Preparation of activated charcoal from the initial plant sources and use it to remove the poisoning cases Drug amoxicillin

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Abstract :

In this study, the preparation of activated carbon from plant primary sources, and use it as a new adsorbent for adsorption drug (Amoxicillin). As the results show that charcoal record high efficient adsorption of the drug under study and used ultraviolet-Visible (UV-Vis) spectrophotometry technique to learn quantity adsorbed. The results showed that the adsorption of the drug amoxicillin process reaches equilibrium with a time of 45 minutes at the concentrations of low-lying, since the study was conducted at different temperatures(50،40،30،25،20،10،60,and70) C° which has been Account thermodynamically functions (ΔH°,ΔG°,ΔS°) at equilibrium, and found that the amount of adsorption decreased with increasing temperature and this shows that the endothermic interaction driven by entropy effect and that the process of adsorption is the process of spontaneous processes. In addition to increasing it increases the efficiency of adsorption at an acid function and acidity natural of the drug under study. The results show that the adsorption on the surface of charcoal record follows Frendlich Equation and Langmuire Equation in adsorption and desorption by a factor of good link .

تحضير فحم منشط من مصادر نباتية اولية واستعماله لإزالة حالات التسمم

بعقار الأموكسيسيلين

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الكلمات المفتاحية : الاموكسيسيلين ، امتزاز ، ثرموداينمك ، قشور الرمان ، الخرنوب .

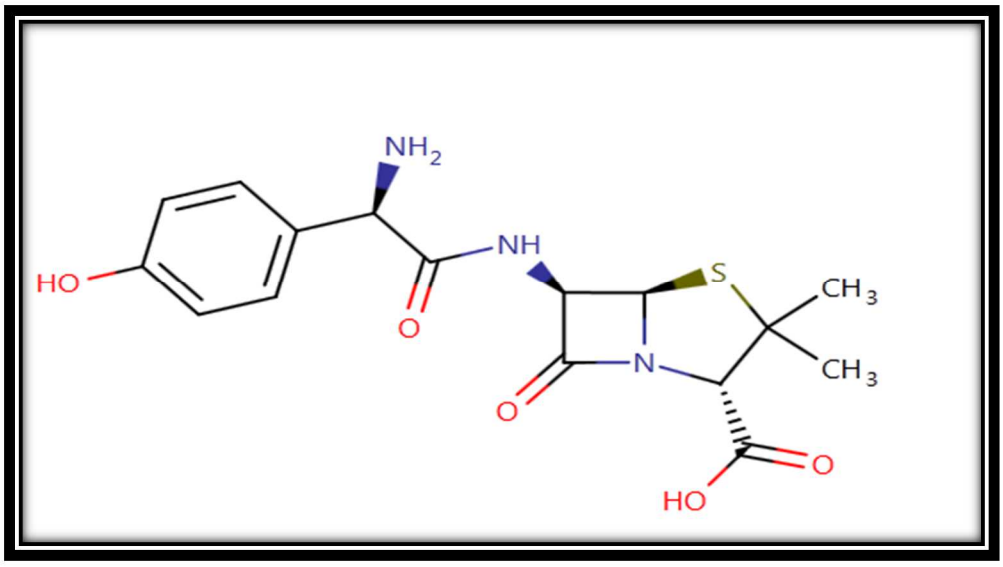
الخلاصة

في هذه الدراسة، حضر الفحم المنشط من المصادر الأولية النباتية، واستخدامه كمادة مازة جديدة لامتزاز عقار (أموكسيسيلين). كما أظهرت النتائج أن للفحم المنشط كفاءة عالية لامتزاز العقار قيد الدراسة واستخدمت تقنية الأشعة مرئية - فوق البنفسجية (UV-Vis) لمعرفة الامتصاصية . وأظهرت النتائج أن عملية امتزاز عقار الأموكسيسيلين يصل إلى التوازن عند زمن 45 دقيقة عند التراكيز المنخفضة ، وقد أجريت الدراسة في درجات حرارية مختلفة (50،40،30،25،20،10، 60, 70) درجة مئوية وذلك لحساب الدوال الثرموديناميكية (ΔS°،ΔG°،ΔH°) عند التوازن ، ووجدت أن كمية الامتزاز انخفضت مع زيادة درجة الحرارة وهذا يدل على أن التفاعل ماص للحرارة مع زياده في الإنتروبي وأن عملية الامتزاز هي عملية تلقائية. بالإضافة إلى دراسة الامتزاز عند الدالة الحامضية الطبيعية وان زيادة الحموضة يزيد من كفاءة الامتزاز للعقار قيد الدراسة. وأظهرت النتائج أن الامتزاز على سطح الفحم المنشط يتبع معادلة فريندليش ومعادلة لانكماير للامتزاز و بمعامل ارتباط جيد.

