ABSTRACT

Title of Thesis : Comparative Adsorption Studies on Clay Soils

Prasanna Mysore R, Master of Science,

Thesis directed by : Professor Cheremisinoff P.N.

An investigation has been made to study clay as sorbent in the treatment of the hazardous contaminants of potential sludge leachate emanating from industrial landfills.

Experimentally was studied six highly toxic and hazardous chemicals, which include: phenol, aniline, cyclohexanol, cyclohexanone, cresol and monochlorophenol. Vermiculate, Kaolinite, Attacote and Hectorite clays were studied as the sorbent material. Removal of organic pollutants were measured using a total organic carbon analyzer (TOC).

Results indicate that these clays can be used for some treatment of the above mentioned organic compounds. The study shows that removal of organic pollutants by clay depends on several factors, such as pH characteristics, washing procedures, residual carbon content of the clay, polarity and solubility of the compounds, and contact time.

In demonstrating utilization of clay material to treat organic pollutants, this study has indicated a treatment technology which may have some potential.

COMPARATIVE ADSORPTION STUDIES

ON

CLAY SOILS

by

Prasanna Mysore R

Thesis submitted to the Faculty of the Graduate school of
The New Jersey Institute of Technology in partial fulfillment of
the requirement for the degree of
Master of Science in Environmental Engineering / Toxicology
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1. BACKGROUND AND INTRODUCTION

1-1. Literature Survey

Studies have indicated that some clay soils can be used as liners to retard the mobility of hazardous leachate from landfills because of their low permeability, or can be used as a sorbent material to adsorb the pollutants from the waste stream. Because of their dynamic and heterogeneous nature, the clay soils have the property of reacting with certain anions and cations and retaining them in an exchangeable state. By these reactions, the clay soils may serve as a medium for waste storage or ultimate waste disposal. Investigators have shown that leachate and waste streams containing organics, pesticides, herbicides, heavy metals can be attenuated by clay minerals, soils and waste by-products such as flyash. Adsorption of organic matter by minerals and clays is the process in which organic species are accumulated either in the interlayer space or on the broken bond surface of the mineral [1,2].

Rios [3] (1960) has developed a processes for removing phenols from aqueous solutions using clay. He showed that clay adsorbents ordinarily used for purification of organic substances of various types and which have been regenerated by combustion have good adsorbent power for phenolic substances in aqueous solutions.

Zachara et. al. [4] (1987) studied single and binary solute sorption of pyridine, quinoline, and acridine on low organic carbon subsurface material when saturated with water. They found that single solute sorption for all compounds is higher in the acidic soil as compared to the basic soil. Binary sorption experiments revealed that competitive sorption occurs more in acidic sub soil rather than basic sub soil.

Wolfe [5] (1986) studied adsorption isotherm for eleven organic compounds using treated (with amines) montmorillonite which indicates that natural clay when suibably treated is an effective adsorbent.

Griffin et. al. [6,7,8] examined the removal of heavy metals by kaolinite and montmorillonite and concluded that both cationic and anionic adsorption on these two clays were significant.

Bittell and Miller [9] investigated the removal of lead, cadmium and calcium and found that the cations exhibited consistent preferential sorption characteristics for clays.

Adsorption results from the high activity of solid surface. It involves either short-range chemical valence bonds, including coordination and H bonds and to some extent also interactions, or long-range physical interactions through electrostatic or Vanderwaals forces [10]. Jordan [11] demonstrated that amine treated clays can give useful information on the effect of adsorbed organic molecule, on the hydration of clay.

A central role in the adsorption process of organic polar molecules is played by the nature of the exchangable cation and the hydration state of the clay. The polarization power of the cation on its associated water molecules, determines the acidity of the clay surfaces [12]. Strong bases are protonated during adsorption, yielding +ve ions. The extent of this reaction depends on the basic strength of organic compounds and the polarizability of metallic cation [13]. This can be illustrated by the adsorption of low volatile aromatic amines which are weak bases such as aniline [14,15] as follows:

$$C_6H_5NH_2 + H_2O \ldots M - \text{Clay} \;\; \text{--->} \;\; C_6H_5\overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle H}{|}}{N}} \ldots H\overset{\overset{\displaystyle H}{|}}{O} \ldots M - \text{Clay}$$

where M is an exchangable metallic ion. These adsorbed compounds react either directly or through water bridges with exchangable metallic cations [16].

The actual adsorption mechanism of the reaction between dissolved organic pollutants and clays soils are still under discussion [17]. The capacity of a clay to adsorb organic component depends on the organic matter (TOC) present in the composition of clay [18,19,20,21]. The sorption capacity of clay with different organic compounds has been extensively studied [22], different hydrophobic compounds [23,24,25] and others [26,27,28]. It is shown generally that the organic compound also confirm to freundlich adsorption isotherm [29]

$$X/M = k\, C_{eq}^{1/n}$$

Griffin et. al. [20] (1980) did work on the attenuation of halogenated hydrocarbon wastes by earth materials. They studied the adsorption and mobility of polychlorinated biphenyls (PCB's) polybrominated biphenyls (PBB's), hexachlorobenzene (HCB) and hexachlorocyclo pentadiene that the adsorption of the above mentioned compounds can be described by the Freundlich adsorption isotherm equation. A high direct correlation is found between the total organic carbon content of the soils and the amount adsorbed and the above compounds will not migrate readily through earth materials leached with water, however, it was noted that reaction products of C-56 with water leached from soil columns and that these compounds may cause problems in natural environments rather than C-56 itself.

Studies have proven that the 5 clay minerals can be ranked according to their attenuating capacity. These are: Montmorillonite > Hectorite > Illite > Vermiculate > Kaolinite

Ratios of S/A of attacote to S/A of hectorite and kaolinite are 1.3 & 2.5 respectively. Data suggests that S/A is not the property of clays that is responsible for attenuation, but rather the cation exchange capacity is probably the principle attenuating property [30].

The purpose of this study is to compare the adsorption characteristics of different clay soils [T-1].

1-2. Description of Clay

Clay consists of predominantly free powder particles. Individual particle sizes may generally vary from 50 - 200 microns. The principal chemical constituents are silica, alumina, iron, calcium, magnesium, lithium & trace elements [31].

