Adsorption Of Clomid Drug On Activated Carbon And Zinc Oxide Surfaces

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Abstract

The research included study the adsorption of Clomid drug on the surface of activated carbon and zinc oxide. Many of parameters were studied which affect the adsorption process such as temperature, weight of adsorbent, equilibrium time, initial concentration and effect of pH. Activated carbon and zinc oxide were used as a model adsorbent in the experiments. We found that increased of temperature (30-50) °C followed by increased in adsorption capacity experiments were done at 30 °C and showed that the optimum weight of activated carbon was (0.15 g) while for zinc oxide was (0.1g), equilibrium time was (150 min) for the two adsorbents. The adsorption capacity of the two adsorbents increased with increasing initial concentration of drug, In addition, the experiments showed that the (3-7) pH was the best medium of the adsorption process.

Keywords: ciomid drug, Adsorption, activated carbon, zinc oxide.

Introduction

Poisoning is one of the most common medical emergencies. For different reasons, the problem of poisoning is faced all over the world. Though the substances implicated for poisoning vary from country to country, use of drugs for poisoning is well documented in the developed and developing countries[1]. For more than 4 decades, clomid has been considering as the most effective drug to treat female infertility. Clomid is a selective estrogen receptor modulator (SERM) which is highly effective in inducing ovulation in females with an ovulation or oligoovulation. The structure of the drug is similar to that of estrogen but is distinguished by the presence of a substituted side chain figure (1) [1,2].

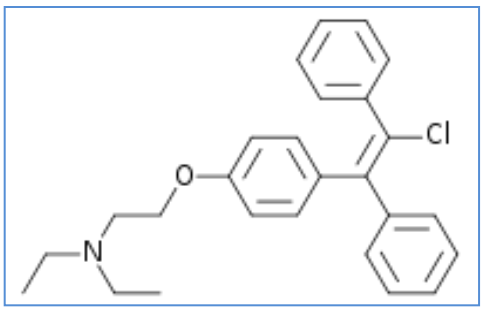

Fig. (1) The Chemical Structure of Clomid drug

Activated carbon is a fine black insoluble powder having no taste. After pyrolysis of organic matter (Wood pulp), the charcoal is activating by an oxidizing gas flow at high temperature to make a fine network of pores. As it absorbs gas from air, therefore it should be protecting to prevent the loss of Potency [3]. Activated carbon has the advantage of exhibiting a high adsorption capacity for colour pollutants due to their high surface area and porous structure [4]. Activated carbon is used as a non-specific gastrointestinal (GI) decontaminant in poisoning, is often used even if the poison has specific antidote. For this reason, easily resuspendable and efficacious preparation of activated carbon should be available in the emergency rooms or nearby [1]. Zinc oxide has received some attention in surface science for its role in the low-temperature synthesis of methanol. More recently, increased interest has been shown in ZnO for its potential as a blue light-emitting material, as a substrate for GaN-based devices, and as a transparent conductor in solar cells [5,6].

Experimental

Materials:

The drug employed in this study was obtained from fabricant, manufacturer, patheon France S.A. The molecular weight is equal to 598.10g/mol, the maximum absorption λ max=353nm. Activated carbon and zinc oxide employed in this study was obtained from Thomas Baker co.

Instruments:

Uv-Vis. Spectrophotometer (Model: CARY 100, VARIAN Co.) in the (200-800) nm regions, PH Meter (Model: hana) and shaking water path (Model: BS-11degetal, JEIO Korea,TECH.

Adsorption Study

preparation of standard solutions:

Stock solution was prepared from the drug in concentration (300 ppm) through the dissolving of certain weight of the drug in water as a solvent. Then a group of solutions with known concentrations in the range (25-250 ppm) were prepared by several dilution from the stock solution.

-Effect of Temperature:

Measurements to the effect of temperature on adsorbent performance (0.1gm) of each adsorbents was added to fixed volume of drug solution (10 ml) of (150 ppm) to six bottles, bottle were shaken for (1 hour) at (25, 30,35, 40, 45 and 50) C^o in shaking water bath, at rotation of (120) turn and then was filtered the solution to get rid of adsorbent and to get clear solutions. The absorbance was measured for each solution using Uv-Vis spectrophotometer[7].