Introduction:

The a drug poisoning (Drug intoxication) regards as a big problems that we face in our time, because of the frequent use of these drugs by the community, in an easy and using the citizens of these drugs, whether one class or more of these medications, known poisoning as a situation caused by swallowing or inhaled or injected, or absorbed by the skin of any chemical or pharmacological amount higher than usual dose or taken for a long time could lead to poisoning or death, and the main roads to deal with cases of poisoning is dilution with water, vomiting and washing contagious and adsorption [(1)].

Amoxicillin drug (amoxicillin) is one of these drugs, which cause poisoning if they are taken in large doses, higher than normal or prescribe dose. Anyone who feels the pain deal sedating drugs or drugs without prescription the doctor, which largely available in pharmacies or health centers, (Amoxicillin) is an antibiotic drug belonging to the penicillins amino Aminopenicillins group, which is used to treat infections caused by certain types of bacteria . As it works to stop the growth of bacteria. Antibiotic average spectrum, from the class of beta-lactam antibiotics. It is an advantage over other drugs of this class because it is characterized by absorbing the best of the body when oral treatment. Amoxicillin is the most commonly used antibiotic for children. That often is mixed with inhibitor [(2)]. The synthetic version of amoxicillin are: -



(2*S*,5*R*,6*R*)- 6-{[(2*R*)-2-amino- 2-(4-hydroxyphenyl)- acetyl]amino}- 3,3-dimethyl- 7-oxo- 4-thia- 1-azabicyclo[3.2.0]heptane- 2-carboxylic acid

The drug is given at different doses, and depending on the situation, which is dealing with, with brand names including: AMOXIL, FLEMOXIN, JULPHAMOX, **and others** .

has been done several research's were studies to remove the poisoning cases using different surfaces adsorbent have the ability and efficiency in dealing with cases of some medications, including activated carbon and kaolin and residues of maize and

palm fronds and other articles poisoning. Al-Bayati studied [3] for the adsorption of the drug on the surface of a couple of adsorbent materials, namely (Attabulgaat and cellulose) and found the high efficiency for the adsorption capacity and use all of the applied isotheirmic to Langmuir and Freundlich for adsorption. Ahmed studied [4] the scalability kaolin clay on the adsorption property of paracetamol and found that a highly efficient adsorption at concentrations as low-lying and thermodynamic functions of adsorption. Attended Alwaan [5] the activated charcoal from palm leaves and used as an adsorbent for a drug mefenamic acid as it found that the prepared charcoal was recorded a high efficiency of the adsorption of mefenamic acid at concentrations of low-lying and that the efficiency of adsorption decreased with increasing temperature, that indicating that the emitter interaction of heat.

The goal of the research:

The aim of the research is to conduct pharmacological treatment of poisoning, by reaching to find a selective adsorbent surfaces, natural and efficient adsorption high.

Experimental

Materials and methods

1- Sensitive Balance type (Sartorius BL210S)
2- pH Meter .(JENWAY pH Meter 3310).
3- Burning Oven (Carbolite – England.)
4- Ultraviolet Spectral Measurement type (UV- 1650PC (UV-Visible)) Spectrophotometer SHIMADZ-Japan.
5- Shaker Shaking Water Bath-YCW-012S Germany .

In this study, the use of a drug (Amoxicillin), which outfitted by a company (D S M) originating in Spain.

Adsorbent:

In this study, the used of peel pomegranate and carob pomegranate peel and Ceratonia Iraq as a new adsorbent for the purpose of treatment of poisoning with drugs where they were creating peel pomegranate through washed, cleaned and dried in order to and got the powder for the purpose (650)rid it of moisture and then burned at C° at a of adsorption temperature for the preparation of amoxicillin solutions under study [6] .