Studies have indicated that some clay soils can be used as liners to retard the mobility of hazardous leachate from landfills because of their low permeability, or can be used as a sorbent to adsorb the pollutants from the leachate because of their dynamic and heterogeneous nature [6,20,32,33]. Investigators have speculated on the effectiveness of kaolinite, illite, montmorillonite and vermiculate in removing pollutants such as organic compounds and heavy metals by adsorption.

1-3. Factors which Influence Adsorption

The effectiveness of clays for removing specific pollutants has been examined in the literature. Studies have been performed either in synthesized leachate or in laboratory modified leachates. However, the leachate to be treated is generally a complex mixture of many compounds.

1). The compounds in solution may interfere with each other, i.e., the sorption of one substance will tend to reduce the sorption of another due to competition for adsorption sites or some other antagonisty effect. Hence the quantity of sorbent available as a driving force to produce sorption of these contaminants is decreased and mutually depressing effects on rates of sorption may be encountered.

2). The influent concentrations of substances to be adsorbed is also an important factor that affects capacity. Since higher concentrations of that substance will provide better opportunity or competition for itself to contact the sorbent, higher adsorption capacity is predicted.

3). The molecular structure, or nature of the adsorbate, is important in dictating the degree of adsorption that can actually occur. As a rule, branch chain compounds are more sorbable than straight chain compounds [35]. The type and location of the substituent (functional) group affects adsorbability, and molecules which are polar tend to be preferentially adsorbed. Large molecules are more sorbable than small molecules of similar chemical nature. This is attributable to more solute chemical bonds being formed, making desorption more difficult [34,35].

4). Selection of temperature at which the isotherm will be conducted depends on one or more of the following:

* Temperature expected in the application
* Volatility of the pollutant
* Thermal stability of the solution and adsorbates
* Feasibility of changing the temperature in a field

application.

5). pH is an important consideration in determination of adsorption isotherm. Usually the isotherm is run at an "as is" pH. This is a logical choice in most applications as it minimizes the pretreatment costs in the overall purification scheme. However, in some applications, for example, organic acids and bases, it might be beneficial to adjust the pH. Investigators [36,37,38,39] show that different types of mineral clay have different adsorptive capacity which is generally maximum at pH 5 - 6.5. There is usually a loss of capacity when pH > 8.00. Luh and Baker [40] (1971), also explored the desorption of pyridine - clay in aqueous solution which showed that the desorption is a direct function of pH and no. of stages. Maximum sodium ion released at pH 1, not at the pH = pK_a = 5.25 where pyridine desorption was much slower than adsorption at a comparable pH and clay organic ratio.

6). The time a solution is in contact with the adsorbent is very critical in the adsorption isotherm process. It should be sufficiently long to allow equilibrium to occur, since the batch isotherm is an equilibrium test. Normally, one to three hours are sufficient to reach equilibrium for most industrial wastes. Longer times may be necessary and certainly should be used if equilibrium cannot be achieved in one to three hours.

7). An optimum clay dosage used for adsorption has been reported [Page 24]. This explains the optimum quantity of clays chosen according to their adsorption capacity.

8). Studies have shown that washed clay samples have better adsorption capacities as compared to unwashed samples, and hence clay samples (vermiculate) were washed in deionized water for three hours in these experiments.

9). Chemical properties of adsorbates can influence adsorption. Phenol, Cresol etc. are among common pollutants found in wastewater, and hence these were chosen along with other compounds for our studies.

2. THEORY

2-1. Isothermal Batch Adsorption

In many applications, the preliminary evaluation may take the form of simple feasibility studies where capacities are determined by batch experiments in the laboratory. This study, together with a knowledge of similar operating systems, may provide sufficient capacity and design information to proceed with a full - scale design. The empirical Freundlich Isotherm used in the present study relates the amount of impurity in the adsorbed phase to that in solution:

$$X/M = K_F \, C^{1/n} \qquad (1)$$

where : X = amount of impurity adsorbed, M = weight of clay, C = equilibrium concentration of impurity in solution, and K_F & n are constants.

Taking logarithm on both sides of equation 1

$$\log X/M = \log K_F + 1/n \log C \qquad (2)$$

This is the equation of straight line with a slope of 1/n and intercept of K_F at C = 1. If X/M is plotted on the ordinate and C is plotted on the abscissa of logarithmic paper, a straight line is normally obtained. There are ocassions where straight line are not obtained. However, valuable predictive information is provided in either event.

The Freundlich Isotherm is valid within the context of a batch test for pure substances and some dilute wastewaters. As shown in Figure 1, its application is limited. When a significant portion of the organic impurities are not amendable to sorption, resulting in a constant residual regardless of clay dosage.

The constants "n" and "K_F" can be used to characterize both the nature of the adsorbent and the adsorbate. High "K_F" and "n" values, for example, indicate good adsorption throughout the concentration range studied. Low "K_F" and "n" values would infer low adsorption at dilute concentrations and high adsorption at the more concentrated levels.