-Effect of Contact Time:

Measurements for the effect of time on adsorbent performance (0.1gm) of each adsorbents was added to fixed volume of drug solution (10 ml) of (150 ppm) to six bottles, bottle were shaken at (30 C^o) at (30, 60, 90, 120, 150 and 180) minutes in shaking water bath, at rotation of (120) turn and then was filtered the solution to get rid of adsorbent and to get clear solutions. The absorbance was measured for each solution[7].

-Effect of adsorbent Weights:

Measure the effect of adsorbant weight, different amount of adsorbed (0.05, 0,1, 0,15, 0,2, 0,25 and 0,3) gm were add to drug solution (10 ml) of (150 ppm) to six bottles, bottle were shaken at (30 C^o) at in shaking water bath, at rotation of (120) turn and then was filtered the solution to get rid of adsorbent and to get clear solutions. The absorbance was measured for each solution[7].

-Effect of Initial Concentrations:

Measure the effect of change Initial Concentrations, different Concentrations (25, 50, 100, 150, 200 and 250) ppm were add to (0.1gm) adsorbent added to drug solution (10 ml) six bottles were shaken at (30 C^o) at in shaking water bath, at rotation of (120) turn and then was filtered the solution to get rid of adsorbent and to get clear solutions. The absorbance was measured for each solution[8].

-Effect of pH:

Measurements for the effect of pH on adsorption performance (0.1gm) of adsorbent added to fixed volume of drug solution (10 ml) of (150 ppm) to five bottles and control by HCl (0.M) and NaOH(0.1M) solution, bottle were shaken at (30 C^o) at pH (2, 5, 7, 9 and 11) in shaking water bath, at rotation of (120) turn and then was filtered the solution to get rid of

adsorbent and to get clear solutions. the absorbance was measured for each solution[7].

Result and Discussion

Calibration curve:

Stock solution was prepared from the drug in concentration (300ppm) through the dissolving of certain weight of the drug in water as a solvent. Then a group of solutions which have known concentrations in the range (15-250 ppm) were prepared and their absorbances were measured at λ_{max} = 353nm. When the values of the absorbances plotted against the values of the concentrations, it was found that these concentrations obey Lambert-Beer law and a=0.0006 $gm^{-1}.L.cm^{-1}$ (fig.2).

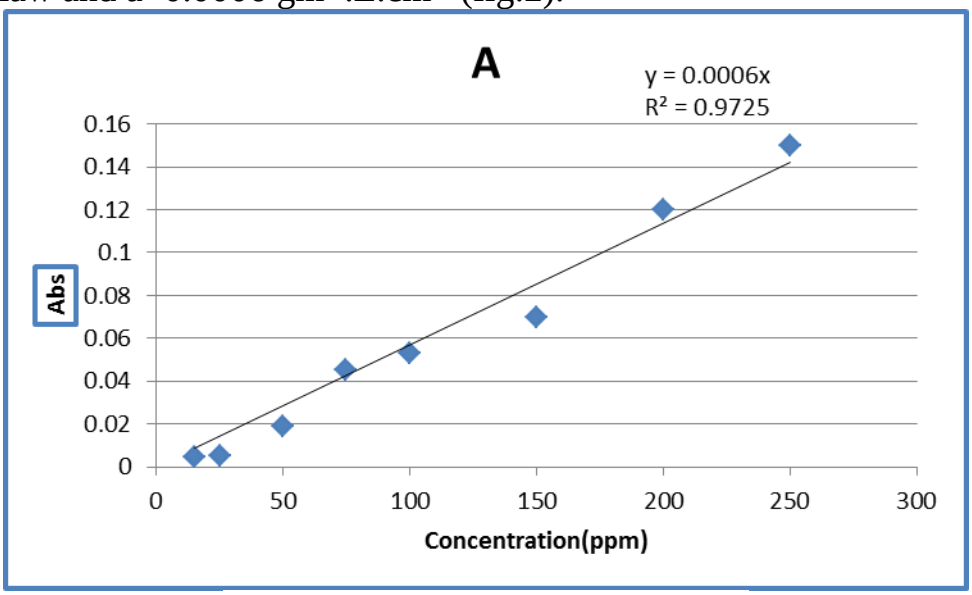

Fig.(2) Calibration curve of clomid

Adsorption Study:

The drug the amount of adsorbed C_e were calculate using

$$C_e = \frac{A}{a}$$

A is absorption and a is extinction coefficient ($gm^{-1}.L.cm^{-1}$).

