



A Study of the Component Formats Effect on Ionization Constants for A Number Schiff Pyridine Water and Ethanol with Variant Temperature Degrees



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Abstract

This investigation This investigation was started by the synthesis of four pyridine Schiff bases from the mother compound (Salicylaldehyde), whose nomenclatures and structures are seen in the text. The structures of these imines were well confirmed from U.V. and I.R. spectra at melting points. The main objective of this study is the determination of K_a values for these mentioned imines at temperature range (20-60) Co by the conductivity measurement method. This method as found, Simple, precise and accurate. The thermodynamic parameters of ionization for acids were also estimated. This shows that the process of ionization of acidic compounds under study in water Solvent is non- spontaneous ($+\Delta H$) and is accompanied by an increase of order ($-\Delta S$). Direct linear plots were obtained between pK_a for any acid versus the dielectric constant of acid and versus the dielectric constant of ethanol at the five different temperatures. Finally, a suitable interpretation for any one of these thermodynamic parameters are given and discussed.

Keywords: Conductivity, pK_a , Phenolic Schiff, Thermodynamic of Ionization

Introduction

1. Schiff bases are very important compounds that are used in various fields due to their biological activities. They have been used as an antimicrobial agent, fungicides and used for the synthesis of many chemical and drugs [1]
2. The 2- aminopyridine can be considered as a type of the intermediate compounds which can be used for the synthesis of many pharmaceutical compounds specially the anti-histamine [2].
3. Researchers in this field noticed that different spatial structures affected many of the physical properties of these compounds such as the stabilities [3] of the azo complex that produced from the reaction of aromatic amines with carboxylic acids In addition to the thermodynamic

- study and tautomeric reactions that occurs in the benzoin compounds by halogenic titration[4].
4. For the mixed, polar and non-polar solvents, the spectra of several Schiff-bases have been studied. The study showed the presence of tautomeric equilibrium in the compound 2-hydroxy-1-naphthylideneaniline Schiff-bases depending on the polarity of the solvent used [5].
5. The study concluded that the equilibrium constants of tautomeric in amines depend on the geometrical structures and the type of the solvent used.

Experimental part

All chemical used in this study were supplied by fluka and BDH chemical companies, and were used without any further purification.

The pyridine Schiff bases were prepared following a standard method[6] by mixing equimolar of

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salicylaldehyde with 2-methylpyridine and its isomers, 3-amino pyridine: 10 cm² / of absolute ethanol was added to each mixture, followed by reflux for the mixture for 2 hours. The products are cooled and filtered. The crude Schiff bases are then recrystallized from ethanol in order to obtain pure compounds as shown in table(1).

Table (1) Names of Compounds, structures and melting points of the studied Schiff bases

Compound	Structure of Schiff Bases	Compound symbol	Melting point °C
Salicylidene-2-amino pyridine		S2AP	62 – 64
Salicylidene-3-amino pyridine		S3AP	64 -66
Salicylidene-2-amino-3- methyl pyridine		S2A3MP	80 -81
Salicylidene-2-amino -4- methyl pyridine		S2A4MP	97 –98

A stock solutions of (10⁻³ M) concentration for each Schiff base is prepared in deionized water. From each of these solution , five solutions were prepared by dilution method in the concentration range (10⁻³-10⁻⁴ M) aiming for measuring the electrical conductance of five different temperatures in the range (20-60) °C.

The sodium salts of the studied Schiff bases were prepared by titration while using ph-ph indicator for each of the (10⁻³ M) solutions. Other five solutions were prepared by the dilution method. Conductivity measurements were carried out for the last solutions.

The equivalents Λ_{eq} for each solution were calculated. The equivalent conduction at infinite dilution (Λ_o) is estimated as indicated by previous study[7].

The values of Ka for all of the mono acids HA were calculated at different temperatures in the range (20 - 60) °C by applying the following relations:

$$K_a = \frac{\alpha^2 c}{1-\alpha} \dots \dots \dots (1)$$

Where C is the molar concentration and α is the degree of ionization, which is expressed by the

following equation.

$$\alpha = \frac{\Lambda}{\Lambda_o} \dots \dots \dots (2)$$

Where, Λ is the equivalent conductance of the Schiff base at certain concentration and Λ_o is at infinite dilution concentration[8].

Instrumentation

- 1- A Memmert thermostat manufactured by Searle company model L200, for fixation of the temperatures of the studied solution in the range (20-60 °c) .
- 2- An apparatus for measuring the electrical conductivity type Wissenschaftlich teches werckstatten model D812.
- 3- FT-IR Spectrophotometry type FETER Bruker Tenson-27 was used for measurement of IR spectra for a solid compound by KBr disc method.
- 4- Electrothermal melting point apparatus type Stuart of model Melting point SMP30.
- 5- Computerized double beam spectrophotometer, Shimadzu, UV visible 1601.
- 6- The Excel office was used for performing the figures presented in this paper.