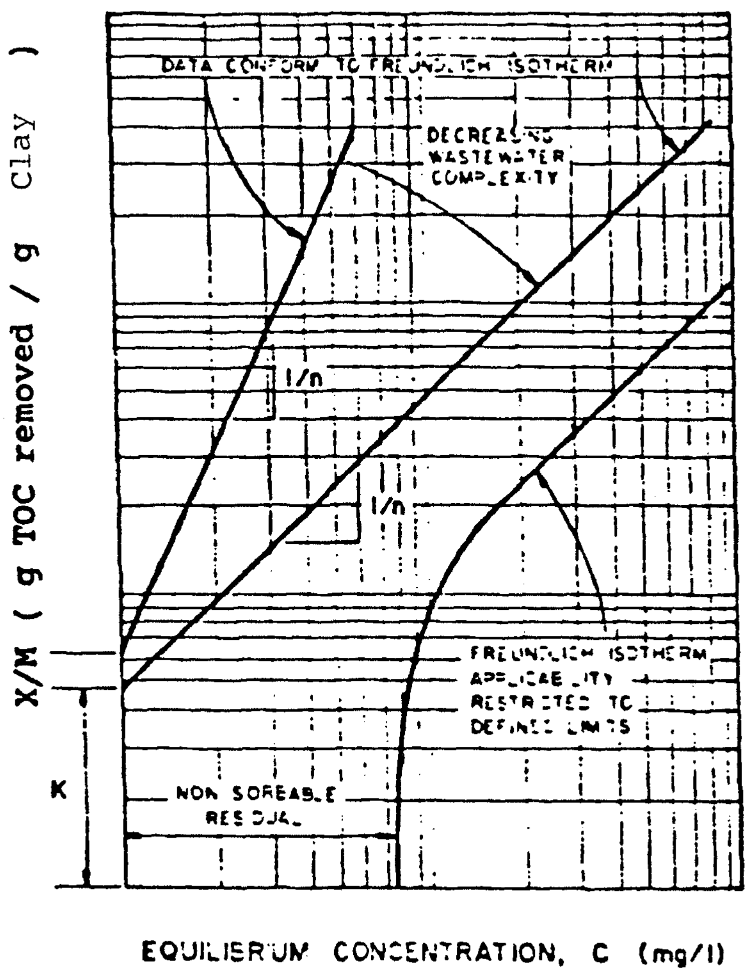


Figure 1. Freundlich Isotherm Application

3. EXPERIMENTAL METHODS

A typical procedure for obtaining batch isotherms consisted of the following steps in the experiments reported here:

1. The sample preparation was the same for all adsorbents. The clay (vermiculate) was washed thoroughly for three hours at the ratio of 100 gms : 1 liter of deionized water, and dried overnight in an oven at 105 ^{o}C prior to use. Washing of other types of clays was not preferred since they existed in powder form and it was very difficult to filter the washed sample.
2. Weighed amounts of each adsorbent was placed in a 750 ml glass media bottle provided with a rubber lined septum and plastic screw cap; then the appropriate solution was added.
3. The pH was adjusted and these sealed bottles were agitated by a shaker till an equilibrium concentration achieved. Each mixture was allowed to settle overnight. The appropriate pH for each clay sample was determined empirically.
4. Samples of the treated solution were then injected into a Total Organic Carbon Analyzer (Beckman Typical Model 915B) using a Hamilton lock stainless steel syringe.
5. The amount of adsorbate adsorbed (x) is obtained by substracting the value of the equilibrium concentration

from that of the influent concentration.

6. On logarithmic paper, values of C were plotted on the abscissa against those of X/M on the ordinate, and the best straight line was determined by linear regression.

4. EQUIPMENT DESCRIPTION

4.1 Introduction and Applicability of the Instrument

Beckman's Model 915 B Total Organic Carbon Analyzer represents a third generation of a basic method to determine the organic carbon content of aqueous solutions. Typical applications involve the TOC analysis of industrial wastewaters, municipal wastes, and potable water supplies. These are common applications. The model 915 B is sensitive to very low TOC levels, and highly reproducible.

4-2. Operating Theory

A microportion (20 - 50 ul) of sample was injected into the combustion tube containing oxidizing catalyst, controlled temperature to 950^{o} c by microprocessor, which oxidizes the sample carbon CO_2. A continuous flow of carrier gas transports the CO_2 to an integral infrared analyzer. The detector output signal is amplified and corrected - microprocessor to provide direct readout of carbon concentration in ppm on the front panel display.

4.3 Standard and Optional Features

A typical instrument is shown in Figure 2.

