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RESEARCH ARTICLE

Study the Effect of Immobilization on Electrostatic potential for Methylene blue dye.

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Abstract

In this study, Immobilized of methylene blue dye from their Aqueous solution on the surface of the glass wool. Usedspectroscopy UV rays in the appointment of this dye adsorption isotherms, It was clear from this isotherms that the amount of adsorption directly proportional with increase concentration. Also studied the effect of acidic pH function on the adsorptioncapacity forthis dye on the surface of glass wool in three values (3,7,1) has been shown to the highest adsorption capacity of the dye was in pH (3) And at least pH (1). Also studied effect of the immobilization on the acid function of the pH values for this dye before and after the of titration with 1M HCl.

Introduction:-

In recent years, researchers interested in different spectral studies for acids and bases, such as spectra of UV [1-2] , IR [3] , NMR [4, 5] and spectra of mass [6] along with other studies included on the bloc [7.8] and measure constants of ionization values [9.10] .The researchers were sure that the voltammetry method [11]It is the best and used when studying the acidic pKa for many acids and bases and at different temperatures.It is curious to see in it Uncertainty because of pKa change with a changes in temperature. The study that in our hands Interested in the effect of compensators, implied hydrogen bonds and factor of Obstruction stereoisomers on the pKa values [12] for the acids and bases.And Interested in as well In the effect of temperature and ionic strength on the electrolytes ionization constants. When Was acidic constants Ka is a form of equilibrium constants for reactions of ionized acids or bases,therefor developed a general and comprehensive plan to study the effecting factors on the physical constants for the acidic compounds under study.

Experimental Part:-

1. Used methylene blue dye purity of 97% From company (Merck). Was selected adsorption surface from glass wool used as insulation In the water heaters, which consists mainly From silica SiO2 where wool was chosen based on the general characteristics as light weight and having a white solid pillar and it is a good surface for the adsorption of the dyes different charge , Were wash process for glass wool and cleaning it From dirt in it and dried by the laboratory degree heat.
2. Prepare different concentrations From aqueous solutions of this dye between (2-12) ppm and measuring the absorbance of these solutions by Spectrophotometer TRSP - 72 .and obtain calibration curves after limited the value of λ max at 620 nm by using water as a solvent In the 30c°.
3. After that immobilized dyes with a concentration From (2-12) ppm on the surface of glass wool by putting equal weights from glass wool pieces In the equal volumes of different concentrations for dye for 24 hours and at a temperature of 25 c°.
4. Was measured acidic function (pH) for Prepared solutions before and after the immobilization by using the pH instrument.
5. Then measured the absorbance for prepared solutions after immobilization.

6. Then calculate the pKa value and acidic function (pH) through calibration (20 ml) From prepared solutions with 0.1M HCl before and after the immobilization of methylene blue dye on wool glass.
7. After that calculate the pKa value and acidic function (pH) through titration volume (20 ml) From 2 ppm methylene blue dye with 1M HCl and repeat process of titration but by addition 5 ml of (0.001M, 0.010M, 0.100M) NaCl Each one individually to (20 ml) From 2 ppm methylene blue dye and titrated it with 1 M HCl before and after the immobilization of methylene blue dye on glass wool surface.

Results and Discussion:-

Through our study we conclude that the PH function for the solutions of methylene blue dye values are low a result of increased concentration values of the dye, as is evident through in Table (1-3) and Figure (1-3).

Table 1-3: Show Values of pH and concentrations of aqueous solution for methylene blue dye from (2-12)ppm.