Results and Discussion:

1- Electronic Spectra:

The electronic spectra is one of the important methods that can be used for identifying the presence of hydrogen bonds in Schiff bases. The UV spectra of the compound was measured (10⁻⁴M) in the range of (200- 450 nm) once in polar solvent (Absolute ethanol) and another in CCl₄ as a non-polar solvent. The type of electronic transition is determined by calculating the value of molar extension coefficient (ϵ_{max} Liter. mole⁻¹. cm⁻¹).

Table (2) shows the values of optimum wave lengths (λ_{max}) of the electronic transition of the studied compounds.

Table (2) The λ_{max} values of the UV spectra of Schiff bases in the ethanol and CCl₄ solvents

Comp.	Solvent CCl ₄			Solvent C ₂ H ₅ OH			Type of transitions
	ϵ_{max} L.mol ⁻¹ .cm ⁻¹	A	λ_{max} (nm)	ϵ_{max} L.mol ⁻¹ .cm ⁻¹	A	λ_{max} (nm)	
S2AP	4920	0.492	302	8550	0.855	354	$\pi - \pi^*$
S2A3MP	11920	1.192	345	5350	0.535	359	$\pi - \pi^*$
S2A4MP	6980	0.698	345	4540	0.454	354	$\pi - \pi^*$
S3AP	5790	0.579	303	7280	0.728	344	$\pi - \pi^*$

Table (2) Indicates that the values [10] of ϵ_{max} is greater than ($10^{-3} \text{ L.mol}^{-1}.\text{cm}^{-1}$) which confirmed the ($\pi-\pi^*$) transition . These values clearly indicate that these compounds have hydrogen bonds of unknown type.

2- **The IR spectra** were recorded in the solid state for all of the considered compounds. The obtained spectra do not clarify the type of the hydrogen bonds in these compounds ; therefore the IR spectra were repeated again in the liquid state as (10^{-4}M) solution in the CCl_4 solvent. It was observed that the hydrogen bonds are attested clearly by dilution [9] which indicates that the present hydrogen bond is of an intra – bonds type . Table (3) shows some important peaks of the IR spectra of Schiff bases under consideration as follows:

- 1- A wide absorption stretching in the range of ($3446.53- 3422.20\text{cm}^{-1}$) of the phenolic OH group.
 - 2- A weak aromatic C-H group in the range of ($2973.07 3054.76\text{ cm}^{-1}$).
- A strong stretching absorption for C=N group in the range of ($1608-1616\text{ cm}^{-1}$)

Table (3) : Important IR absorption bands of Schiff bases (v cm-1)

Compound	Stretch O-H	Stretch C-H	Stretch C=N
S2Ap	3422.20(b)	3051.72(W)	(v.s) 1608.53
S2A3M p	3443.84(b)	2973.07(W)	(v.s) 1611.28
S2A4M p	3444.12(b)	3054.76(W)	(v.s) 1616.42
S3Ap	3446.53(b)	3051.13(W)	(v.s) 1615.46

S= strong, v.s = very strong, m= medium, b= broad

The obtained U.V ad IR spectra are totally consistent with previous studies in this field [10-11] "which applied conductivity for the determination of the ionization constants of the compound under study.

For this purpose, calculations of the equivalent conductance of electrolytes must be achieved, which is represented by the following equation.

$$\Lambda = \frac{1000k}{c} \dots\dots\dots (3)$$

Where Λ is the equivalent convenience of the electrolyte at certain concentration, K is the specific conductivity and C is the equivalent of molar concentrations for the acid under consideration. As it is known [12], there are two types of electrolytes. The strong electrolytes give straight lines when plotting the relation between the equivalent conductance of the electrolyte at constant

temperature versus the square root of concentration. While the weak electrolytes give curved lines at the same temperature according to equation (4).

$$\Lambda = \Lambda_o - b\sqrt{c} \dots\dots (4)$$

$$\Lambda_o = \lambda_o^+ + \lambda_o^-$$

Where as λ_o^+ and λ_o^- are the conductivity at infinite dilution for positive and negative ions respectively.

Equation (4) is applied first on the weak electrolyte at a constant temperature, then on the sodium salt of the acids which were prepared by titration following electronical conductance in which NaOH was used at various temperatures, the figures(1 and 2) for the compound S3AP illustrate respectively the relation between (Λ) and (\sqrt{C}) of the bases and their sodium salt derivative at various temperatures [13], as shown below:

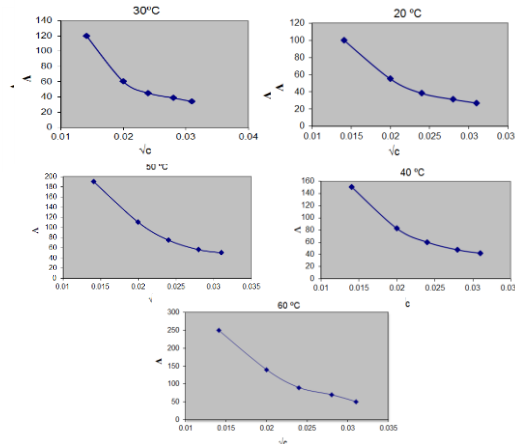


Figure (1) The relation between (Λ) and (\sqrt{C}) for the base S3AP at various temperatures..

