Saltiness effect on the ability of conocarpus charcoal for adsorption of some ketonic compounds from their aqueous solution.

تاثير الملوحة على قابلية سطح الكاربس في امتزاز بعض المركبات الكيتونية من محاليلها المائية

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Abstract:

In this study a UV visible spectrophotometric technique was applied to study the adsorption isotherms of acetophenone, 2-aminoactophenone, 3-amino acetophenone, 4-aminoacetophenone, 4-chloro acetophenone, 4-methy acetophenone , 2-hydroxyl acetophenone, and 4-hydroxy acetophenone in aqueous solutions using conocarpus charcoal as selective adsorbent. The efficiency degree of the adsorption on the conocarpus charcoal in the natural form was investigated.The salting effect on the adsorbed amount of acetophenone and their derivativecompoundswas also investigated.The adsorption isotherms of the acetophenone and their derivative compounds in this study are marked by similar to S model according to Gills classification. The adsorption on the surface of charcoal obey Freundlich equation rather than other equations, since the adsorption is physical chemistry.In this study X-ray diffracted spectroscopy XRD technique was also applied to this study.The results shows that the adsorption of acetophenonedervitaves compounds increase as the amount of salt increased

الملخص:

تم في هذه الدراسة تتبع سلوك الامتزاز لبعض المركبات الكيتونية على سطح فحم الكاربس والذي استخدم لمعرفة مدى كفاءة السطح لامتزاز هذه المركبات في الظروف الاعتيادية وايضا تحت تاثير الملوحة على عملية الامتزاز لتحديد مدىتاثير وجود كمية بسيطة من الكتروليتNaCl في عملية الامتزاز مقارنة بالوسط الاعتيادي للامتزاز.

وتم تتبع عملية الامتزاز لهذه المركبات في الوسط الاعتيادي وفي الاوساطالمالحة على سطح الفحم باستخدام تقنية الامتصاص للاشعة الفوق بنفسجية والمرئية وذلك لغرض الحصول على ايزوثيرمات الامتزاز والتي كانت مشابهة للنوع (s) على حسب تصنيف جيلز(Giles) وكانت معادلة فريندلش للامتزاز الاكثر ملائمة في التطبيق حيث الامتزاز من النوع الفيزيائي.

كما تمت دراسة طبيعة السطح الماز (فحم الكاربس) بشكله الطبيعي، وايضا تحت تاثيرالملوحة على الامتزاز باستخدام جهاز مطيافية الاشعة السينية بالحيود (XRD)

وتمت دراسة تاثير الملوحة في الامتزاز واوضحت الدراسة ان الامتزاز يزداد بزيادة ملوحة المحلول وذلك لجميع المركبات الكيتونية الخاضعة للدراسة على سطح فحم الكاربس

Introduction

It has been clear that adsorption is of great significance , although many researches published in this field, yet many of the studies dealt with this subject are concerned with carbon surfaces non – polar uniform[1-5] after using spectroscopic analysis and developing methodology of adsorption studies that helped studding adsorption on other surfaces of not less importance of carbon [6-10], Its found thatcharcoal takes the first position among the solid substance used as adsorbent surfaces in adsorption process that because charcoal has high porous structural [11-12] which is different from one plant to another making adsorbent surface area very high, this is needed several industries . The prepared charcoal is considered one of the most surfaces on account of less expenditure and easy adaptation compared with other surfaces . Conocarpus charcoal produces high capacity in adsorption process and this is study subjec . Adsorption process between solution and adsorbent solid substance is very crucial,understanding the process is still limited . Adsorption process from solution more difficult by handling it in theory comparing with adsorption of gases on solid substances.It can be imagined that adsorption electrolytic materials in differentiating surface between solution and solid substance. In two different ways, first one adsorption conducted on one molecular layer is on contact with solid substances surface, The other layers below the first situated inside in the solution , has weak connection with adsorbate layer, this conception likes, to great extent, chemical adsorption for gases on solid substances .It involves decreasing mutual action between the solute and solid substances , with increasing solute particles distance from surface of solid substance on the contrary to the chemical adsorption that has less or almost the same adsorption heat in the solution.Whereas the second way it involves making adsorption layer of density of several molecules that the mutual action between the solute and solid substance surface decreases ,when exceeding like this density. Decreasing is gradual and this is like physic adsorption of vapors on the surface of solid substances where adsorption becomes multiple molecules at reaching vapor pressure, according to this concept adsorption is a process distributing the solute between liquid size and interference surfacephase. It is influenced by temperature and concentration as well as adsorption quantity decreased, in general, with increasing temperature and increases with increasing concentration(13). The basis of accompanied theory advancing for adsorption phenomena was put in 1916 , when Langmuire(14) assumes adsorption for one molecular surface layer on the surface of adsorbent substance where he depreciates reactions between adsorbate particles in the low coverage surface by this increases the adsorption substance quantity fast in the beginning of adsorption then it becomes steady gradually because of desorption process. It means leaving adsorption molecules the surface when adsorption rate equates the desorption rate, the process becomes inequilibriumstatus.

