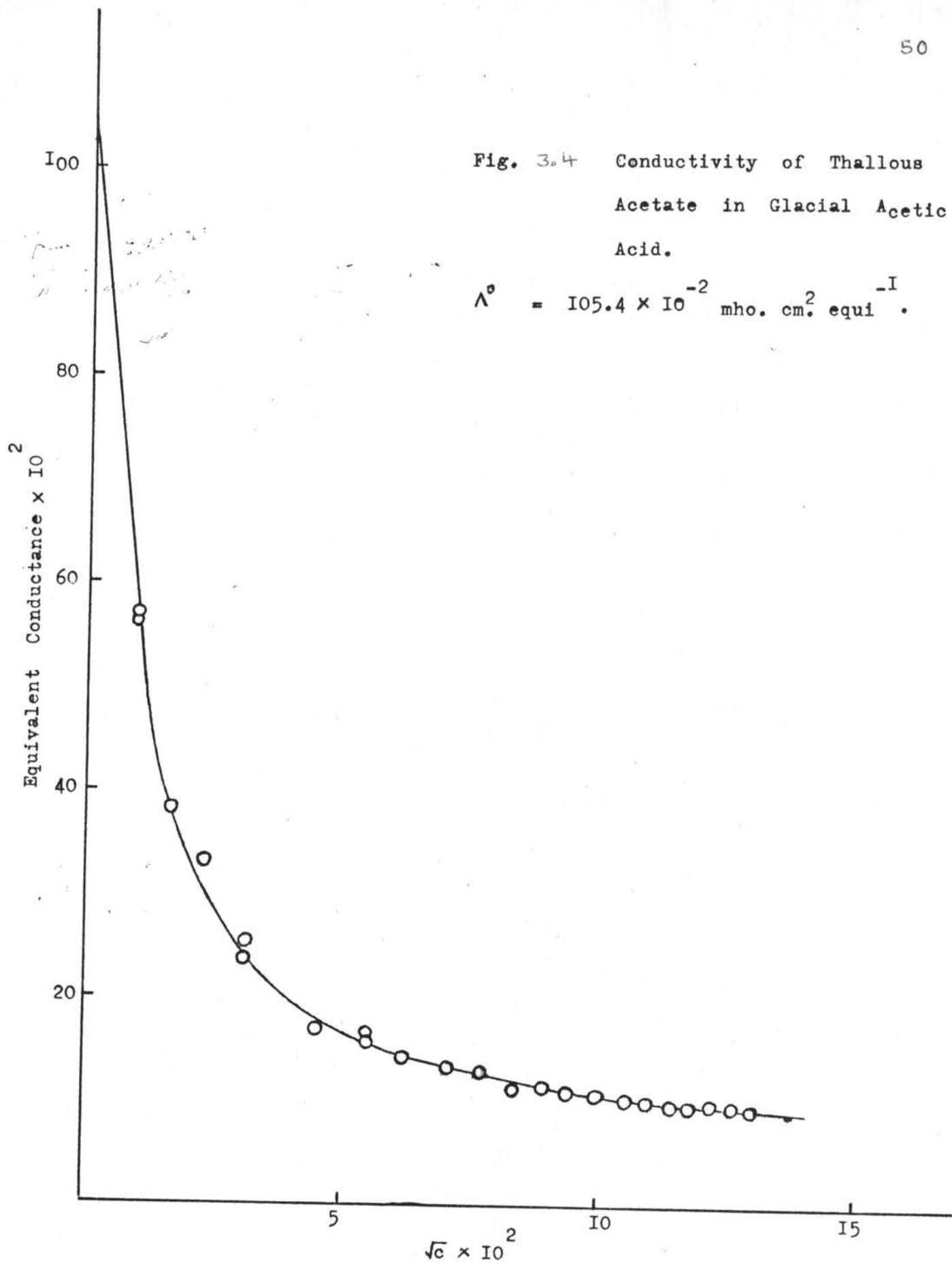
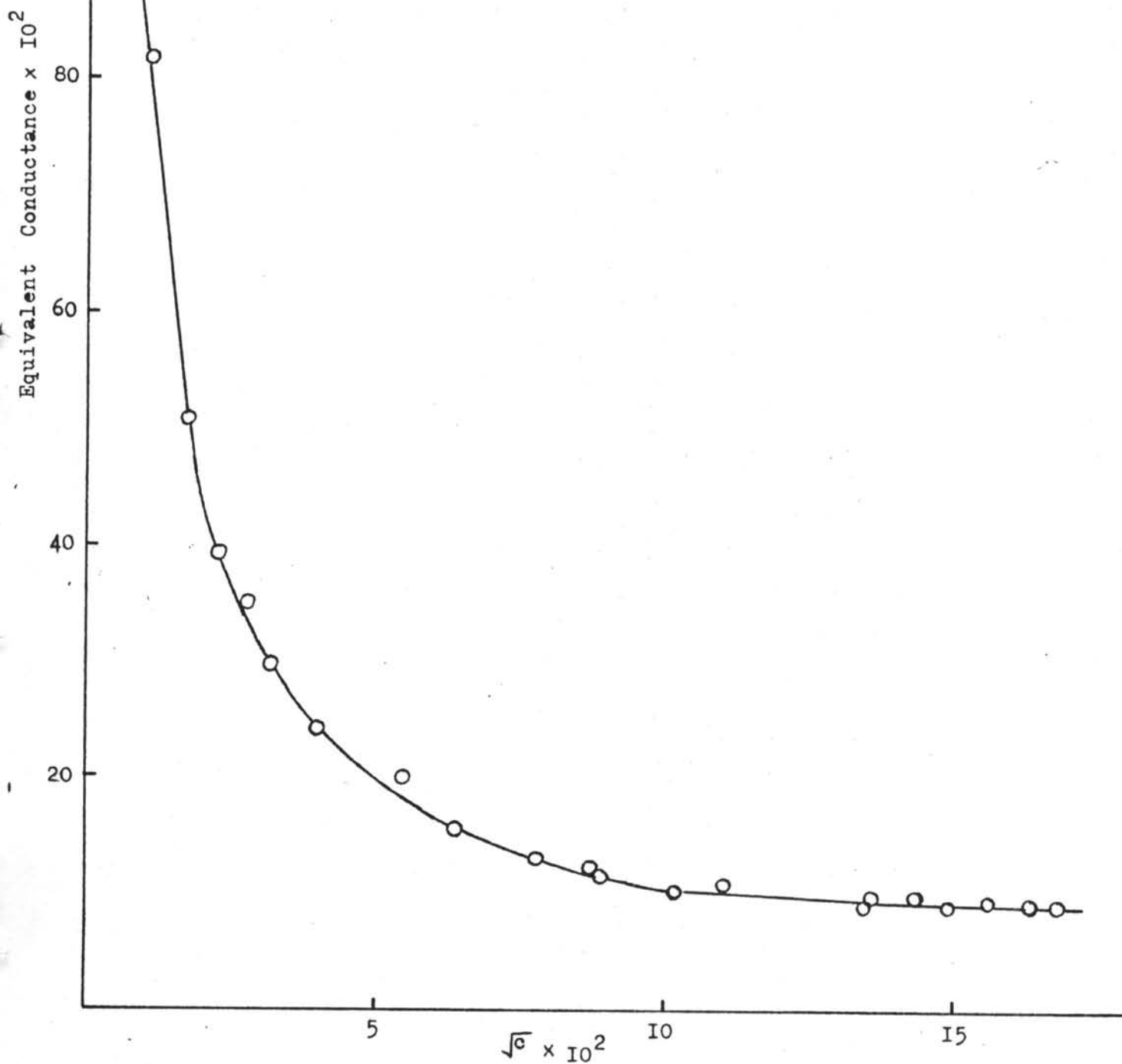


Fig. 3.5 Conductivity of Thallous Acetate
in Anhydrous Acetic Acid.