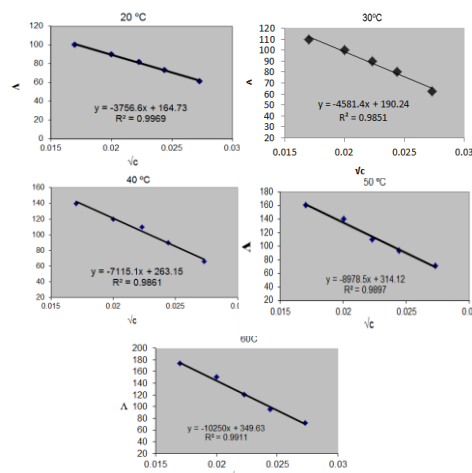


Figure (2) The relation between (Λ) and (\sqrt{C}) for sodium salt of S3AP at various temperatures.

Kohlraush method has been applied for obtaining the equivalent conductance $\Lambda_{o,HA}$ at infinite dilution

of each base. This requires the determination of equivalent conductance at infinite dilution for the solutions of NaCl and HCl and at the temperatures just mentioned above. In order to calculate Λ_{oNaCl}

and Λ_{oHCl} values of a previous study [14] were used. This study included the following :
Effect of structural geometry on the ionization constant and the results were discussed in details as shown:

Table (4) the equivalent conductance, ionization degree for compounds (S3AP and S2AP) in water solvent

Symbol of compound	Conc. 10^{-3} equiv/L ⁻¹	T ^o . K	Λ_c of Acid $ohm^{-1} cm^2.equiv.^{-1}$	Λ_o of Schiff base $ohm^{-1} cm^2.equiv.^{-1}$	α	$Ka * 10^{-6}$	Ka^*10^{-6}
S3AP	1	293	27	437.83	0.0616	4.045	6.8
	0.8		31.25		0.0713	4.379	
	0.6		38.33		0.0875	4.979	
	0.4		55		0.1256	7.151	
	0.2		100		0.2283	13.484	
	1	303	34	497.7	0.0683	4.966	7.476
	0.8		38.75		0.0778	5.144	
	0.6		45		0.0904	5.394	
	0.4		60		0.1205	6.552	
	0.2		120		0.2411	15.324	
	1	313	42	605.97	0.0693	5.119	8.346
	0.8		47.5		0.0783	5.284	
	0.6		60		0.0990	6.534	
	0.4		82.5		0.1361	8.572	
	0.2		150		0.2475	16.225	
	1	323	50	690.3	0.0724	5.592	10.432
	0.8		56.25		0.0814	5.786	
	0.6		75		0.1086	7.854	
	0.4		110		0.1593	12.038	
	0.2		190		0.2752	20.89	
1	333	51	760.17	0.0670	4.816	14.0942	
0.8		70		0.0920	7.465		
0.6		90		0.1183	9.482		
0.4		140		0.1841	16.647		
0.2		250		0.3288	32.061		
S2AP	1	293	26	565.1	0.04600	2.22	6.603
	0.8		30		0.05308	2.375	
	0.6		41.66		0.0737	3.452	
	0.4		65		0.1150	5.984	
	0.2		150		0.2654	19.13	
	1	303	30	622.16	0.0482	2.42	7.458
	0.8		38		0.0610	3.173	
	0.6		48.33		0.0776	3.559	
	0.4		80		0.1285	7.524	
	0.2		170		0.2732	20.616	
	1	313	40	720.92	0.06935	3.204	8.0188
	0.8		50		0.06935	4.095	
	0.6		60		0.0832	4.512	
	0.4		90		0.1248	7.029	
	0.2		200		0.2774	21.254	
	1	323	50	797.38	0.06270	4.102	9.534
	0.8		60		0.07524	4.87	
	0.6		80		0.100328	6.674	
	0.4		110		0.1379	8.709	
	0.2		230		0.2884	23.331	
1	333	75	864.44	0.0867	8.1	12.956	
0.8		80		0.0925	7.462		
0.6		100		0.11568	8.976		
0.4		150		0.1735	14.493		
0.2		260		0.3007	25.751		

Table (5) the equivalent conductance, ionization degree for compounds (S2A3MP andS2A4MP) in water solvent