one of the most crucial equations used in adsorption from solution is Frendlish equation where all surfaces are considered heterogeneous on account of non-arrangement changes potential on it, since that adsorption positions have disparate levels of energy (15-16).Frendlish equation represents the change in amount of adsorbate substance $Q_e$upon area unit or adsorbent substance mass with of equilibrium.concentrationC_eStudies was carried out for some ketone , aldehyde compounds and other derivatives from aqueous solution on the surfaces of Kaoline and Bentonite(17-18) and Asphaltien(19), poly styrene (20-21), Alumina silicate (22), Silica gel (23), Acrylate co-polymer (24), Commerical activated carbon(25), and Carboxy methyl cellulose (26)

The Aim of Research

This research is aiming to useConocarpus charcoal in treatment of sanitation water and disposal of chemical contaminations , as well to study effect of saltiness on the competence of charcoal in the process of adsorption of ketonic compounds from their aqueous solution .

Experimental part

The adsorption surface is prepared ((conocarpus charcoal) by burning it at heat temperature around 500^0c for an hour in container evacuated from air , washed , dried and crushed then had undergone sift process to get the right amount which was 0.25mm, The standard solutions are supplied from adsorbatesubstance, with concentrations vary from (4-300) PPm according to every kind of compound and measured UV absorption spectra of fix wave length and drawing standard graph by using Beer Lamber'slaw.In order to determine the necessary time for adsorption equilibrium between adsorbent surface and adsorbate substance , it was chosen some concentrations fit for every compound in touch with (0.25g) from crushed charcoal of particle size(0.25mm) by heat degree 25^0C . Samples were taken from every compound in consecutive periods and analyze them to know the change in theconcentration , with time passing , the necessary time to have equilibrium is three hours

Theadsorbate amount wascalculated from the following relationship

$Q_e = (C_0 - C_e)\ V/m$ ------------- (1)
Q_e: great amount adsorbed (mg\g).
C_o: Initial concentration(mg\L).
C_e: concentration at equilibrium(mg\L).
V: The total volume of adsorbate substance(L).
m: adsorbent substance weight (gm).

Adsorption isotherm of ketoniccompounds solutions also has been studied which whichare used as adsorbate substancein the research. With three levels of saltiness by using sodium chloride (1N) and the conductivity was measured for these three levels , the result was different from one level to another , adsorption isotherm gained by impact of saltiness compared with adsorption isotherm for natural solution. Also it was used in the research the measuring device of X-ray diffraction (XRD) for adsorbent (Conocarpus charcoal) in its natural view , also the impact of saltiness on the surface of coal for comparing two situations.

Results and Discussions

It has observed the behavioradsorbateketoniccompounds on the adsorbente surface of charcoal from its natural solution, and comparing to adsorbate behavior of these compounds when simple amount electrolyte is available (NaCl) adsorption medium, at temperature degree 25 ^{0}C , the adsorption isotherm is determined for these compounds in both cases The results showed in the figure (1) and adsorption isotherm gained by ,through a relationship between (Q_e) , (C_e), that the adsorption of ketonic compounds on the surface charcoal of in usual solution status , and in the medium saltiness, follows Frendlish equation of adsorption in solution.