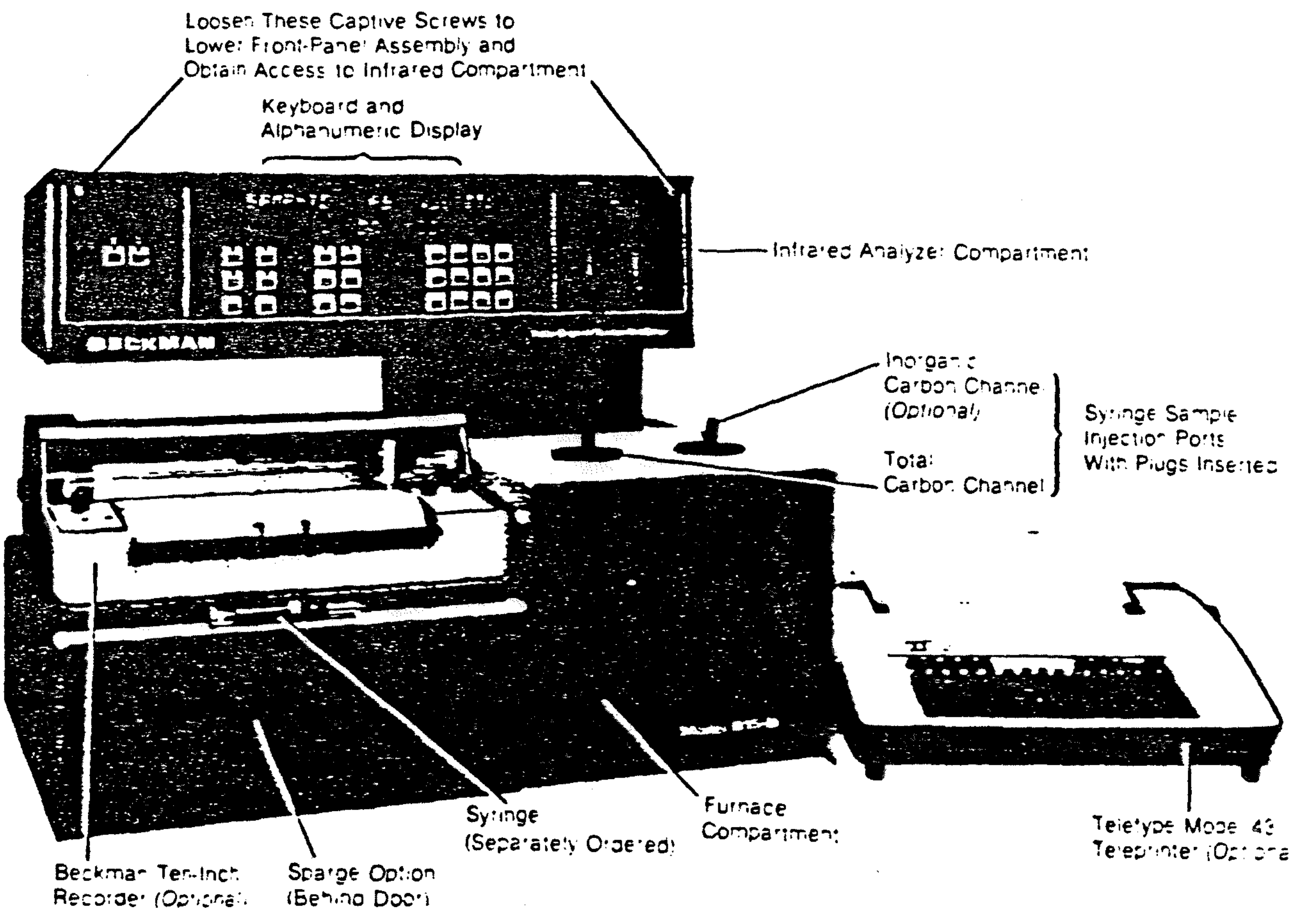


Figure 2 Typical Model 915B TOCAMASTER Total Organic Carbon Computational System

5. Results and Discussions:

Results of the batch isotherm tests are shown in Pages 25 to 72. Phenol, aniline, cyclohexanol, cresol, cyclohexanone and monochlorophenol were selected as "target compounds" during the experiment. The selection was based on the physical properties, toxicity and polarity. For each "target compound" the kinetic study, pH effect and adsorption isotherm were determined. Clays tested were Vermiculate, Kaolinite, Attacote and Hectorite.

From the regression of the isotherm test data, the Freundlich parameters for different kinds of clays, target compounds are shown in Table 1. Also the regression coefficients show that the experimental data was well represented by the Freundlich Equation (r generally greater than 0.95).

The calculated adsorptive capacities of different clays using different compounds are shown in pages 24 to 71. In order to improve the adsorptive capacity, Vermiculate clay was washed by distilled water prior to use. The mixture was filtered later on and dried overnight prior to use. An examination of the organic removal using Vermiculate clay showed that the total organic carbon reduction in phenol waste by washed sample is somewhere two to three times more effective than that of unwashed clay. Other types of clays were not preferred to be washed since they existed in powdered form and extraction seemed to be difficult after settling. Further, to increase adsorption capacities of Vermiculate clay, they were sieved using standard sieves (Table 1) prior to washing. It was found that particles passing through sieve 40 gave better results.

5.1 Contact Time Effect on Adsorption

In order to evaluate the optimum contact time between the waste solution and clay, a batch kinetic study was performed for each compound. Samples at different intervals of time were collected and allow to settle overnight. The clear supernatants were then injected into the TOC analyzer using a microliter syringe. Results show that the optimum contact time for removal of target compounds is in the range of 2 to 3 hours. It appears that the optimum contact time is higher for high water soluble compounds (phenol etc.) . Pages 24 to 71, Fig. 73 to 96 show the results.

5.2 pH Effect on Adsorption

Because different types of clays possess different pH backgrounds, it was felt necessary to evaluate the optimum pH levels for the treatment process. Results show that generally Vermuculate favors a pH range 5.7 - 6.5. Table shows that the optimum pH value for Kaolinite is in the range of 4.5 - 6.0. Table P25 shows that attacote demonstrates its highest adsorptive capacity in the range of pH

6.5 - 7.5. Tables (p25-72) show that for Hectorite clay, pH range (neutral) of 6.0 - 7.5 is the most suitable for organic adsorption. In the subsequent isotherm batch tests reported, the pH was adjusted to the optimum value before the TOC data were taken.

5.3 Effect of Polarity on Adsorption

The polarity of the organic compound also plays a significant role on adsorptive capacity. This alsoagrees with reference [4] which indicated that the lower the polarity of the target compound the higher the adsorptive capacity of the clay.

The adsorption characteristics of the above mentioned pollutants have been analyzed and evaluated using the Freundlich adsorption isotherm equation. This equation works best for dilute solutions over small concentration ranges:

$$X/M = K_F \, C^{I/N}$$

where X = weight of the substance adsorbed

M = weight of adsorbent

X/M = adsorptive capacity of the sorbent

C = concentration of solute remaining in the solution

k_F and n are constants depending on temperature, the characteristics of sorbent, and the substance to be adsorbed.

From the above equations both the value of k_F and 1/n will give adsorption capacity as a function of effluent concentration. The higher value of k_F and $1/n$ indicate better adsorption capacity. However the value of k_F is only a linear function of the concentration where as $1/n$ is an exponential function. That means, if the value of k_F is small and that of $1/n$ is large (greater than 1) the adsorption capacity is highly dependent on the effluent concentration. Under this condition the organic treatment is favored at higher concentrations of pollutant. Conversely, if k_F value is large and $1/n$ is small (smaller than 1) then the adsorption will be favored by a lower effluent concentration, it has been found that the concentration level of the toxic organic compounds in the hazardous waste stream are usually low, so it is better to select such adsorbent which has high k_F and low $1/n$ value.

6. CONCLUSION

The use of clays as sorbent material appears to have limited potential application for the treatment of organic waste materials such as phenol, aniline, cyclohexanol, cresol, cyclohexanone and monochlorophenol. Washed vermiculate clay possess better adsorptive capacity than unwashed vermiculate clay.

The pH study indicates that adsorption is generally optimal in the range of 5 - 7.5. However, this varies with respect to individual clay and its composition.

Polarity of the organic compounds to be treated plays a significant role in treatment. Generally speaking, low polar compounds are easier to adsorb than high polar compounds which follows general organic adsorption experience.

Investigations have shown that contact time of the clay with the compound has some effect on adsorption and in our study it was found that most of the clays when kept in contact with the compound for 2.5 - 3.0 hours gave optimum adsorption capacities.