Symbol of compound	Conc. 10^{-3} equiv/L ⁻¹	T ^o . K	Λ_c of Acid $ohm^{-1} cm^2.equiv.^{-1}$	Λ_o of Schiff base $ohm^{-1} cm^2.equiv.^{-1}$	α	$Ka * 10^{-6}$	Ka^*10^{-6}
S2A3MP	1	293	18	412.95	0.0435	1.979	3.426
	0.8		21.25		0.0507	2.107	
	0.6		26.6		0.0644	2.628	
	0.4		37.5		0.0908	3.56	
	0.2		70		0.169	6.882	
	1	303	22	458.27	0.0480	2.422	4.082
	0.8		25		0.0545	2.468	
	0.6		30		0.0654	3.946	
	0.4		45		0.0981	4.263	
	0.2		80		0.1745	7.339	
	1	313	26	527.84	0.0492	2.527	5.252
	0.8		30		0.0568	2.66	
	0.6		43.33		0.0820	4.399	
	0.4		60		0.1136	5.764	
	0.2		100		0.2083	10.939	
	1	323	34	592.182	0.0574	3.499	6.104
	0.8		40		0.0675	3.853	
	0.6		50		0.0844	4.626	
	0.4		70		0.1182	6.321	
	0.2		130		0.2195	12.297	
1	333	46.6	672.35	0.0693	5.119	8.1089	
0.8		55		0.08102	5.717		
0.6		70		0.1041	7.25		
0.4		100		0.1487	10.295		
0.2		200		0.2974	25.13		
S2A4MP	1	293	12	423.3	0.0283	0.807	2.382
	0.8		15		0.0354	1.016	
	0.6		20		0.0472	1.404	
	0.4		30		0.0708	2.158	
	0.2		70		0.1653	6.528	
	1	303	14	470.861	0.02973	0.867	2.759
	0.8		17		0.03610	1.082	
	0.6		23.33		0.0495	1.547	
	0.4		35		0.0743	2.387	
	0.2		85		0.1805	7.912	
	1	313	17	535.52	0.0315	1.025	3.231
	0.8		22.5		0.0417	1.403	
	0.6		30		0.0557	1.922	
	0.4		47.5		0.0882	3.40	
	0.2		100		0.1856	8.409	
	1	323	22	610.982	0.0360	1.345	3.6184
	0.8		26.25		0.0429	1.538	
	0.6		35		0.0572	2.082	
	0.4		55		0.0900	3.565	
	0.2		120		0.1964	9.562	
1	333	25	664.84	0.03760	1.423	4.1022	
0.8		30		0.04512	1.698		
0.6		40		0.06016	2.307		
0.4		62.5		0.0940	3.905		
0.2		140		0.2105	11.178		

It was noted that, in all the bases (compounds), the increase in temperature is accompanied by an increase in the value of Ka, in other words, the

acidity of the compound increases with the increase of temperature.

It was also seen that, at the range of temperature, (20-60C°), the increase of various acidities in the

following order $S3AP > S2AP$ and $S2A3MP > S2A4MP$ and in general following this sequences $S3AP > S2AP > S2A3MP > S2A4MP$.

This variation is realized due to the following:

A. There is a direct relationship between the ionization constant and the value of the ϵ_{max} [15], where the latter increases meaning an increase of the planarity of the compound (base) and an increase in the capacity of the base as the donor electrons and to ease its ability to ionize, hence a loss of an acidic proton which leads to increasing acidity.

This interpretation is applied to all of the studied compounds. This is proved through the values of ϵ_{max} as illustrated in Table (2).

B. It can be seen that the value of acidity of compound S3AP is higher than S2AP. In the meta position in compound S3AP, The lone electronic pair of present on the nitrogen atom is not resonance impressive in the meta position while impressively inter - resonance in the ortho position, which reduces the acidity of the compound. While in the case of meta no electronic donating through resonance is present but only there is an electronic withdrawal by induction that exists due to the relatively high electronegativity of nitrogen.

In the case of the compounds S2A3MP and S2A4MP, the former is more acidic than the latter, The reason is thought to be that the existence of CH₃ group in the ortho position does not make the pyridine ring in the same plane as with Salysilidine, therefore, the inductive effect through pushing electrons is weak in comparison with the para where electronic pushing operates freely on the planer system of the salicylidine and pyridine ring. As a result, the inductive effect in compound S3AP is higher and it is more acidic. After that comes the S2AP compound were in both the inductive and resonance cases, acidity is reduced. The two compounds discussed so far are more acidic than

the compounds S2A3MP, S2A4MP, since in the last compounds, there is a denoting CH₃ group which operate to reduce their inductive and acidities as a result, as mentioned previously.

Finally, it is believed that, both reasons (a and b) cause the change of the acidity sequences mentioned above.

The results obtained so encourage the thermodynamic study of ionization reaction of acids (S3AP, S2AP, S2A3MP, S2A4MP).