$$\Lambda^{\circ} = 126.0 \times 10^{-2} \text{ mho. cm}^2 \text{ eq}^{-1}.$$



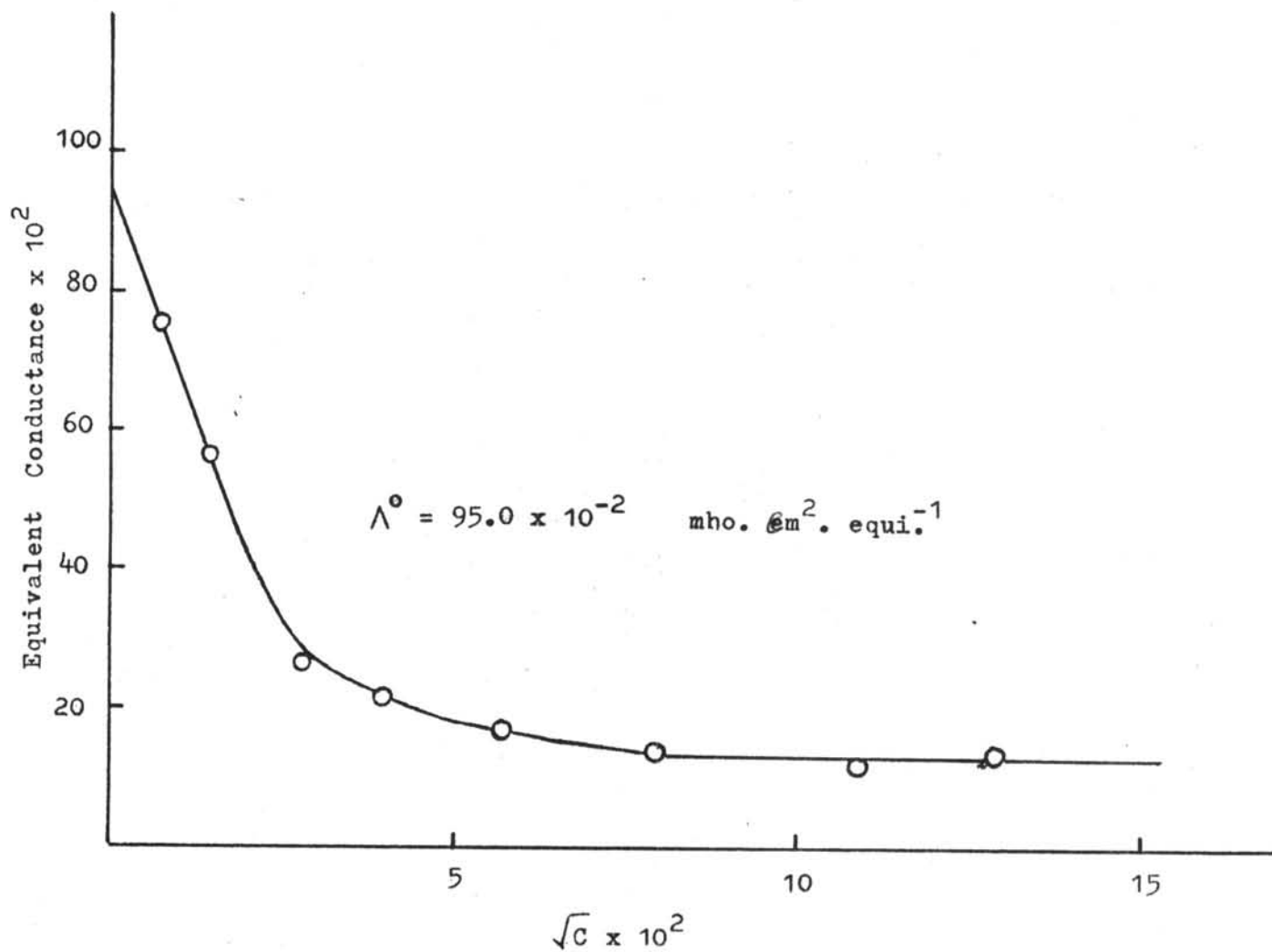


Fig.3.6 Conductivity of Sodium Acetate Trihydrate in Glacial Acetic Acid.