$Q_e = K_f C_e^{1/n}$ --------------------(2)

K_f= freudlish constant and represent the intensity of adsorption, n= represent the capacity of adsorption. This leads us for a conclusion that isothermal adsorption for these compounds understudy follows Freundlish equation for adsorption in solution(27).This study also shows saltiness impact in ketonic compounds on the charcoal surface and make a comparison to know the competence of adsorbent surface of charcoal when adding small amounts of electrolyte (NaCl) for solution comparing with charcoal competence in natural case adsorption medium, and this is done by using three saltiness media of different conductivity of the solutions:

(0.00 ohm $^{-1}$.cm^{-1} , 4.37ohm $^{-1}$ .cm^{-1} , 8.32ohm $^{-1}$ .cm^{-1} , 12.53ohm^{-1} .cm^{-1}

The first average was natural solution for adsorbatesolution without addingadding(NaCl) the measure of conductivity is hardly to mention for all compounds undergone for study , experiment results shown in table (1) for ketonic compounds on the charcoal surface while adsorption isotherm

shown in figures (1) till (8), figure (9) shows the diffraction of X-ray for Conocarpus charcoal surface in its natural view

that shows peaks that are not acute because of fusing materials and congregating on carbon surface , that influences in great extent on diagonal X-ray as it is showed in figure (10) the diagonal shows acute peaks due to existence of molecules NaC**l** and properties that adsorbent surface , in medium of saltiness, acquire where molecule surface NaC1 receives and influences on adsorption nature and how to accost and engage adsorbate molecules adsorbent surface . It can noticed in the figure (3-10) acute peaks proving the existence of molecules NaCl on the charcoal surface and reception of it, study results show that there is high activation of adsorption surface on charcoal for absorbing ketonic compounds when small amounts of (NaCl) is available in solutionviz there is great impact of saltiness about the adsorption ability compounds on charcoal surface. It is detected increasing adsorption amount with increasing solution saltiness comparing with adsorption amount in natural solution case .This is can be explained on the basis of these media, ions are available Cl^- , Na^+ added electrolyte that cause pressure for molecules prevailed paved the scope before molecules existed in solution to approach more to others and attracted in themselves because of vanderwaals interferences that make it easy to approach to the surface and amass greatly , thus leadsinto increasing adsorption percentage. There is another impact regarding adsorption of ions by stern layer where the value of surface potential will decrease,thus leads into approaching molecules to each other. On the other hand the reason behind increasing adsorption amount is osmotic effect which counts on density molecules charge and electrolyte concentration(28). It seems ionic concentration inside particles higher than in solution for existence osmotic effect trying to lessen concentration inside by taking solvent and this leads into swelling molecules in turn leads into opening porousness and approach to surface and a mass greatly thus leads into increasing adsorption percentage and big gaps make it spacious for receiving available molecules in solution greatly, this is what analysis results prove by X-ray spectroscopy diffraction by approaching to adsorbentsubstance used (charcoal) in saltiness experiments that is shown in the figure (10) these results point to the truth that the adsorbentsubstance receive molecules (NaCl) that add some properties on adsorbent substance help to garner new adsorbed molecules , which leads into increasing amount of adsorbate substance comparing with adsorbate amount in usual case for adsorption medium

Table (1) shows the results of adsorption of some ketone compounds on the surface of conocarpus in the natural state and in the presence of salt