The thermodynamic functions ΔG° of the ionization reaction were calculated at five different temperatures using equation (5).

$$\Delta G^\circ = -RT \ln K_a \dots \dots (5)$$

The ionization enthalpy variation ΔH° of the studied acids were determined by applying the Vant Hoff equation (equation (6))

$$\ln K_a = \text{constant} - \frac{\Delta H}{RT} \dots \dots (6)$$

The plot of $\ln K_a$ versus $\frac{1}{T}$ gives straight lines for the acids under concentration with correlation coefficients R^2 in the range of (0.975-0.993) as shown in figure (3).

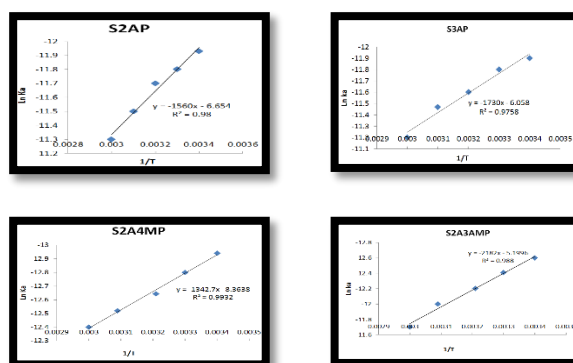


Figure (3) Relation between $\ln K_a$ versus $1/T$ for S2AP, S3AP, S2A3MP and S2A4MP

Finally the variation in entropy ΔS° of ionization reaction of acids under consideration using equation (7).

$$\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ \dots \dots (7)$$

Table (6) : the thermodynamic functions of ionization reactions of the studied compounds at various temperature in the range (293-333K).

Symbol of compound	Temperature	ΔH KJ/mol	ΔH° KJ/mol	ΔG KJ/mol	ΔG° KJ/mol	ΔS KJ/mol	ΔS° J/mol
S3AP	293	14.206	14.398	28.964	30.164	-50.366	-50.366
	303	14.464		29.725		-50.366	
	313	14.656		30.420		-50.366	
	323	14.533		30.801		-50.366	
	333	14.398		30.924		-50.366	
S2AP	293	12.827		29.037		-55.321	
	303	12.963		29.725		-55.321	

	313	13.209	12.974	30.524	30.29	-55.321	-55.321
	323	13.174		31.043		-55.321	
	333	12.72		31.146		-55.321	
S2A3MP	293	17.980	18.102	30.64	31.628	-43.224	-43.224
	303	18.14		31.23		-43.224	
	313	18.08		31.61		-43.224	
	323	18.26		32.22		-43.224	
	333	18.05		32.44		-43.224	
S2A4MP	293	11.149	11.152	31.521	32.92	-69.53	-69.53
	303	11.177		32.245		-69.53	
	313	11.129		32.892		-69.53	
	323	11.163		33.621		-69.53	
	333	11.176		34.33		-69.53	

Looking throughout the results obtained in Table (6), the following remarks are indicated:

1. The values of ΔG° of the ionization reaction are positive indicating that the reactions are non-spontaneous. This can be referred to the fact that the acidic phenolic group present in such compounds contain covalent bond which is difficult to be ionized in water.
2. The values of ΔH° with positive change indicate that the ionization reactions are endothermic processes.
3. The values of ΔS° are negative. This case is opposite to the theory of this work in which entropy of the product is increased with respect to the reactant of the ionization reaction. This can be interpreted as a result of the interactions among the solvent molecules with the produced molecules from the ionization reaction. That leads to an increase in the entropy of the product or as a result of the possibility of the presence of hydrogen bonds especially in the intra molecular interactions. This result is supported by previous studies [7,14,16-17].

Effect of Temperature

This work included a study [18] of the impact of enclave temperature change between (20-60°C) on the equivalent conductance at infinite dilution and according to the relation (8).

$$\Lambda_{\infty}(t) = \Lambda_{\infty}(25) + B\Lambda_{(25)}(t - 25) \dots \dots (80)$$

When $\Lambda_{\infty}(t)$ is the equivalent conductance at infinite dilution of solution at any temperature, $\Lambda_{\infty}(25)$ is a conductance at infinite delusion at 25 c° and B is a constant.

When plotting the relationship between $\Lambda_{\infty}(t)$ versus (t-25), straight lines are obtained as shown in figures (4) with correlation coefficient (R^2) in the range of(0.992- 0.995). When calculating the values of B from the equation (8), the following values (0.0177, 0.0129, 0.0150 and 0.0139) are obtained for the compounds ((S2A P, S3A P, S2A3MP and S2A4M P) respectively. Where it was reached to a

conclusion that there is a direct correlation between the temperature and the equivalent conductance $\Lambda_{\infty}(t)$ for the acids under study.