The amount of drug adsorbed at time t, Q_e (mg/g), was calculating using

$$Qe = \frac{(Co - Ce)V}{m}$$

C_0 is the initial concentration of drug (mg/L) and C_e is the amount of adsorbed drug on the adsorbent (mg/g). V is the volume of the solution (ml) and m is the amount of adsorbent (g).

-Effect of Temperature

The adsorption study was done for clomid drug on activated carbon and zinc oxide at different temperature (25, 30, 35, 40, 45 and 50)° C using

constant concentration of drug at 30 C and results were shown in (Table 1) and (fig. 3)

Table (1)
Adsorption quantities of drug in different temperature at 60 min.

Adsorbent	Conc.of drug (ppm)	Temp.(C)	Q_e (mg/g)
Activated carbon	150	25	2.32
		30	4.27
		35	4.86
		40	7.15
		45	5.98
		50	6.18
Zinc oxide	150	25	12.36
		30	10.9
		35	11.5
		40	12.1
		45	12.38
		50	11.1

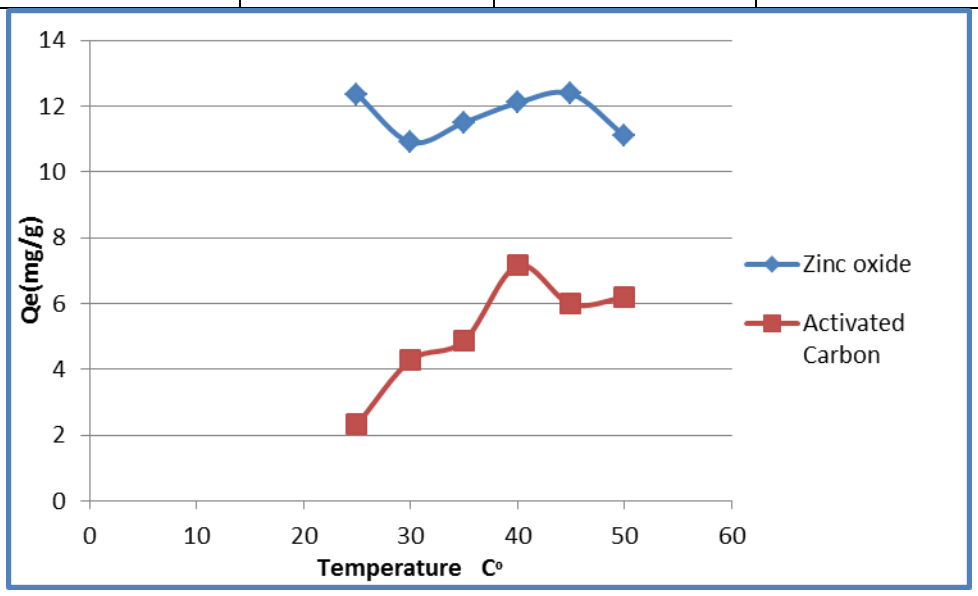

Fig. (3) Effect of temperature on the extent of drug.