	0.00 $ohm^{-1}cm^{-1}$		4.37 $ohm^{-1}cm^{-1}$		8.32 $ohm^{-1}cm^{-1}$		12.53 $ohm^{-1}cm^{-1}$	
C_o	C_e	Q_e	C_e	Q_e	C_e	Q_e	C_e	Q_e
25	5	20	5	20	4	21	5.2	22.5
50	18	32	15	35	13	37	10.5	39.5
75	30	45	28.75	46.25	27.8	47.2	21.25	53.75
100	43.5	56.25	38	62	38	62	33.5	66.5
125	59.375	65.625	54	71	50	75	48	77
150	73.75	76.25	73.75	76.25	66.25	83.75	68	82
175	89	86	80.625	94.375	77.5	97.5	75	100
2-aminoacetophenone								
	0.00 $ohm^{-1}cm^{-1}$		4.37 $ohm^{-1}cm^{-1}$		8.32 $ohm^{-1}cm^{-1}$		12.53 $ohm^{-1}cm^{-1}$	
C_o	C_e	Q_e	C_e	Q_e	C_e	Q_e	C_e	Q_e
8	6.4	1.6	4	4	4	4	3.65	4.35
16	12.8	3.2	9.2	6.8	9.1	6.9	8.7	7.3
24	18.4	5.6	14.5	9.5	14.5	9.5	14.4	9.6
32	25.7	6.3	21.4	10.6	21	11	20	12
40	32	8	27.5	12.5	26	14	26.8	13.2
48	38.1	9.9	34	14	33	15	32.35	15.65
56	45.9	10.1	41	15	40	16	38.8	17.2
3-aminoacetophenone								
	0.00 $ohm^{-1}cm^{-1}$		4.37 $ohm^{-1}cm^{-1}$		8.32 $ohm^{-1}cm^{-1}$		12.53 $ohm^{-1}cm^{-1}$	
C_o	C_e	Q_e	C_e	Q_e	C_e	Q_e	C_e	Q_e
8	7.1	0.9	6.2	1.8	6.2	1.8	6.3	1.7
16	14.3	1.7	12.4	3.6	12.4	3.6	12.2	3.8
24	20.8	3.2	18.5	5.5	18.2	5.8	17.2	6.8
32	27.5	4.5	24.5	7.5	24.8	7.2	23	9
40	34	6	31.6	8.4	31	9	27	13
48	41	7	36.73	11.27	36	12	33.5	14.5
56	47.3	8.7	41.8	14.2	41.2	14.8	39.2	16.8
2-Hydroxyacetophenone								
	0.00 $ohm^{-1}cm^{-1}$		4.37 $ohm^{-1}cm^{-1}$		8.32 $ohm^{-1}cm^{-1}$		12.53 $ohm^{-1}cm^{-1}$	
C_o	C_e	Q_e	C_e	Q_e	C_e	Q_e	C_e	Q_e
7.5	3.625	3.875	2.9	4.6	3.5	4	3.5	4
10	5.4	4.6	5.25	4.75	5	5	4.75	5.25
12.5	6.8	5.7	5.75	6.75	5.75	6.75	5.5	7
17.5	9.5	8	7.75	9.75	8.3	9.2	7.5	10
20	11.5	8.5	8.5	11.5	8	12	7.75	12.25
25	13.35	11.65	11.25	13.75	11	14	10.25	14.75
30	15.8	14.2	13.25	16.75	13.1	16.9	12.56	17.44
4-Hydroxyacetophenone								
	0.00 $ohm^{-1}cm^{-1}$		4.37 $ohm^{-1}cm^{-1}$		8.32 $ohm^{-1}cm^{-1}$		12.53 $ohm^{-1}cm^{-1}$	
C_o	C_e	Q_e	C_e	Q_e	C_e	Q_e	C_e	Q_e
5	3.8	1.2	3	2	3	2	2.625	2.375
7.5	5.68	1.82	4.43	3.07	4.2	3.3	3.9	3.6
10	7.5	2.5	6.25	3.75	6	4	5.25	4.75
12.5	8.92	3.58	7.5	5	7.2	5.3	6.5	6
15	11	4	9.25	5.75	8.8	6.2	8.19	6.81
17.5	12.3	5.2	10.5	7	10.1	7.4	9.55	7.95
20	14	6	11.8	8.2	11.6	8.4	11.25	8.75