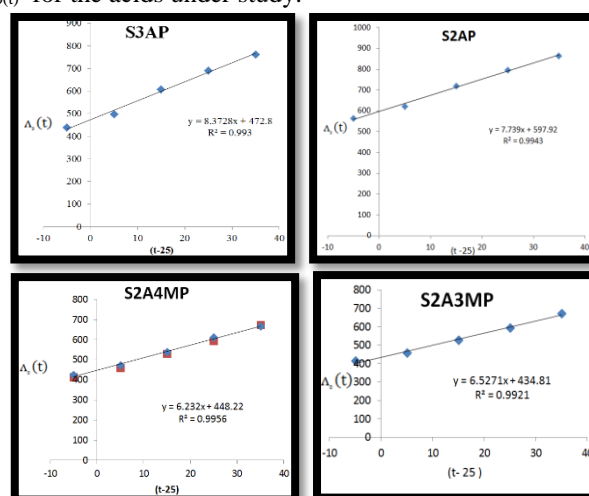


Figure (4): The relation between $\Lambda_{\infty}(t)$ and (t-25) of the studied compounds

Effect of Solvent

A summary of the studies [19] have proved that, the best solvent used to appoint the ionization constant for different compounds acidic or basic is water, because of its high value of the dielectric constant value when compared with respect to the other solvents and according to equation.

$$F = \frac{q_1 q_2}{dr^2} \dots \dots (9)$$

Where F is the ionization energy, q_1 and q_2 are the positive and negative charges of acid respectively, d is dielectric constant of the medium and r is the distance between the positive and negative ions.

It is clear from the equation (9) that the relationship between the ionization energy and the dielectric constant is an inverse relationship that explains easy ionization of acids or organic bases in the water.

One of problems that accompany using the water as a solvent is often difficulties is dissolving the acidic and basic organic compounds. So researchers

resorted to add alcohol to water during measurement of ionization constant of any organic compound in order dissolve the organic compound. The relative error caused by Alcohol in the value of

(Ka) is almost constant in all studies, which can be neglected, so it does not affect the pattern and direction of change outcomes.

Table (7) the equivalent conductance, ionization degree for compounds (S3AP and S2AP) in ethanol solvent

Conc. 10^{-3} equiv./L ⁻¹	T ^o . K	Λ_c of Acid $ohm^{-1} cm^2.equiv.^{-1}$	Λ_c of Acid $ohm^{-1} cm^2.equiv.^{-1}$	Λ_o of Schiff base $ohm^{-1} cm^2.equiv.^{-1}$	α	$Ka^* 10^{-9}$	$Ka^* 10^{-9}$
S3AP	1	293	2.5	437.83	5.709	7	60.8
	0.8		2.8		6.395	31	
	0.6		4		9.135	50	
	0.4		7.25		16.558	104	
	0.2		14.5		33.117	112	
	1	303	2.6	497.7	5.224	27	90.4
	0.8		3.125		6.278	30	
	0.6		5		10.046	60	
	0.4		8.25		16.576	110	
	0.2		16.5		33.152	225	
	1	313	3.5	605.97	5.775	35	109
	0.8		4		6.600	35	
	0.6		7		11.551	75	
	0.4		11		18.152	133	
	0.2		22		36.305	269	
	1	323	5	690.3	7.243	52	122.6
	0.8		6		8.691	60	
	0.6		8		11.589	73	
	0.4		13		18.832	144	
	0.2		26		37.664	284	
1	333	6	760.17	7.892	62	141.6	
0.8		7		9.208	68		
0.6		10		13.154	104		
0.4		15		19.732	158		
0.2		30		39.464	316		
S2AP	1	293	1	565.1	1.769	3	51.4
	0.8		2		3.539	10	
	0.6		4		7.078	30	
	0.4		7.5		13.271	70	
	0.2		15		26.543	144	
	1	303	1.5	622.16	2.410	5	62.4
	0.8		2.5		2.018	12	
	0.6		5		4.036	39	
	0.4		9		14.465	84	
	0.2		18		28.931	172	
	1	313	2	720.92	2.774	7	73
	0.8		3		4.161	13	
	0.6		6		8.322	41	
	0.4		12		16.645	112	
	0.2		22		30.516	192	
	1	323	2.5	797.38	3.135	9	86.4
	0.8		4		5.016	20	
	0.6		8		10.016	60	
	0.4		14		17.557	124	
	0.2		26		32.606	219	
1	333	4	864.44	4.627	21	100	
0.8		5		5.784	26		
0.6		9		10.411	65		
0.4		16		18.509	139		
0.2		30		34.704	249		

Table (8) the equivalent conductance, ionization degree for compounds (S2A3MP andS2A4MP) in ethanol solvent