The data presented in Figure (2) showed that adsorption of drug by Activated carbon and Zinc oxide increased with increase in temperature[9], observing from table data that adsorbents activity in the adsorption of drug from aqueous solution as follow:

Zinc oxide > Activated carbon

-Effect of Contact Time

The adsorption study was done for clomid drug on activated carbon and zinc oxide at different time (30, 60, 90, 120, 150 and 180) minutes using constant concentration of drug solution at 30 C, results shown in (Table 2) and (fig. 4)

Table (2)
Adsorption quantities of drug at different time at 30°C

Adsorbent	Conc.of drug (ppm)	Time(min)	Q_e (mg/g)
Activated carbon	150	30	0.96
		60	1.56
		90	6.45
		120	9.08
		150	1.62
		180	1.16
Zinc oxide	150	30	5.67
		60	10.71
		90	6.64
		120	13.3
		150	1.48
		180	1.29

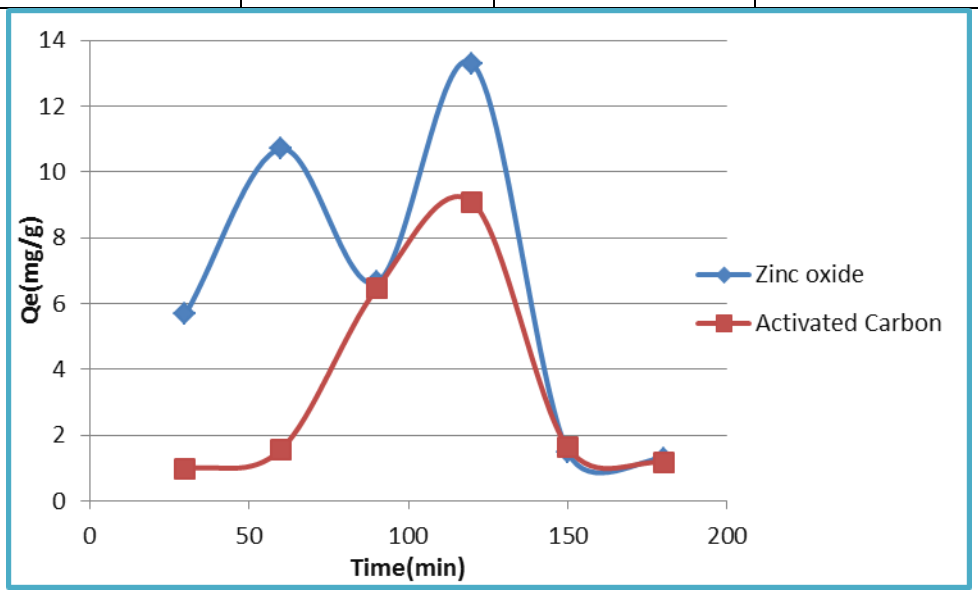

Fig. (4) Effect of time on the extent of drug adsorption

It was observed from Fig.3; the drug adsorption an uptake was increased with time increased, and reaches the contact equilibrium at 120 minutes. The result suggests that, adsorption takes place rapidly at the initial stage on the external surface of the adsorbent followed by a slower internal diffusion process, which may be the rate-determining step. Further increase

of contact time beyond 120 minutes generally results in decrease in the adsorption of drug [10,11].

-Effect of Adsorbent amount

The adsorption study was done for clomid drug on activated carbon and zinc oxide at different adsorbent weights (0.05, 0.1, 0.15, 0.2, 0.25 and 0.3) grams using constant concentration of drug solution at 30 C° for 60 min as shown in (Table 3) and (fig. 5)

Table (3)

Adsorption quantities of drug in different weights of adsorbent at 30°C

Adsorbent	Conc.of drug (ppm)	Wt.of adsorb.(gm)	Q_e (mg/g)
Activated carbon	150	0.05	1.55
		0.1	3.25
		0.15	7.71
		0.2	2.4
		0.25	10.9
		0.3	11.4
Zinc oxide	150	0.05	13.6
		0.1	13.2
		0.15	12.05
		0.2	12.9
		0.25	13.04
		0.3	12.4