Con.(ppm)	pH
2	7.161
4	7.074
6	6.872
8	6.964
10	7.606
12	8.85

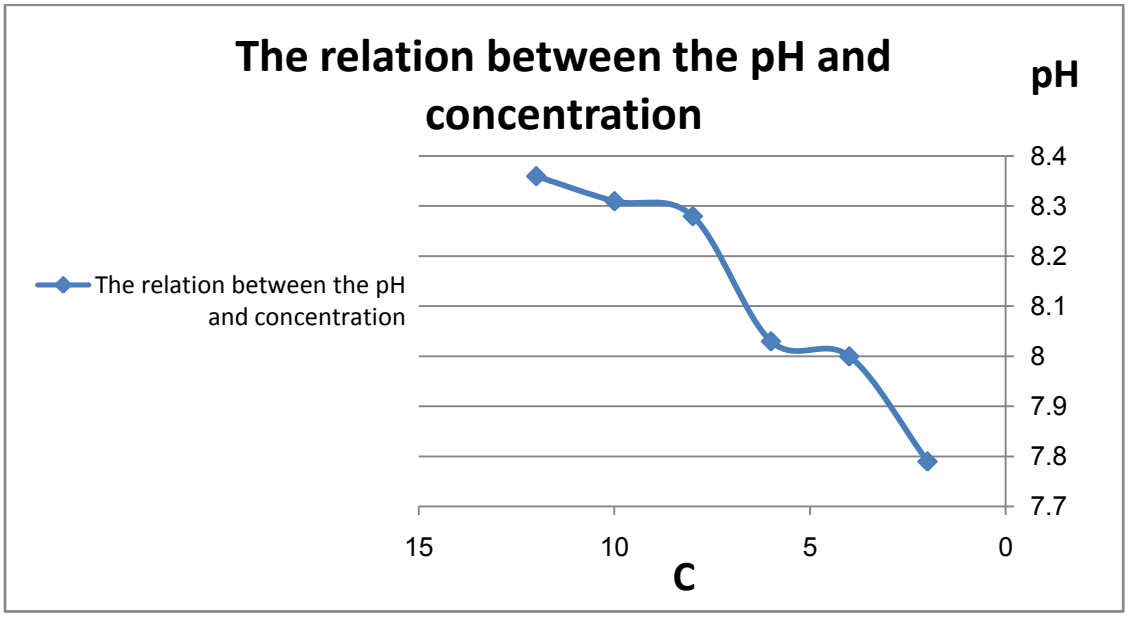

Figure 1-3: The relation between the pH and concentration of methylene blue dye.

And also absorption increases with the concentration of methylene blue dye as in the table No.(2-3) and Figure(2-3).

Table 2-3: Show Values of Absorption and concentrations of aqueous solution for methylene blue dye from (2-12) ppm.