Equilibrium State study :

The adsorption experiments were carried out as a batch method , were samples of 0.1 g of activated carbon preparation from **pomegranate** peel and Ceratonia were equilibrated with 250ml of solution containing certain amount of the studied Amoxicillin drug. The initial pH of the drug solution was adjusted by using diluted solution of HCl or NaOH and measured with JENWAY pH Meter 3310.

The different temperatures of the Amoxicillin solutions (10,20,25,30,40,50,60 and 70) C° were controlled by a thermostatic water bath. The time of equilibrium constant was estimated to be (45 min.) ,the concentration of Amoxicillin in supernatant is determined spectrophotometrically with Ultraviolet Spectral Measurement at the λ_{max} (274nm) .

$Q_e=(C_o-C_e)/M$(mg of Amoxicillin / g of adsorbent in V)-----(1)

The amount of amoxicillin adsorption is evaluated by the equation above Where C_o and C_e are the first and equilibrium concentrations (mg/L) respectively, and (M) is the mass of activated carbon preparation (g) and V is the volume of solution (l) , The kinetic of adsorbent of Amoxicillin on carbon prepared was performed as follow(0.1g) of the activation carbon is added into 250ml solution of the tested Amoxicillin of certain initial concentration, shacked for (10,20,25,30,40,50,60 and 70) C° ,The amount of the adsorbed Amoxicillin (Q_t was calculated at 10-60 min. and the value of Q_e was determined at 45 min) the residue concentration .of sample was determined by who .(UV-VIS.) spectroscopy and estimated by eq.(1).

Results and discussion :

In this study , The maximum wavelength (λmax) For a drug solution under study (amoxicillin) was determined using UV spectroscopy within the range (200-800 nm). In order to determine the efficiency of the recorded charcoal and follow the adsorption process and estimate the amount of material absorbed and remaining in the solutions, Within a range of concentrations(0.5×10^{-5} - 4×10^{-5}) The relationship between absorption and concentration.as Show in figure (1,2).

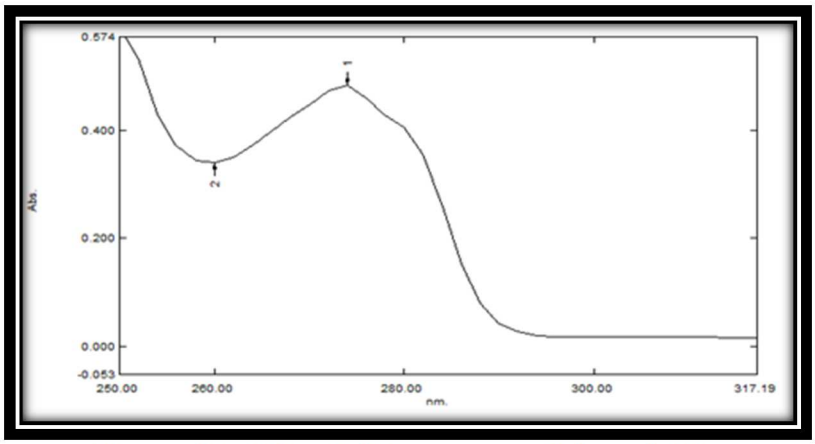


Figure (1): UV - visible spectro of Amoxicillin

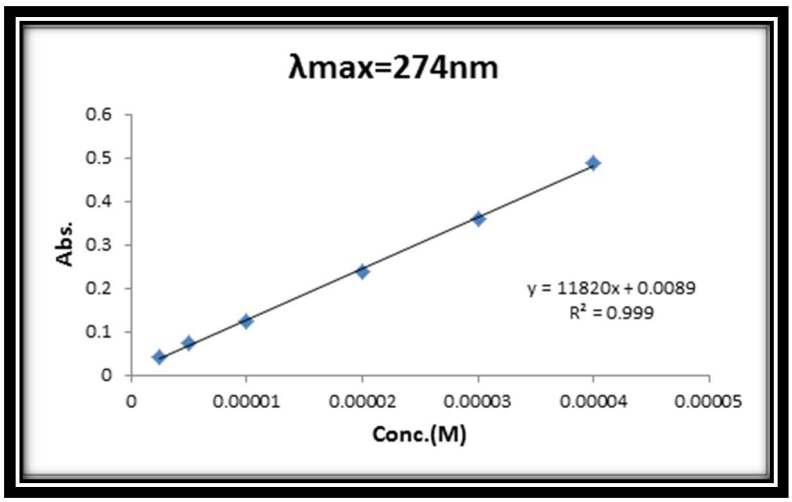


Figure (2)
Calibration curve of Amoxicillin drug

Effect of contact Equilibrium time :