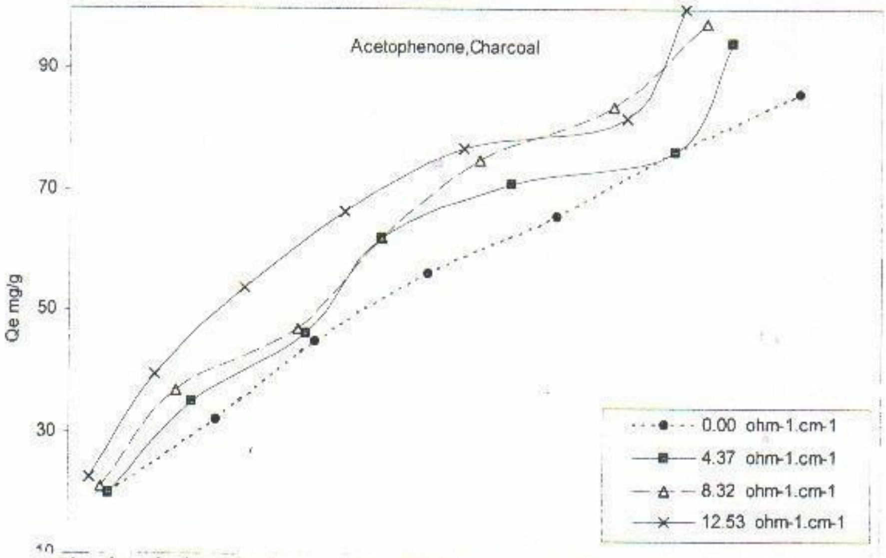

Fig. (1) shows the effect of saltiness on the adsorption of acetophenone on the surface of conocarpus

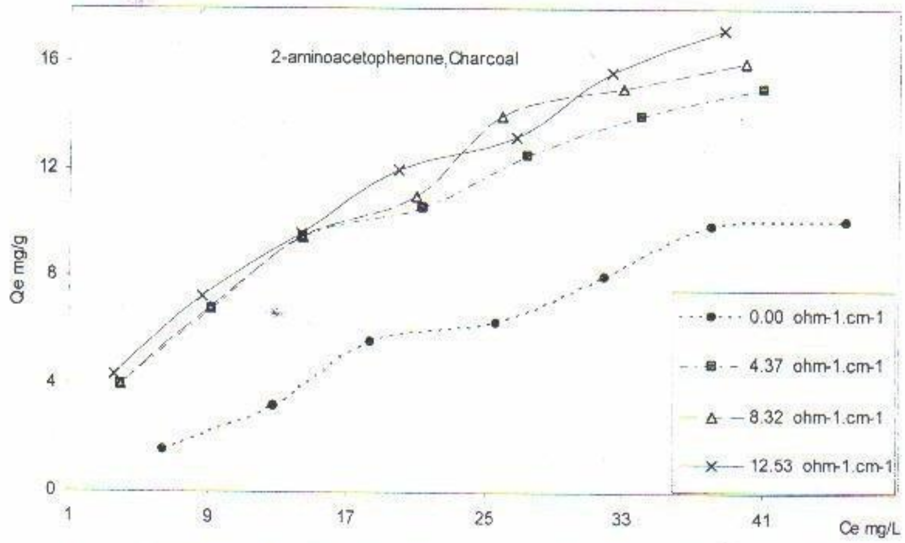

Fig. (2) shows the effect of saltiness on the adsorption of 2-aminoacetophenone on the surface of conocarpus

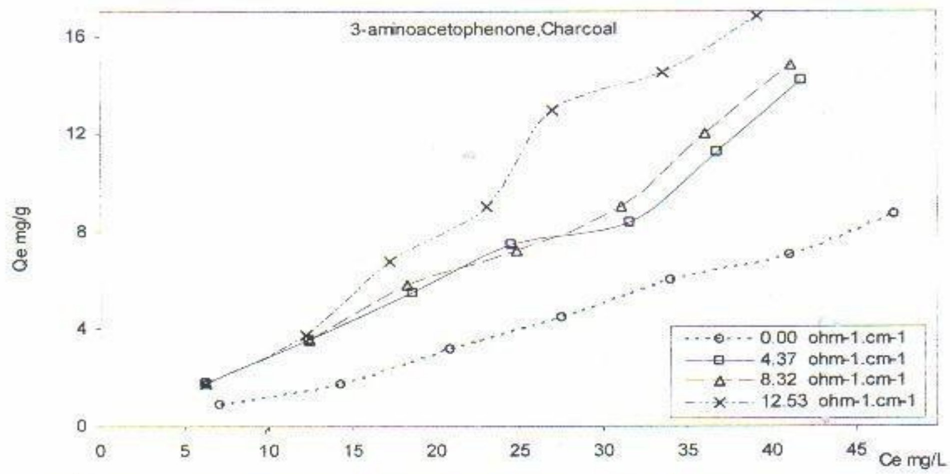

Fig. (3) shows the effect of saltiness on the adsorption of 3-aminoacetophenone on the surface of conocarpus