APPENDIX

* FREUNDLICH EQUATION OF ADSORPTION *

* ISOTHERM TEST DATA OF **CLAY SOILS** *

* pH EFFECT ON ADSORPTION *

* TIME EFFECT ON ADSORPTION *

* EFFECT OF OPTIMUM RATIO ON ADSORPTION *

* FIGURES OF ADSORPTION ISOTHERM *

* FIGURES OF pH EFFECT *

* FIGURES OF CONTACT TIME EFFECT *

* FIGURES OF OPTIMUM RATIO EFFECT *

FREUNDLICH ISOTHERM EQUATIONS

Adsorbent : Vermiculate Clay

Compound	k_f	1/n	Eqn. (q in mg/gm)
Phenol	0.7789	1.21	$q = 0.7789\ C^{1.21}$
Aniline	1.003	1.545	$q = 1.003\ C^{1.545}$
Cyclohexanol	55.2321	0.5114	$q = 14.375\ C^{.5114}$
Cresol	14.375	0.8182	$q = 14.375\ C^{.8182}$
Cyclohexanone	4.3929	1.031	$q = 4.3929\ C^{1.031}$
Monochlorophenol	0.068	1.575	$q = 0.068\ C^{1.575}$

Adsorbent : Kaolinite Clay

Phenol	2.69	0.80	$q = 2.69\ C^{0.8}$
Aniline	0.3781	1.094	$q = 0.3781\ C^{1.094}$
Cyclohexanol	2.8115	0.7781	$q = 2.8115\ C^{0.7781}$
Cresol	0.0016	1.9848	$q = 0.0016\ C^{1.9848}$
Cyclohexanone	0.5326	0.99	$q = 0.5326\ C^{0.99}$
Monochlorophenol	0.421	1.135	$q = 0.421\ C^{1.135}$

Adsorbent : Attacote

Phenol	1.58	0.879	$q = 1.58\ C^{0.879}$
Aniline	0.0362	1.39	$q = 0.0362\ C^{1.39}$
Cyclohexanol	1.752	0.8551	$q = 1.752\ C^{0.8551}$
Cresol	0.0195	1.544	$q = 0.0195\ C^{1.544}$
Cyclohexanone	0.5326	0.99	$q = 0.5326\ C^{0.99}$
Monochlorophenol	1.1372	0.8898	$q = 1.1372\ C^{0.8988}$

Adsorbent : Hectorite Clay

Phenol	26.04	0.572	$q = 26.04\ C^{0.572}$
Aniline	13.199	1.03	$q = 13.199\ C^{1.03}$
Cyclohexanol	8.994	0.969	$q = 8.994\ C^{0.969}$
Cresol	4.259	1.202	$q = 4.259\ C^{1.202}$
Cyclohexanone	9.849	0.6019	$q = 9.849\ C^{0.6019}$
Monochlorophenol	7.498	1.114	$q = 7.498\ C^{1.114}$

TABLE - 1

EFFECT OF OPTIMUM RATIO ON ADSORPTION

Type of clay used : Vermiculate

Compound : Phenol

Influent Conc. : 1299 mg/l of TOC

Sieve No.	Wt. (gms)	Effluent Conc. (ppm)	X/M (g/gm)
20	2	1293	2.25
	5	1274	3.75
	10	1268	2.33
	15	1260	1.95
40	2	1287	4.50
	5	1267	4.80
	10	1257	3.15
	15	1246	2.65
100	2	1285	4.8
	5	1266	4.85
	10	1258	3.08
	15	1248	2.55

Optimum Ratio 5 gms : 750 ml (Sieve No. 40)

EFFECT OF CONTACT TIME ON ADSORPTION

Type of clay used : Vermiculate

Compound : Phenol

Influent Conc. : 968 mg/l of TOC

Time (mts)	EffluentConc. (ppm)	X/M (mg/gm)
10	964	0.60
20	961	1.05
30	958	1.50
45	949	2.85
60	948	3.00
90	945	3.45
120	940	4.20
150	937	4.65
180	937	4.65

EFFECT OF pH ON ADSORPTION

Type of clay used : Vermiculate

Compound : Phenol

Influent Conc. : 1090 mg/l of TOC

pH	EffluentConc. (ppm)	X/M (mg/gm)
3.8	1069	3.15
6.0	1063	4.05
6.2	1070	3.00
7.3	1076	2.10
8.0	1080	1.50
8.7	1086	0.60

EFFECT OF ISOTHERM ON ADSORPTION

Type of clay used : Vermiculate

Compound : Phenol

Influent Conc. (ppm)	Effluent Conc. (ppm)	X/M (mg/gm)
986	960	3.90
978	953	3.75
790	772	2.70
739	727	1.80
662	660	0.30
513	507	1.05
435	428	1.00
319	313	0.90
245	240	0.75

$$q = q = 0.7788\ C^{1.21}$$

EFFECT OF OPTIMUM RATIO ON ADSORPTION

Type of clay used : Vermiculate

Compound : Aniline

Influent Conc. : 1213 mg/l of TOC

Wt.(gms)	EffluentConc.(ppm)	X/M (mg/gm)
2.0	1208	1.88
5.0	1193	3.0
10.0	1170	3.23
15.0	1191	1.10

Optimum Ratio 10 gms : 750 ml

EFFECT OF CONTACT TIME ON ADSORPTION

Type of clay used : Vermiculate

Compound : Aniline

Influent Conc. : 1091 mg/l of TOC

Time (mts)	EffluentConc.(ppm)	X/M (mg/gm)
30	1081	0.8
45	1079	0.9
60	1076	1.13
120	1060	2.4
150	1053	2.9
180	1051	3.2
210	1050	3.2

EFFECT OF pH ON ADSORPTION

Type of clay used : Vermiculate

Compound : Aniline

Influent Conc. : 1213 mg/l of TOC

pH	Effluent Conc. (ppm)	X/M (g/gm)
3.8	1209	0.60
5.1	1201	1.96
6.0	1190	3.45
6.8	1193	3.00
7.2	1198	2.25
8.1	1208	1.80
9.9	1210	0.45

EFFECT OF ISOTHERM ON ADSORPTION

Type of clay used : Vermiculate

Compound : Aniline

Influent Conc. (ppm)	Effluent Conc. (ppm)	X/M (g/gm)
936	915	3.15
923	905	2.70
819	804	2.25
743	730	1.95
662	651	1.65
534	525	1.35
412	406	0.90
346	341	0.75
214	210	0.60

$$q = 1.003 \ C^{1.545}$$

EFFECT OF OPTIMUM RATIO ON ADSORPTION

Type of Clay used : Vermiculate

Compound : Cyclohexanol

Influent conc. : 1046 mg/l of TOC

Wt. (gms)	Effluent Conc. (ppm)	X/M (g/gm)
2	1040	1.90
5	1032	2.1
10	1030	1.95
15	1023	1.15