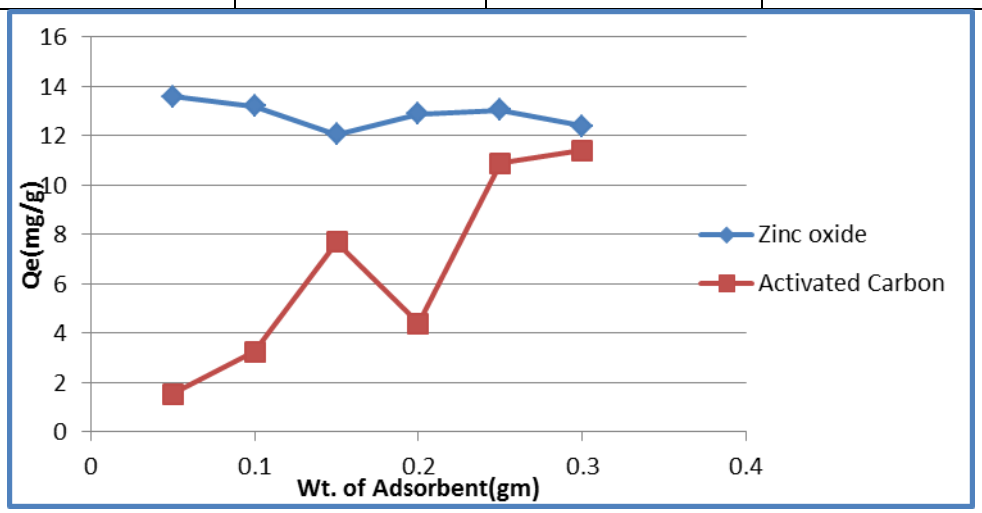

Fig. (5) Effect of adsorbend amount on extent of drug adsorption at 30° C

Fig.(4) showd that the adsorption of the drug on activated carbon increased when the weight of adsorbent increased . While the adsorption quantity of zinc oxide decreased when the weight of adsorbent increased until it reached to fixed concentration at (0.15) gm. This means any

increase in the weight of adsorbent had no effect, because of the perfect saturation of active centers of adsorbent by drug molecules [12].

-Effect of Initial Concentrations

The adsorption study was done for clomid drug on activated carbon and zinc oxide at different concentrations (25, 50, 100, 150, 200 and 250) using constant concentration of drug solution at 30 C° as showing in (Table 4) and (fig. 6).

Table (4)

Adsorption quantities of drug in different Concentrations at 30°C

Adsorbent	Conc.of drug (ppm)	Q_e (mg/g)
Activated carbon	0.25	1.9
	0.5	4.2
	0.10	5.8
	0.15	4.8
	0.20	7.9
	0.25	9.1
Zinc oxide	0.25	4
	0.5	4.3
	0.10	6
	0.15	5.7
	0.20	7.5
	0.25	17

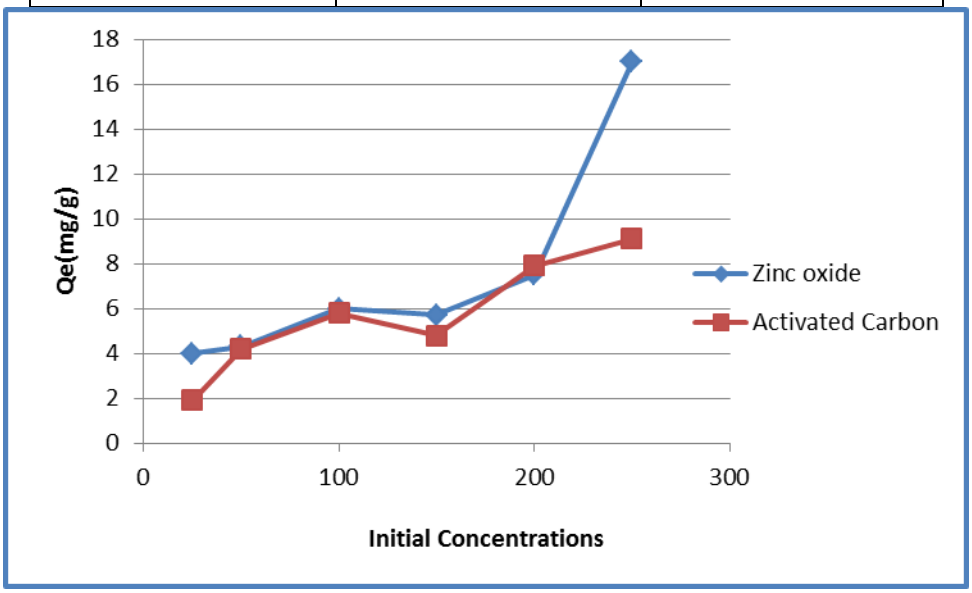

Fig. (6) Effect of initial Conc. Of extent of drug adsorption at 30° C

The adsorption capacity of the adsorbents increased with increasing initial concentration of drug.