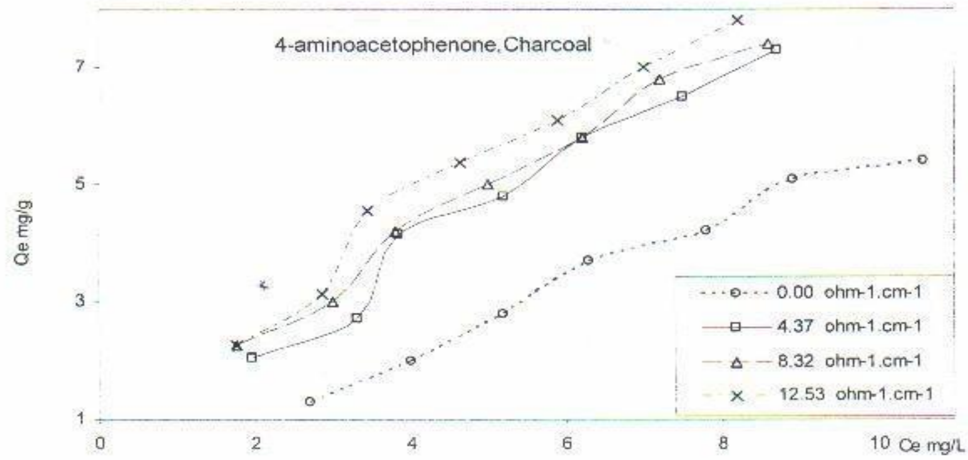

Fig. (4) shows the effect of saltiness on the adsorption of 4-aminoacetophenone on the surface of conocarpus

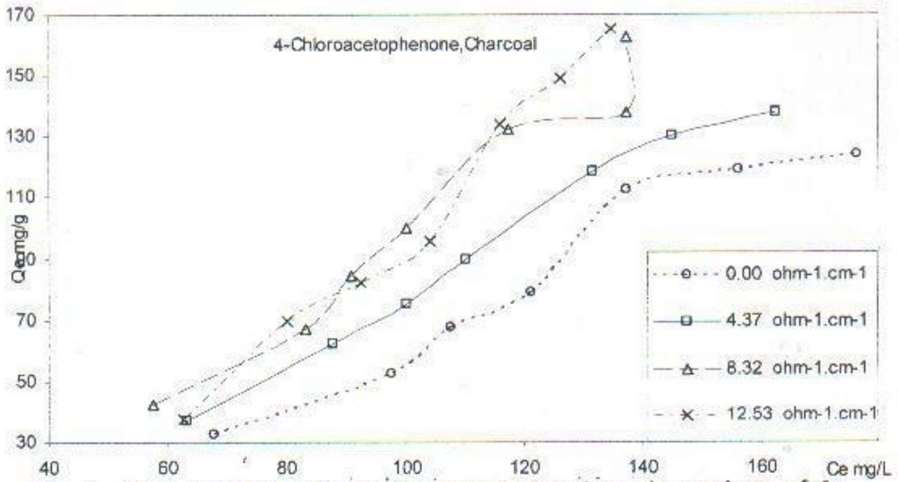

Fig. (-5) shows the effect of saltiness on the adsorption of 4-chloroacetophenone on the surface of conocarpus