Optimum Ratio 5 gms : 750 ml

EFFECT OF CONTACT TIME ON ADSORPTION

Type of clay used : Vermiculate

Compound : Cylcohexanol

Influent Conc. : 982 mg/l of TOC

Time (minutes)	Effluent Conc. (ppm)	X/M (mg/gm)
30	974	0.45
60	974	1.20
90	972	1.40
120	970	1.80
150	968	2.10
180	968	2.10

EFFECT OF pH ON ADSORPTION

Type of clay used : Vermiculate

Compound : Cyclohexanol

Influent Conc. : 940 mg/1 of TOC

pH	Effluent Conc. (ppm)	X/M (mg/gm)
3.8	932	1.2
5.5	926	2.1
6.7	927	1.95
7.1	932	1.20
7.8	934	0.90

EFFECT OF ISOTHERM ON ADSORPTION

Type of clay used : Vermiculate

Compound : Cyclohexanol

Influent Conc. (ppm)	Effluent Conc. (ppm)	X/M (mg/gm)
982	968	2.10
932	920	1.80
842	831	1.65
736	726	1.50
624	614	1.50
512	504	1.20
389	381	1.20
299	292	1.05

$$q = 55.2321 \ C^{0.5114}$$

EFFECT OF OPTIMUM RATIO ON ADSORPTION

Type of clay used : Vermiculate

Compound : Cresol

Influent Conc. : 976 mg/l of TOC

Wt. (gms)	Effluent Conc. (ppm)	X/M (mg/gm)
2	957	2.85
5	946	4.50
10	936	3.00
15	929	1.40

Optimum Ratio 5 gms : 750 ml

EFFECT OF CONTACT TIME ON ADSORPTION

Type of clay used : Vermiculate

Compound : Cresol

Influent conc. : 1006 mg/l of TOC

Time (minutes)	Effluent Conc. (ppm)	X/M (mg/gm)
30	1000	0.9
60	998	1.20
90	989	2.55
120	981	3.75
150	979	4.10
180	979	4.10

EFFECT OF pH ON ADSORPTION

Type of Clay used : Vermiculate

Compound : Cresol

Influent Conc. : 1018 mg/l of TOC

pH	Effluent Conc. (ppm)	X/M (mg/gm)
4.5	997	3.15
5.8	983	5.25
7.3	994	3.60
8.5	1005	1.95

EFFECT OF ISOTHERM ON ADSORPTION

Type of clay used : Vermiculate

Compound : Cresol

Influent Conc. (ppm)	Effluent Conc. (ppm)	X/M (mg/gm)
942	919	4.50
822	797	3.75
750	728	3.30
638	618	3.00
574	561	1.95
536	523	1.95
442	430	1.80
320	309	1.65
246	236	1.50

$$q = 14.3750\ C^{0.8182}$$

EFFECT OF OPTIMUM RATIO ON ADSORPTION

Type of clay used : Vermiculate

Compound : Cyclohexanone

Influent Conc. : 1037 mg/l of TOC

Wt. (gms)	Effluent Conc. (ppm)	X/M (mg/gm)
2	1025	4.5
5	1020	1.55
10	1020	1.00

Optimum ratio 2 gms : 750 ml

EFFECT OF CONTACT TIME ON ADSORPTION

Type of clay used : Vermiculate

Compound : Cyclohexanone

Influent Conc. : 986 mg/l of TOC

Time (minutes)	Effluent Conc. (ppm)	X/M (mg/gm)
30	984	0.75
60	983	1.20
90	981	1.90
120	975	4.13
150	975	4.13

EFFECT OF pH ON ADSORPTION

Type of clay used : Vermiculate

Compound : Cyclohexanone

Influent conc. : 989 mg/l of TOC

pH	Effluent Conc. (ppm)	X/M (mg/gm)
4.2	983	2.25
6.0	977	4.50
7.1	980	3.38
7.4	984	1.90
8.1	984	1.90

EFFECT OF ISOTHERM ON ADSORPTION

Type of clay used : Vermiculate

Compound : Cyclohexanone

Influent Conc. (ppm)	Effluent Conc. (ppm)	X/M (mg/gm)
984	970	5.25
832	821	4.13
641	632	3.40
523	515	3.00
412	406	1.90
308	304	1.70
246	243	1.20

$$q = 4.3929\ C^{1.03}$$

EFFECT OF OPTIMUM RATIO ON ADSORPTION

Type of clay used : Vermiculate

Compound : Monochlorophenol

Influent Conc. : 1190 mg/l of TOC

Wt.(gms)	EffluentConc.(ppm)	X/M (mg/gm)
2.0	1179	4.13
5.0	1162	4.20
10.0	1150	3.00
15.00	1143	2.35

Optimum Ratio 5 gms : 750 ml

EFFECT OF CONTACT TIME ON ADSORPTION

Type of clay used : Vermiculate

Compound : Monochlorophenol

Influent Conc. : 1204 mg/l of TOC

Time (mts)	EffluentConc.(ppm)	X/M (mg/gm)
30	1200	0.6
60	1192	1.8
90	1189	2.25
120	1188	2.40
165	1176	4.2
180	1175	4.4
210	1175	4.4

EFFECT OF pH ON ADSORPTION

Type of clay used : Vermiculate

Compound : Monochlorophenol

Influent Conc. : 1090 mg/l of TOC

pH	Effluent Conc. (ppm)	X/M (mg/gm)
4.2	1080	1.50
4.9	1075	2.25
5.2	1072	2.70
6.0	1063	4.05
6.5	1061	4.4
7.7	1070	3.00

EFFECT OF ISOTHERM ON ADSORPTION

Type of clay used : Vermiculate

Compound : Monochlorophenol

Influent Conc. (ppm)	Effluent Conc. (ppm)	X/M (mg/gm)
1106	1077	3.9
904	880	3.6
821	802	2.85
695	681	2.1
601	592	1.35
532	526	0.9
412	407	0.75
309	304	0.75

$$q = 0.068 \; C^{1.575}$$

EFFECT OF OPTIMUM RATIO ON ADSORPTION

Type of clay used : Kaolinite

Compound : Phenol

Influent Conc. : 1138 mg/l of TOC

Wt. (gms)	EffluentConc. (ppm)	X/M (mg/gm)
15	1120	0.48
20	1111	0.54
25	1090	0.80
30	1083	0.70