A series of experiments were The optimized the time that required to reach to equilibrium . The results obtained at different time are contact shown in Figure (3) for the of Amoxicillin .The results were listed in Table (1) The max in adsorption. Time was reached to equilibrium at 45 min. for Amoxicillin considered and at the natural pH . at this time (45 min.), the thermodynamic parameter were calculated .

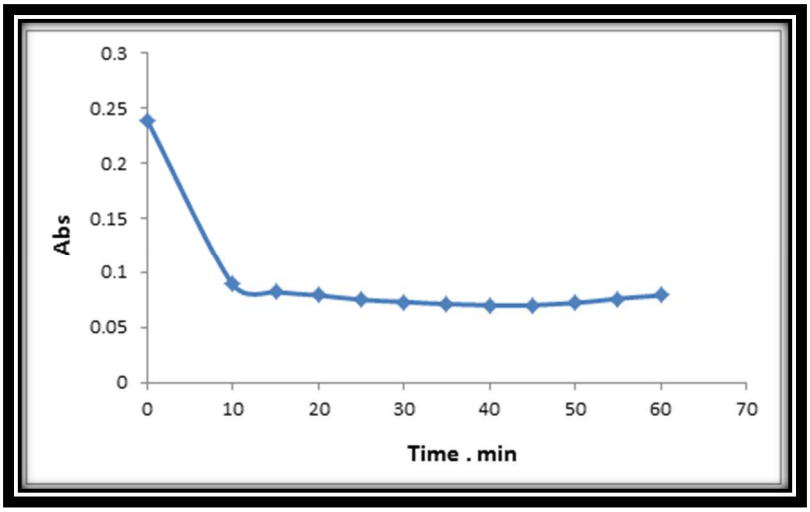


Figure (3)
Effect of contact time of Amoxicillin drug of pH natural

Table (1): Change in absorbance of the property with the times concentration (2×10^{-5}M) and the weight of coal (0.1 gm)

Time min	0	10	15	20	25	30	35	40	45	50	55	60
Abs.	0.239	0.089	0.082	0.079	0.075	0.073	0.071	0.070	0.070	0.072	0.076	0.079

Effect of various pH

This affect was uptaked level of adsorbate in an adsorption process since the nature of both adsorbent and adsorbate could varied by different pH . In this research , the effect of different pH on adsorption of the studied Amoxicillin on prepared carbon from pomegranate peel and Ceratonia were examined in the basic (pH=9) and natural (pH=7) medium in addition to the natural pH of the Amoxicillin solution (pH of = 4.5). The experiments was carried out at the Amoxicillin initial conc. of (2×10^{-5} M) for the Amoxicillin . (0.1 g) of prepared carbon is added into (25ml) of the Amoxicillin solution at (25 C^o) . The results showed that, the adsorption capacity (Q_e) of Amoxicillin decreased with increasing pH .The results showed that, the maximum removal of Amoxicillin observed at the lower pH values (4.5) .as show in table (2,3).

Table (2): effect of the concentration on the percentage of adsorption at 298K

Conc.(M)	4×10^{-5}M	3×10^{-5}M	2×10^{-5}M
Abs%	64.2	65	74

Table(3): Function effect of acid on the adsorption property Amoxicillin

	Natural* pH (4.5)	pH = 7	pH = 9
Q_e	74	67.8	56

Acidic natural function of the property 4.5*

Equilibrium stat study

In order to evaluate the adsorption capacity of the removal process of Amoxicillin by prepared carbon , thermodynamic factors were calculated by equation[7] :

$$\ln K_{Amox.} = \frac{-\Delta H^o}{RT} + \frac{\Delta S^o}{R} \quad \text{……..…… (2)}$$