Conc. 10 ⁻³ equiv/L ⁻¹	T ^o . K	Λ_c of Acid ohm ⁻¹ cm ² .equiv. ⁻¹	Λ_c of Acid ohm ⁻¹ cm ² .equiv. ⁻¹	Λ_o of Schiff base ohm ⁻¹ cm ² .equiv. ⁻¹	α	Ka*10 ⁻⁹	Ka*10 ⁻⁹
S2A3MP	1	293	0.6	412.95	1.452	2	24.8
	0.8		0.75		1.816	2	
	0.6		1		2.421	3	
	0.4		3		7.264	21	
	0.2		9		21.794	96	
	1	303	0.8	458.271	1.745	3	27.8
	0.8		1		2.182	3	
	0.6		1.5		3.273	6	
	0.4		4		8.728	30	
	0.2		10		21.821	97	
	1	313	1.2	527.84	2.273	5	35
	0.8		1.5		2.841	6	
	0.6		2		3.789	8	
	0.4		6		11.367	51	
	0.2		12		22.734	105	
	1	323	1.5	592.182	2.533	6	46.8
	0.8		2		3.377	9	
	0.6		3		5.066	15	
	0.4		8		13.509	73	
	0.2		15		25.330	131	
1	333	1.8	672.25	2.677	7	54.6	
0.8		2.5		3.718	11		
0.6		4		5.942	21		
0.4		10		14.873	88		
0.2		18		26.771	146		
S2A4MP	1	293	0.2	423.3	0.472	0.223	15.846
	0.8		0.5		1.181	1	
	0.6		0.66		1.559	1	
	0.4		1.5		3.543	5	
	0.2		8		18.899	72	
	1	303	0.3	470.861	0.637	0.406	21.081
	0.8		0.6		1.274	1	
	0.6		1		2.123	2	
	0.4		2.5		5.309	11	
	0.2		10		21.237	91	
	1	313	0.5	538.52	0.928	0.862	29.572
	0.8		1		1.856	2	
	0.6		1.5		2.785	4	
	0.4		4		7.427	22	
	0.2		13		24.140	119	
	1	323	0.8	610.982	1.309	1	43.8
	0.8		1.5		2.455	4	
	0.6		2.5		4.091	10	
	0.4		5		8.183	2	
	0.2		18		29.460	178	
1	333	1	664.84	1.504	2	58	
0.8		2		3.008	7		
0.6		3		4.512	12		
0.4		7		10.528	44		
0.2		22		33.090	225		

Table (9) The relative Constant at certain temperatures of the studied compounds

Compound	$K' r = \frac{k_a \text{ ethanol}}{k_a \text{ water}} * 10^3$	T. K
S2AP	7.78	293
	8.37	303
	9.11	313
	9.06	323
	7.72	333
S3A P	8.94	293
	12.10	303
	13.06	313
	11.75	323
	10.04	333
S2A3M P	7.25	293
	6.81	303
	6.66	313
	7.67	323
	6.74	333
S2A4M P	6.65	293
	7.66	303
	9.15	313
	12.13	323
	14.1	333

The relative Kr was calculated after installing temperature and the molecular formulae of the acid. This study confirms that the alcohol molecularly dissolve [20](solvation) the negative ions of acids more than dissolving the original ion. In other words, the number of alcohol molecules surrounding the negative ion is more than the non-ionized molecules. The value of the dielectric constant (D) of the ethanol 100% at absolute temperature (T) was calculated from the relationship after alteration to suit different temperature, turns to:

$$\text{Log } D = 1.3976 - 0.00264 (t-20) \dots\dots (10)$$

The Drawing of the relationship between pKa against the dielectric constant (D) at different temperatures [21] gives the figures (5) which reflected off the direct relationship between pKa and the dielectric constant at various temperatures:

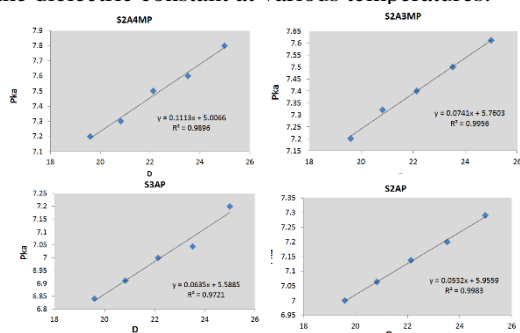


Figure (5) : The relation between the Pka versus the dielectric constant of the studied compounds

Conclusions

Finally, a conclusion can be reached that the acidity of all compounds contained in this study had declined after the change from water to the Ethyl alcohol in five different temperatures. The reason for that can be attributed to the value of dielectric constant of Alcohol to be less than water, due to difficult the ionization of compounds leading to clearing acidity.