Optimum Ratio 25 gms : 400 ml

EFFECT OF CONTACT TIME ON ADSORPTION

Type of clay used : Kaolinite

Compound : Phenol

Influent Conc. : 1590 mg/l of TOC

Time (mts)	EffluentConc. (ppm)	X/M (mg/gm)
30	1581	0.15
45	1576	0.23
60	1570	0.32
90	1533	0.91
120	1538	0.83
150	1530	0.96
180	1528	0.99
210	1528	0.99

EFFECT OF pH ON ADSORPTION

Type of clay used : Kaolinite

Compound : Phenol

Influent Conc. : 1480 mg/l of TOC

pH	Effluent Conc. (ppm)	X/M (mg/gm)
2.0	1449	0.50
2.6	1432	0.77
3.9	1444	0.78
4.2	1450	0.48
5.0	1454	0.42
5.6	1460	0.32

EFFECT OF ISOTHERM ON ADSORPTION

Type of clay used : Kaolinite

Compound : Phenol

Influent Conc. (ppm)	Effluent Conc. (ppm)	X/M (mg/gm)
984	936	0.77
895	855	0.64
842	808	0.55
734	700	0.54
632	604	0.45
529	507	0.35
413	395	0.29
309	294	0.24
215	201	0.23

$$q = 2.69\ C^{0.8}$$

EFFECT OF OPTIMUM RATIO ON ADSORPTION

Type of clay used : Kaolinite

Compound : Aniline

Influent Conc. : 1213 mg/l of TOC

Wt. (gms)	EffluentConc. (ppm)	X/M (mg/gm)
20	1167	0.92
25	1146	1.07
30	1140	0.97
35	1130	0.95

Optimum Ratio 25 gms : 750 ml

EFFECT OF CONTACT TIME ON ADSORPTION

Type of clay used : Kaolinite

Compound : Aniline

Influent Conc. : 1091 mg/l of TOC

Time (mts)	EffluentConc. (ppm)	X/M (mg/gm)
90	1070	0.37
120	1065	0.58
150	1052	0.73
180	1033	0.95
195	1031	0.97
240	1031	0.97

EFFECT OF pH ON ADSORPTION

Type of clay used : Kaolinite

Compound : Aniline

Influent Conc. : 1213 mg/l of TOC

pH	Effluent Conc. (ppm)	X/M (mg/gm)
1.1	1173	0.64
2.8	1145	1.10
4.2	1157	0.90
5.7	1160	0.85
7.0	1191	0.35

EFFECT OF ISOTHERM ON ADSORPTION

Type of clay used : Kaolinite

Compound : Aniline

Influent Conc. (ppm)	Effluent Conc. (ppm)	X/M (mg/gm)
936	871	1.04
923	877	0.74
819	784	0.56
743	718	0.40
662	640	0.36
534	514	0.32
412	396	0.26
346	335	0.18
214	200	0.16

$$q = 0.3781\ C^{1.094}$$

EFFECT OF OPTIMUM RATIO ON ADSORPTION

Type of clay used : Kaolinite
Compound : Cyclohexanol
Influent Conc. : 1060 mg/l of TOC

Wt. (gms)	Effluent Conc. (ppm)	X/M (mg/gm)
15	1033	0.72
20	1020	0.80
25	1014	0.74
30	1019	0.55

Optimum Ratio 20 gms : 400 ml

EFFECT OF CONTACT TIME ON ADSORPTION

Type of clay used : Kaolinite
Compound : Cyclohexanol
Influent Conc. : 940 mg/l of TOC

Time (minutes)	Effluent Conc. (ppm)	X/M (mg/gm)
15	925	0.30
30	925	0.3
60	922	0.36
90	910	0.60
120	899	0.82
150	897	0.86
180	897	0.86

EFFECT OF pH ON ADSORPTION

Type of clay used : Kaolinite

Compound : Cyclohexanol

Influent Conc. : 935 mg/l of TOC

pH	Effluent Conc.(ppm)	X/M (mg/gm)
2.6	932	0.06
3.1	927	0.16
4.8	907	0.56
6.1	895	0.80
7.2	917	0.36

EFFECT OF ISOTHERM ON ADSORPTION

Type of clay used : Kaolinite

Compound : Cyclohexanol

Influent Conc. (ppm)	Effluent Conc. (ppm)	X/M (mg/gm)
988	946	0.84
932	902	0.60
857	832	0.50
769	756	0.26
676	660	0.32
571	556	0.30
339	326	0.26
254	242	0.24

$$q = 2.8115\ C^{0.7781}$$

EFFECT OF OPTIMUM RATIO ON ADSORPTION

Type of clay used : Kaolinite

Compound : Cresol

Influent Conc. : 976 mg/l of TOC

Wt. (gms)	Effluent Conc. (ppm)	X/M (mg/gm)
10	943	1.22
15	921	1.47
20	912	1.28
25	915	0.98
30	910	0.90

Optimum Ratio 15 gms : 400 ml

EFFECT OF CONTACT TIME ON ADSORPTION

Type of clay used : Kaolinite

Compound : Cresol

Influent Conc. : 1006 mg/l of TOC

Time (minutes)	Effluent Conc. (ppm)	X/M (mg/gm)
15	984	0.59
30	981	0.67
60	979	0.73
90	975	0.84
120	951	1.49
150	949	1.54
180	949	1.54

EFFECT OF pH ON ADSORPTION

Type of clay used : Kaolinite

Compound : Cresol

Influent Conc. : 1018 mg/l of TOC

pH	Effluent Conc. (ppm)	X/M (mg/gm)
2.4	989	0.58
2.6	980	0.76
3.8	974	0.88
5.9	960	1.26
7.1	972	0.92

EFFECT OF ISOTHERM ON ADSORPTION

Type of clay used : Kaolinite

Compound : Cresol

Influent Conc. (ppm)	Effluent Conc. (ppm)	X/M (mg/gm)
949	872	1.44
822	770	1.03
750	722	0.56
574	552	0.44
536	518	0.36
442	432	0.20
320	312	0.16
246	242	0.10

$$q = 0.0016\ C^{1.9848}$$

EFFECT OF OPTIMUM RATIO ON ADSORPTION

Type of clay used : Kaolinite

Compound : Cyclohexanone

Influent Conc. : 1037 mg/l of TOC

Wt. (gms)	Effluent Conc. (ppm)	X/M (mg/gm)
15	1019	0.48
20	1007	0.60
25	1002	0.56