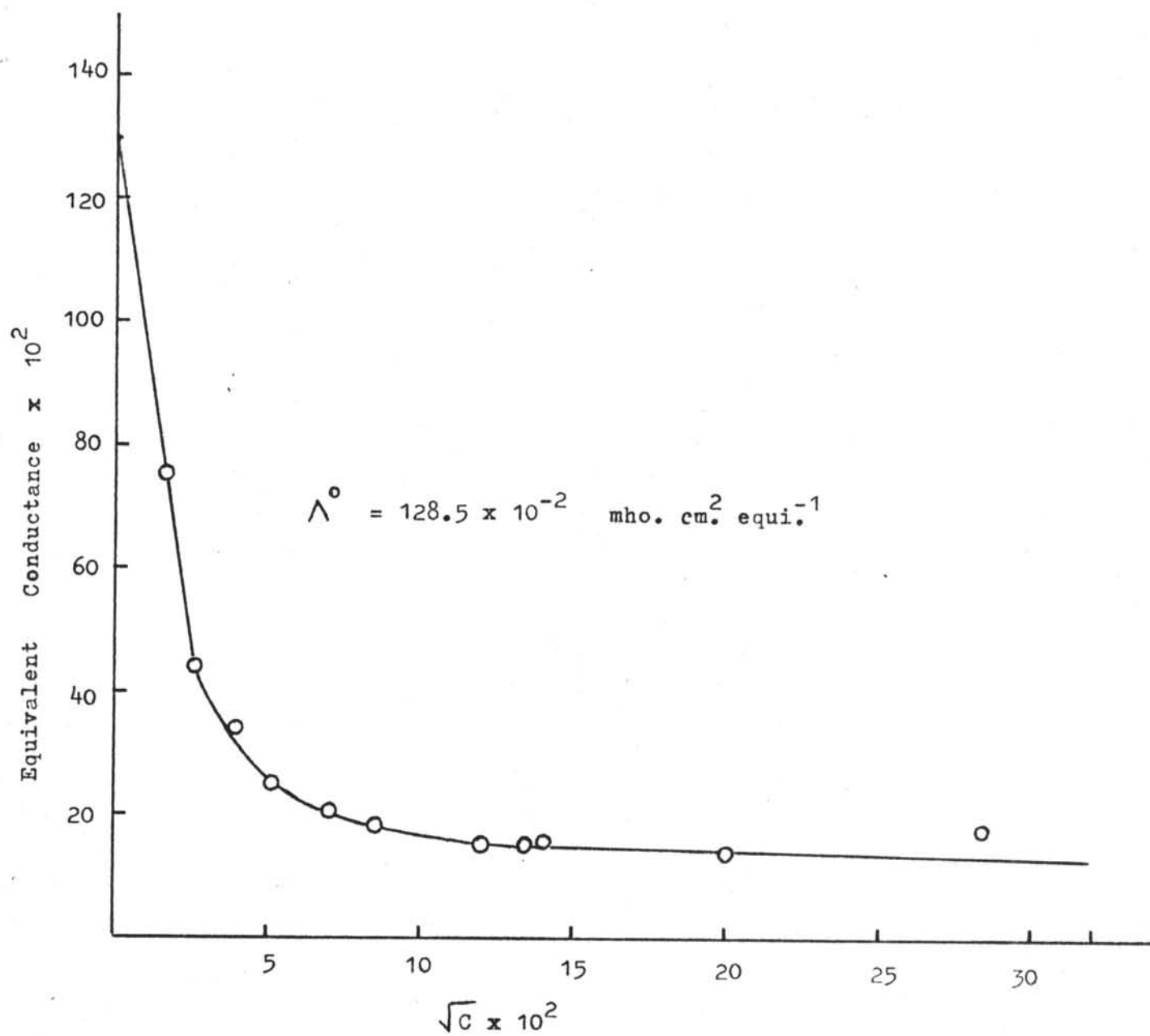


Fig.3.7 Conductivity of Potassium Acetate in Glacial Acetic Acid.