Con.(ppm)	**Absorption**
2	0.197
4	0.386
6	0.569
8	0.703
10	0.845
12	1.052

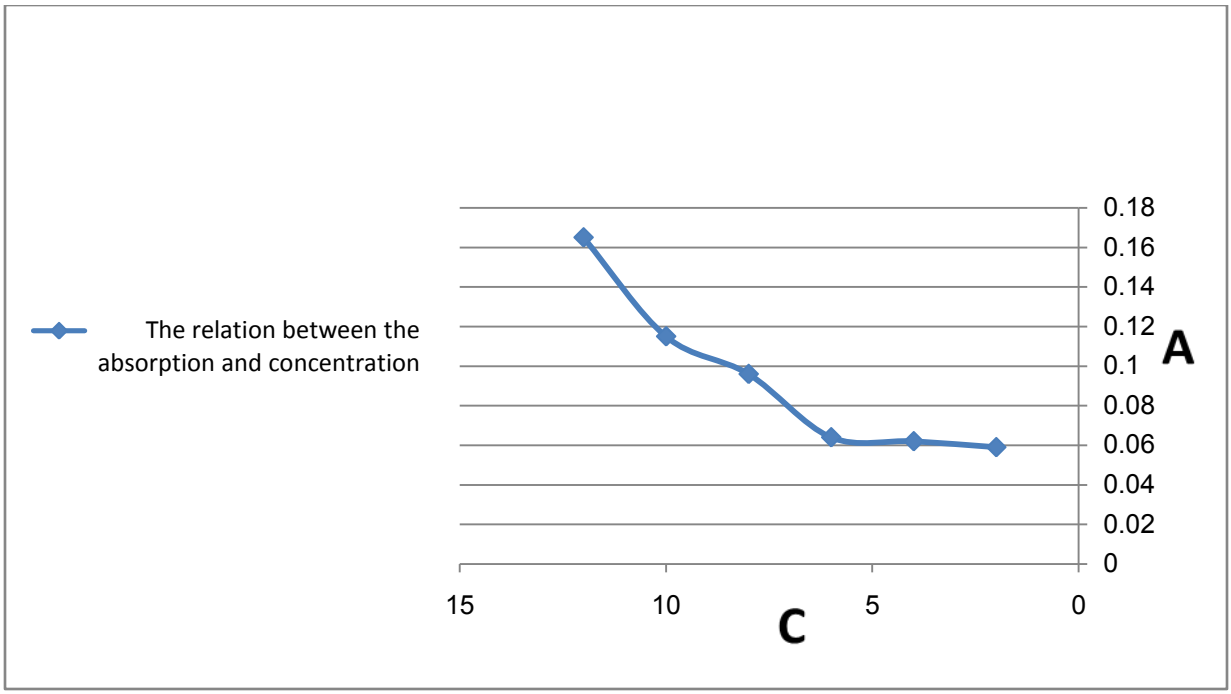

Figure 2-3: The relation between the absorption and concentration of methylene blue dye before immobilization with glass wool .

If we compare these results after the immobilization of methylene blue dye on the surface of glass wool We conclude that the immobilization effected on changing the acidity properties Of aqueous solutions for the methylene blue dye, we find that the value of pH for aqueous solutions of dye after immobilization increased with concentration and this shows the low acidity as a result of the immobilization as in Table (3.3) and Figure (3.3).

Table 3-3: Show Values of pH and concentrations of aqueous solution for methylene blue dye from (2-12)ppm with glass wool.

Con.(ppm)	PH
2	7.79
4	8.00
6	8.03
8	8.28
10	8.31
12	8.36

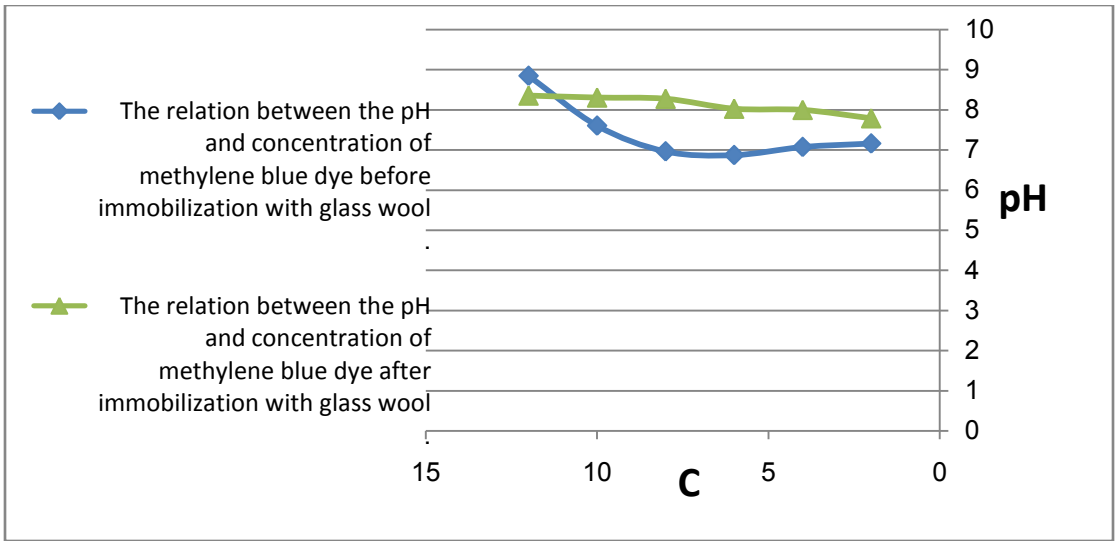

Figure 3-3: The relation between the pH and concentration of methylene blue dye before and after immobilization with glass wool .

While the absorbance increases with concentration as in Table (4.3) and Figure (4-3) , but the absorbance values are low after Immobilization if compared with those before Immobilization.

Table 4-3: Show Values of Absorption and concentrations of aqueous solution for methylene blue dye from (2-12)ppm with glass wool.