$$K_{Amox.} = Q_e / C_e \quad \text{……..….(3)}$$

$$\Delta G^o = -RT \ln K_{Amox} \quad \text{…….... (4)}$$

Where $K_{Amox.}$is the distribution coefficient adsorption, C_e is the conc. (mg/l) of remained Amoxicillin in the solution at equilibrium, R is gas constant (8.314 J) and T is the absolute temperature in the range (10-70) C° in this study. The ΔH^o and is obtained from the slope and intercept of the plot of $\ln K_{Amox.}$ versus 1/T as shown in Figure (4). The results listed in Table (4,5), the negative value of ΔG^o indicates that, the adsorption process of Amoxicillin drug spontaneously. The positive values of ΔH° refer to the endothermic nature of adsorption process . The positive value of ΔS^o of Amoxicillin drug at pH= 4.5 (the normal pH for drug) suggests[8] favorable adsorption. The positive of ΔS^o characterize This driving force of the adsorption process is by entropy ΔS^o effect.

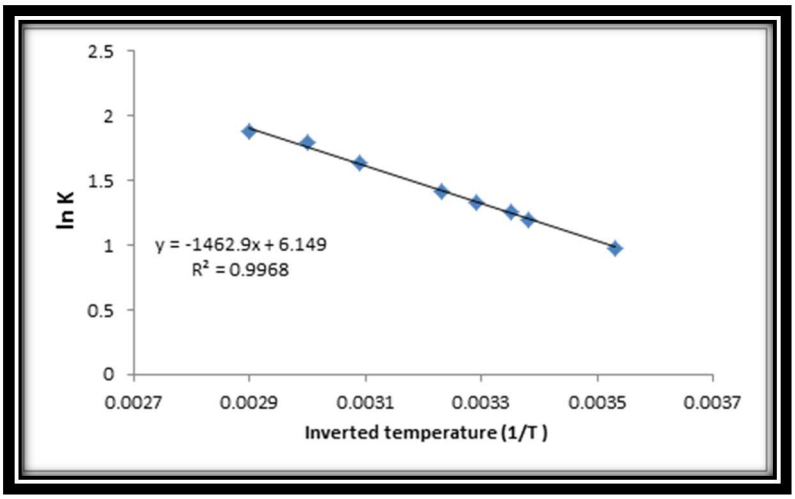


Figure (4)
The application of eq. (2) to calculate the thermodynamic parameters of Amoxicillin drug

Table(4): The temperature on the percentage of the adsorption effect when the focus (2×10^{-5}M)

% of adsorption at temperature (K)							
283.15	293.15	298.15	303.15	313.15	323.15	333.15	343.15
80.5	75.4	74	72.5	70	66	62.7	60

Table (5): Thermodynamic factors of the studied Amoxicillin drug

T (K°)	ΔG^{o} ($KJ.mole^{-1}$)	ΔH^{o} ($KJ.mole^{-1}$)	ΔS^{o} ($J.mole^{-1}.K^{-1}$)
283.15	-2.14	12.16	50.52
293.15	-2.92		51.46
298.15	-3.11		51.23
303.15	-3.35		51.17
313.15	-3.77		50.89
323.15	-4.40		51.26
333.15	-4.96		51.39
343.15	-5.35		51.00

I have been using isotheirmic equations to describe the relationship between the adsorbent materials with surface Adsorbent and study the efficiency of adsorption which gives when applied Ideally its linear relationships and I've included previous studies[9] different types of these isotheirm which has been used for a variety of purposes and multiple applications, and in this study was the use of two models from equations isotheirm was one for Freundlich and the other for Langmuir in order to clarify the relationship between the drug under study with Adsorbent surface which is activated charcoal prepared from pomegranate peel.
Table (6) shows the results that have been reached through the application of isotheirm Freundlich [10] and isotheirm to Langmuir and through the use of the following equations:

$\text{Log } Q_{eq} = \text{Log } K + 1/n \log C_{eq}$ ……(5)

$C_e/Q_e = (1/a)+(b/a)\, C_e$ ……..... (6)

Through the application of the two models on the property under study results were reached in writing
and by a factor of good link as shown in Figure(5) and Figure (6), as we find The fundamentals of Freundlich that the values of equilibrium constant value (K) decreases with the decrease in the efficiency of adsorption, as well as the top points (n) to the efficiency of adsorption on the Hard surface. When the value of (n) sandwiched between (10-1) this is that the good adsorption efficiency. isotheirm to Langmuir values as well as the results indicate that adsorption capacity (Q) increased with increasing adsorption efficiency[11].