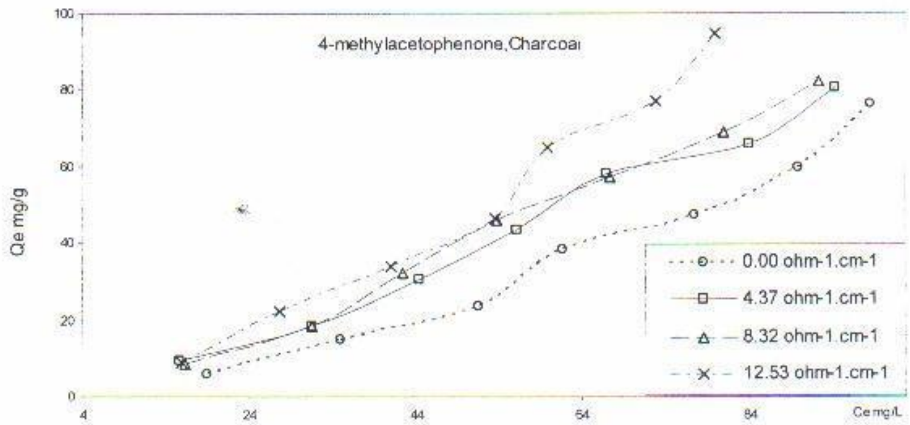

Fig. (6) shows the effect of saltiness on the adsorption of 4-methylacetophenone on the surface of conocarpus

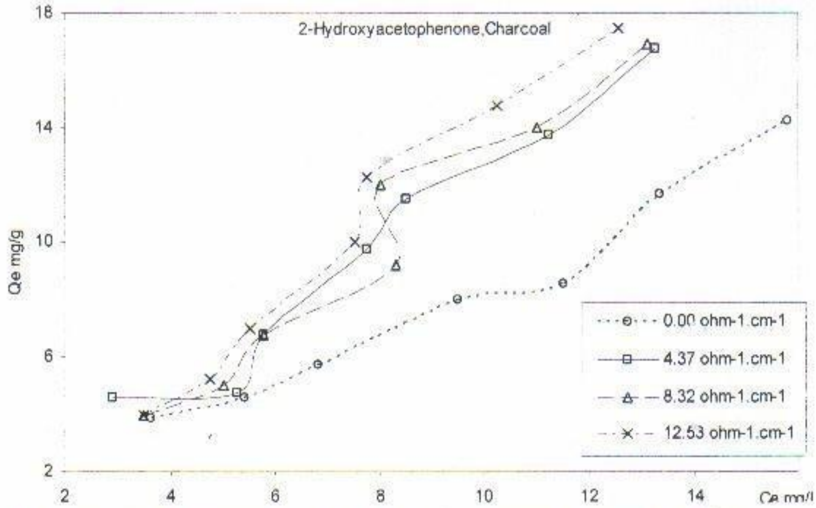

Fig. (7) shows the effect of saltiness on the adsorption of 2-hydroxyacetophenone on the surface of conocarpus

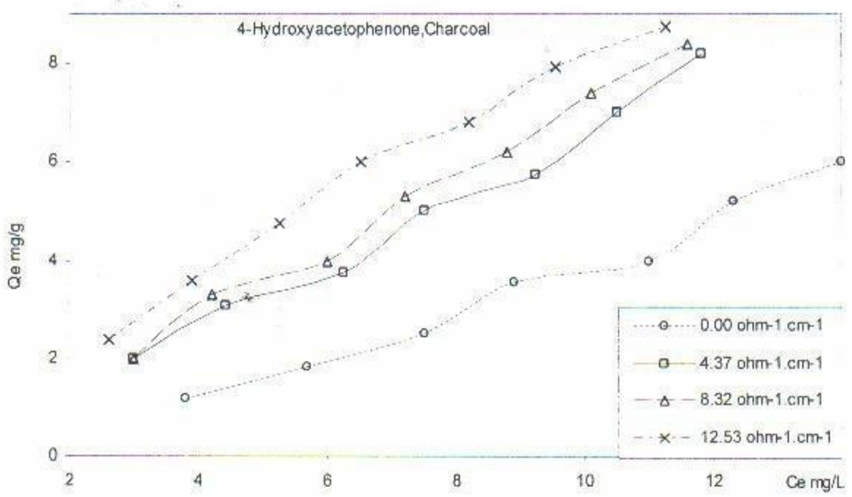

Fig. (8) shows the effect of saltiness on the adsorption of 4-hydroxyacetophenone on the surface of conocarpus

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