Con.(ppm)	Absorption
2	0.059
4	0.062
6	0.064
8	0.096
10	0.115
12	0.165

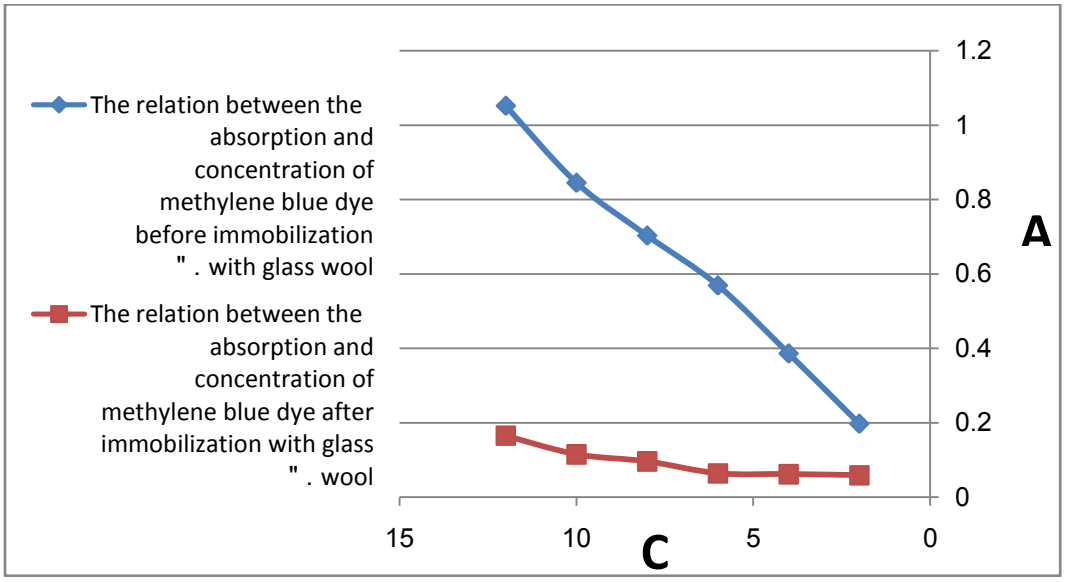

Figure 4-3: The relation between the absorption and concentration of methylene blue dye before and after immobilization with glass wool .

After that calculated electrostatic potential,by depending on ionic strength and according to the following mathematical relation.

$$I = 1/2 \sum Z^{j}2C^{j}$$

And by depending on set of physical constants was found relation from it through calculated electrostatic potential values for methylene blue dye by depending on pKa value.

$$K_a = \frac{a(H_3O^+)\cdot a(A^-)}{a(HA)} = \frac{a(H_3O^+)\cdot [A^-]\cdot f(A^-)}{[HA]\cdot f(HA)}$$

$[HA] \cong [A^-]$,

$$K_a = \frac{a(H_3O^+)\cdot [A^-]\cdot f(A^-)}{[HA]\cdot f(HA)} = \frac{a(H_3O^+)\cdot f(A^-)}{f(HA)}$$

$$-\lg K_a = -\lg a(H_3O^+) - \lg \frac{f(A^-)}{f(HA)}$$

$$(pK_a)_{эксп} = pH = pK_a + \lg \frac{f(A^-)}{f(HA)}$$

ΔGa= - RTlnKa = - 2.3RtpKa

Δφ = - 2.3RTpKa / F

pKa = - 2.3RT Δφ/ F

Δφ = φ2 – φ1

φ2 = φ1 + Δφ

φ1 M.v = Z e /4πεε$_o$r = 29.6 мv

Z=Charge Z=+1

e = Charge of electron = 1.6 * 10^{-19} col

ε= =81 , ε$_o$= =8,854 . 10^{-12}

φM.v = 29.6 +Δφ

Table 5-3: Show Values of pKa and Electrostatic potential before immobilization methylene blue dye on glass wool.

pka1	Δpka1	Δϕ	Φ	I
2.7	0	0	29.6	0
2.5	-0.2	11.74	41.34	0.001
2.3	-0.4	23.48	53.08	0.01
2.1	-0.6	35.22	64.82	0.1

Table 6-3: Show Values of pKa and Electrostatic potential after immobilization methylene blue dye on glass wool.