Table(6): constants Freundlich and Langmuir values and correlation coefficients for adsorption

Freundlich			Langmuir		
N	K	R	Q(mg/g)	b(L/mg)	R
1.37	3076.09	0.9920	3.47	28.74	0.9918

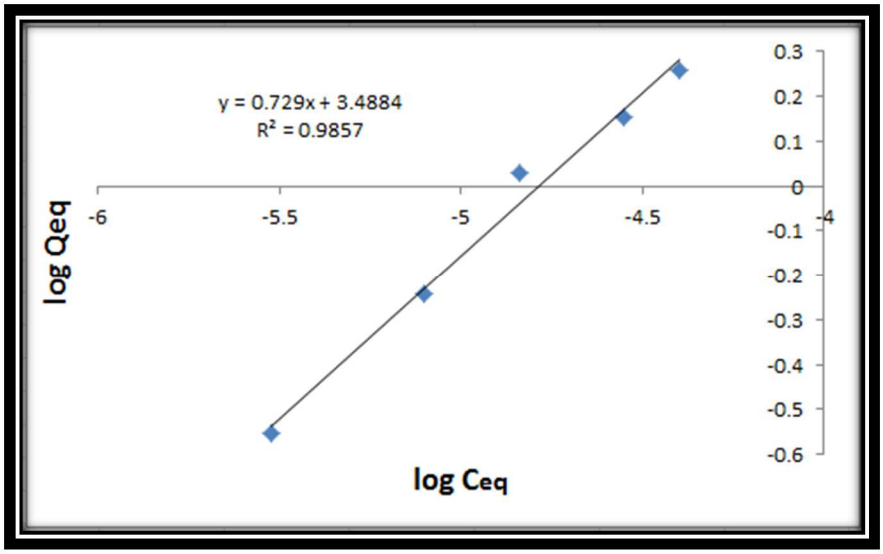


Figure (5): isotheirm Freundlich adsorption charcoal on Amoxicillin

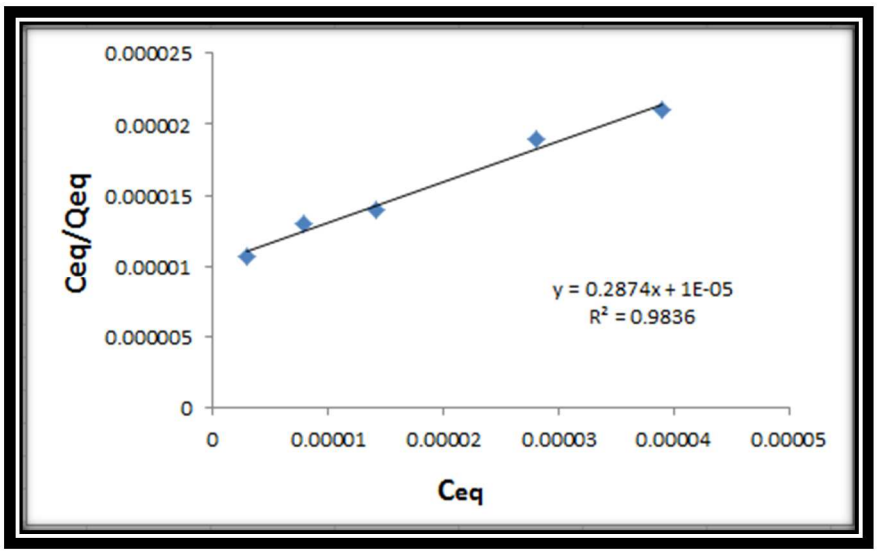


Figure (6): isotheirm to Langmuir adsorption charcoal on Amoxicillin

Conclusions :

1.The time required to reach the equilibrium state (K_{eq}) of the property under study is about 45 minutes.

2.The amount of material absorbed from the drug under study on the surface of activated carbon is at low concentrations and low temperatures.

3.The efficiency of adsorption increases when the natural acid function of the solutions of these drug.

4. It showed that the thermodynamic functions Adsorption used the drug in the study were of the type endothermic, that the ΔH positive.

5. And it found that the adsorption occurs automatically (ΔG negative) at high and low concentrations.

6. The value of entropy ΔS is positive for the drug user under study and at all concentrations.

7. Isotherm-Freundlich and Langmuir showed acceptable linear results and good correlation coefficients.

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