The high concentration of adsorbate has been proven to be able to provide driving force to oppose the mass transfer resistance between the aqueous and solid phases [13].

-Effect of PH

The adsorption study was working for clomid drug on activated carbon and zinc oxide at different pH (3, 5, 7, 9 and 11) using constant concentration of drug solution at 30 C° and the study results show in (Table 5) and (fig. 7)

Table (5)

Adsorption quantities of drug in different pH at 30°C

Adsorbent	Conc.of drug (ppm)	pH	Q_e (mg/g)
Activated carbon	150	3	7.29
		5	4.78
		7	9.73
		9	8.91
		11	2.95
Zinc oxide	150	3	12.08
		5	12.1
		7	12.05
		9	11.9
		11	4.03

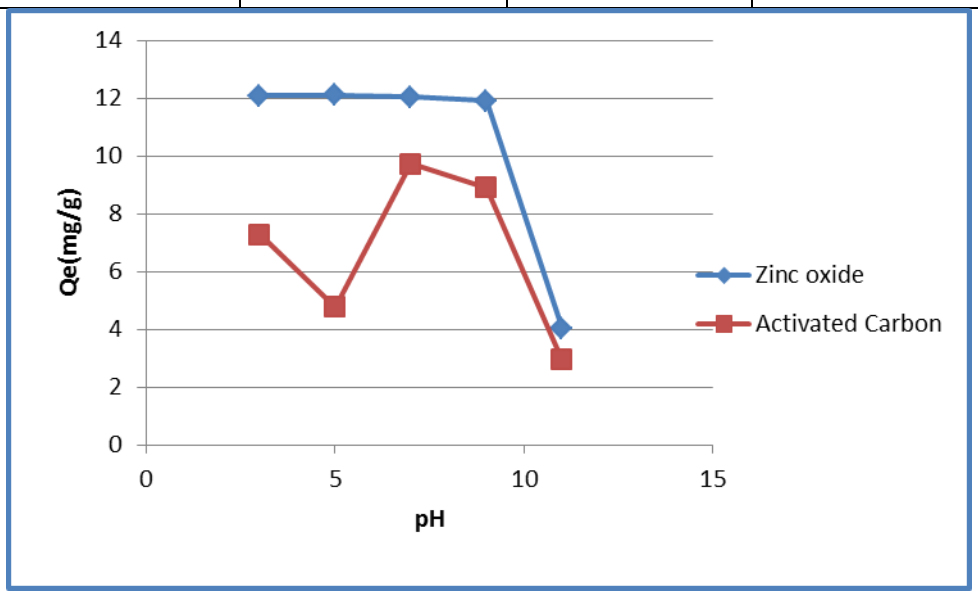

Fig. (7) Effect of pH on extent of drug adsorption at 30° C

As pH was increased, the amount of adsorption of the drug on all adsorbents also increased. This trend is consistent between (3-7). Further

increase of pH beyond 7 generally results in decrease in the adsorption of drug [14,15].

Conclusion

The adsorption of clomid drug from aqueous solutions on both activated carbon and zinc oxide surfaces is a function of temperature, contact time, adsorbent weights, initial drug concentration and pH. Although the two surfaces used in this study can adsorb clomid drug, but the most selective surface observed was zinc oxide, which appeared to posses highly active adsorption capacity. This conclusion could be applied in medicine for the treatment of poisoning by the above drug.

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ى ئ لقور خوة ؟ملك قك ه لؤيخ عكو ضر حى لمك قذنا ه م

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بدش لإخلك

قتصع ل م لك اقت خؤزغ بئ لقور خوة ؟ملك قك ه لؤيخ عكو زغض حى قك قلم لك قذنا ه م

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