Pka2	Δpka2	Δϕ	Φ	I
2.3	-0.4	23.48	53.08	0
2.4	-0.3	17.61	47.21	0.001
2.6	-0.1	5.87	35.47	0.01
2.7	0	0	29.6	0.1

From our study for effect ionic strength on pKa and it effect on electrostatic potential was found that electrostatic potential increased with ionic strength for methylene blue dye before immobilization While electrostatic potential decrease with increase ionic strength as in Table (5.3), (6.3) and Figure (5-3)

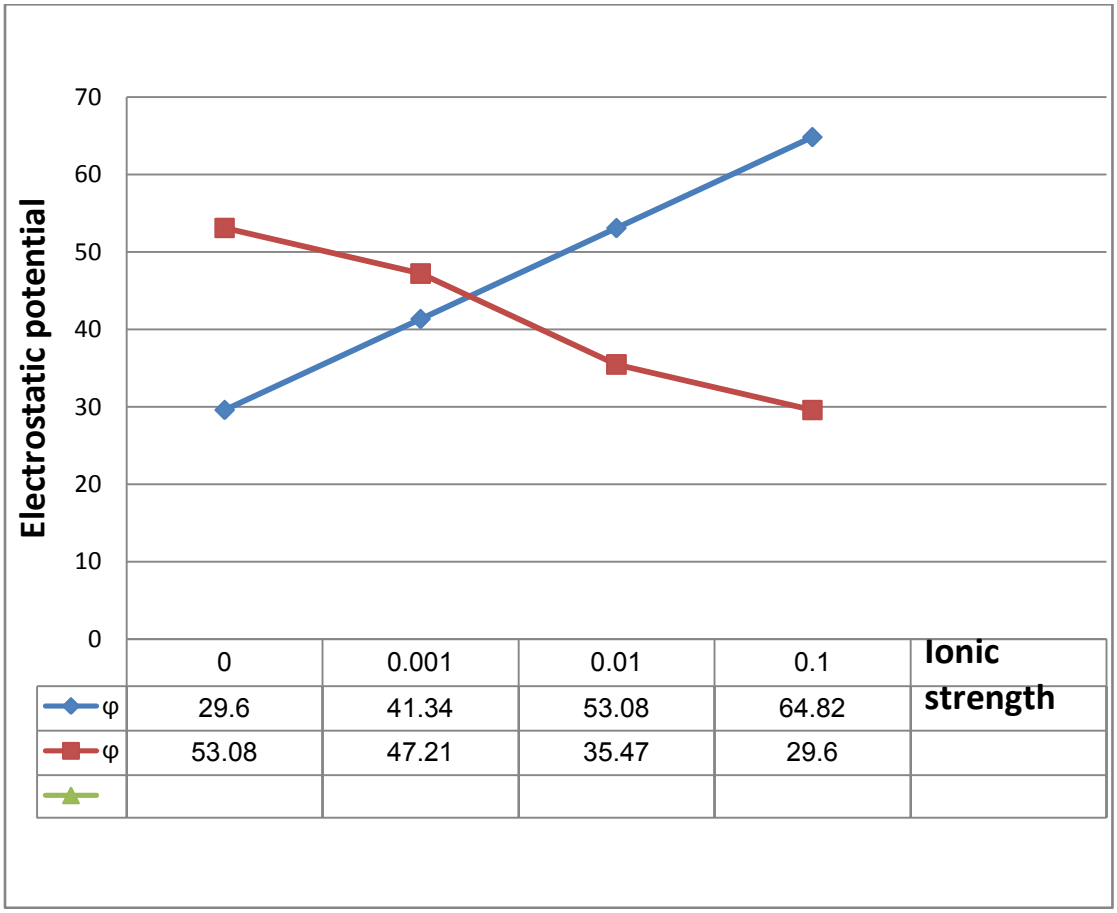

Figure 5-3: The relation between the electrostatic potential and ionic strength of methylene blue dye before and after immobilization with glass wool .

Conclusions:-

1. When immobilized methylene blue dyethePH value changed to more acidic region.
2. The change in value of Pka related by electrostatic potential effect therefor value of electrostatic potential increasing with Pka value after immobilization.
3. Conclude that the ionic strength effected on the value Pka where pka value of methylene blue dye decreased with increasing ionic strength before immobilization while we find that the value ofpka for indicator methylene blue increases with ionic strength after the immobilization.

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