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References

- [1] Divya, K., Pinto, G.M. and Pinto, A.F., 2017, Application of metal complexes of Schiff bases as an antimicrobial drug: a review of recent works. *Int. J. Curr. Pharm. Res*, 9(3), pp.27-30.
- [2] Zi, Q.X., Yan, S.J., Yang, C.L., Li, K. and Lin, J., 2019. "Three-Component Cascade Reaction of 1, 1-Enediamines, N, N-Dimethylformamide Dimethyl Acetal, and 1, 3-Dicarbonyl Compounds: Selective Synthesis of Diverse 2-Aminopyridine Derivatives". *ACS omega*, 4(2), pp.2863-2873.
- [3] Azzouz, A.S.P., Al-Ghabsha, T.S. and Agha, A.O., 2011. Kinetic and thermodynamic study on tautomerism of dyes formed by reactions of aromatic imines with diazotized sulphanic acid", *PCAIJ*, Vol. 6, pp.
- [4] Azzouz, A.S.P., Hussin, M.A. and Al-Dabbagh, M.G., 2010. "Thermodynamic Study on tautomerism reactions of some benzoin compounds by halogen titration method" *Iraqi National Journal Of Chemistry*, (38), pp.361-372.
- [5] Saleem, L.M.N. and Sultan, R.H., 2014. "Keto-Enol Tautomerism of Schiff-bases derived from 2-Hydroxy naphthaldehyde and substituted aniline with LSR Pr (fod)". *3. International Journal of Enhanced Research in Science Technology & Engineering*, (3), pp.167-172.
- [6] Vogel, A.I., Furniss, B.S., Hannaford, A.J., Smith, P.W. and Tatchell, A.R., 1989. "Vogel's textbook of practical organic chemistry" (Vol. 5). New York: Longman Scientific & Technical.
- [7] M Gh AE AL-Dabbagh, M., 2014. "Determination of pKa for some Schiff bases derived from benzaldehyde and amino phenols by conductivity measurement". *JOURNAL OF EDUCATION AND SCIENCE*, 27(1), pp.1-15.
- [8] Zevatskii, Y.E. and Selitrenikov, A.V., 2013. "Conductometry of solutions of very weak electrolytes and dibasic acid solutions". *Russian Journal of General Chemistry*, 83(5), pp.884-892.
- [9] Han, L., Zhang, K., Ishida, H. and Froimowicz, P., 2017. "Study of the Effects of Intramolecular and Intermolecular Hydrogen-Bonding Systems on the Polymerization of Amide-Containing Benzoxazines". *Macromolecular Chemistry and Physics*, 218(18), p.1600562.
- [10] R.Silverstein, F.Webster et al, 2014. "Spectrometric Identification of organic compounds", eight ed. Wiley, United States, 464 pp. ISBN: 978-0-470-61637.).

- [11] Al-Bakzo, D.B.T., 2014. "Potentiometric study for Determination of values for Schiff bases derived from 2-acetyl pyridine with heterocyclic amines". *Iraqi National Journal Of Chemistry*, (54), pp.152-164.
- [12] Martínez, L., 2018. "Measuring the conductivity of very dilute electrolyte solutions, drop by drop". *Quimica Nova*, 41(7), pp.814-817.
- [13] Masa, J., Barwe, S., Andronesco, C. and Schuhmann, W., 2019. "On the theory of electrolytic dissociation, the greenhouse effect, and activation energy in (Electro) catalysis: a tribute to Svante Augustus Arrhenius". *Chemistry–A European Journal*, 25(1), pp.158-166.
- [14] AL-Hyali, E.A., Al-Taai, F.M. and Othman, S.S., 2018. "Thermodynamic and Theoretical Studies of average Ionization Constants of a Number of Phenolic Schiff Bases Derived from Salicylaldehyde by Conductivity Measurements". *JOURNAL OF EDUCATION AND SCIENCE*, 27(3), pp.46-70.
- [15] Majer, J.R. and Azzouz, A.S., 1983. "Mass spectrometric study of the isomerism of aromatic aldoximes". *Journal of the Chemical Society, Faraday Transactions 1: Physical Chemistry in Condensed Phases*, 79(3), pp.675-688.
- [16] Bakzo, D.P. and Azzouz, A.S.P., 2014. "Thermodynamic study on pKa values of some imines and their acids conjugate derived from different aromatic carbonyl compounds". *Iraqi National Journal Of Chemistry*, (53), pp.43-55.
- [17] AL-Memary, K.A., Al-Hyali, E.A. and Toohi, H.T.A.S., 2019. "Adsorption of New Azo Dyes Derived From 4-Aminoantipyrine from Aqueous solution by A New Type of Activated Carbon: Equilibrium and Kinetic Studies". *Research Journal of Pharmacy and Technology*, 12(3), pp.1206-1218.
- [18] Maron, S.H., Lando, J.B. and Prutton, C.F., 1974. *Fundamentals of physical chemistry*. Prentice Hall, pp.466.
- [19] Hine, J., 1960. "Physical organic chemistry". *Annual Review of Physical Chemistry*, 11(1), pp.65-86.
- [20] Masood, S., Saeed, R. and Khan, S.R., 2013. "Conductometric and Thermodynamic Study of Copper and Nickel Sulfate in Aqueous Methanol Systems". *J. Mater. Phys. Chem*, 1(4), pp.69-75.
- [21] Atique Ullah, A.K.M., Akter, M. and Hossain Firoz, S., 2014. "Thermodynamic Dissociation Constants of Propionic Acid in Water and 1-Propanol Mixtures between 303.15 and 323.15 K". *Journal of the Chemical Society of Pakistan*, 36(6).