Optimum Ratio 20 gms. : 400 ml

EFFECT OF CONTACT TIME ON ADSORPTION

Type of clay used : Kaolinite

Compound : Cyclohexanone

Influent Conc. : 1018 mg/l of TOC

Time (minutes)	Effluent Conc. (ppm)	X/M (mg/gm)
30	1014	0.08
45	1013	0.10
60	1004	0.28
90	994	0.48
120	988	0.60
150	989	0.60

EFFECT OF pH ON ADSORPTION

Type of clay used : Kaolinite

Compound : Cyclohexanone

Influent Conc. : 994 mg/l of TOC

pH	Effluent Conc. (ppm)	X/M (mg/gm)
2.4	981	0.26
3.1	974	0.40
4.6	968	0.52
5.2	963	0.62
6.0	966	0.56
6.8	971	0.46

EFFECT OF ISOTHERM ON ADSORPTION

Type of clay used : Kaolinite

Compound : Cyclohexanone

Influent Conc. (ppm)	Effluent Conc. (ppm)	X/M (mg/gm)
984	959	0.5
832	814	0.37
641	625	0.31
523	511	0.24
412	402	0.20
308	300	0.17
246	241	0.11

$$q = 0.5326\ C^{0.99}$$

EFFECT OF OPTIMUM RATIO ON ADSORPTION

Type of clay used : Kaolinite

Compound : Monochlorophenol

Influent Conc. : 1180 mg/l of TOC

Wt. (gms)	EffluentConc. (ppm)	X/M (mg/gm)
15	1165	0.4
20	1144	0.71
25	1124	0.9
30	1113	0.89

Optimum Ratio 25 gms : 400 ml

EFFECT OF CONTACT TIME ON ADSORPTION

Type of clay used : Kaolinite

Compound : Monochlorophenol

Influent Conc. : 954 mg/l of TOC

Time (mts)	EffluentConc. (ppm)	X/M (mg/gm)
30	928	0.42
60	919	0.56
90	914	0.64
120	899	0.88
150	896	0.93
180	896	0.93

EFFECT OF pH ON ADSORPTION

Type of clay used : Kaolinite

Compound : Monochlorophenol

Influent Conc. : 999 mg/l of TOC

pH	Effluent Conc. (ppm)	X/M (mg/gm)
2.9	953	0.74
4.5	951	0.77
5.2	955	0.704
5.9	966	0.53
6.1	972	0.43
6.7	978	0.19

EFFECT OF ISOTHERM ON ADSORPTION

Type of clay used : Kaolinite

Compound : Monochlorophenol

Influent Conc. (ppm)	Effluent Conc. (ppm)	X/M (mg/gm)
964	911	0.85
885	833	0.83
812	763	0.78
734	686	0.77
618	578	0.64
513	483	0.48
407	382	0.40
303	289	0.22

$$q = 0.421\, C^{1.135}$$

EFFECT OF OPTIMUM RATIO ON ADSORPTION

Type of clay used : Attacote

Compound : Phenol

Influent Conc. : 1006 mg/l of TOC

Wt.(gms)	EffluentConc.(ppm)	X/M (mg/gm)
15	978	0.75
20	966	0.8
25	954	0.84
30	945	0.41

Optimum Ratio 25 gms : 400 ml

EFFECT OF CONTACT TIME ON ADSORPTION

Type of clay used : Attacote

Compound : Phenol

Influent Conc. : 1004 mg/l of TOC

Time (mts)	EffluentConc.(ppm)	X/M (mg/gm)
30	991	0.21
60	987	0.27
90	972	0.51
120	960	0.7
150	954	0.8
180	954	0.8

EFFECT OF pH ON ADSORPTION

Type of clay used : Attacote

Compound : Phenol

Influent Conc. : 927 mg/l of TOC

pH	Effluent Conc. (ppm)	X/M (mg/gm)
5.8	897	0.48
6.0	885	0.67
6.4	880	0.75
7.3	876	0.82
8.0	878	0.78
8.5	895	0.51

EFFECT OF ISOTHERM ON ADSORPTION

Type of clay used : Attacote

Compound : Phenol

Influent Conc. (ppm)	Effluent Conc. (ppm)	X/M (mg/gm)
956	914	0.67
779	747	0.51
757	727	0.48
632	602	0.48
512	489	0.37
403	386	0.27
328	312	0.26
259	244	0.20

$$q = 1.58\ C^{0.879}$$

EFFECT OF OPTIMUM RATIO ON ADSORPTION

Type of clay used : Attacote

Compound : Aniline

Influent Conc. : 1062 mg/l of TOC

Wt. (gms)	Effluent Conc. (ppm)	X/M (mg/gm)
15	1043	0.50
20	1030	0.64
25	1026	0.58
30	1020	0.55

Optimum Ratio 20 gms. : 400 ml

EFFECT OF CONTACT TIME ON ADSORPTION

Type of clay used : Attacote

Compound : Aniline

Influent Conc. : 982 mg/l of TOC

Time (minutes)	Effluent Conc. (ppm)	X/M (mg/gm)
30	971	0.22
45	966	0.32
60	960	0.44
90	954	0.56
120	949	0.66
150	949	0.66
180	950	0.66

EFFECT OF pH ON ADSORPTION

Type of clay used : Attacote

Compound : Aniline

Influent Conc. : 1034 mg/l of TOC

pH	Effluent Conc. (ppm)	X/M (mg/gm)
6.2	1008	0.52
6.9	1000	0.68
7.4	1002	0.64
7.9	1011	0.46
8.6	1014	0.40

EFFECT OF ISOTHERM ON ADSORPTION

Type of clay used : Attacote

Compound : Aniline

Influent Conc. (ppm)	Effluent Conc. (ppm)	X/M (mg/gm)
936	901	0.70
923	900	0.46
819	801	0.36
743	731	0.24
662	650	0.24
534	524	0.20
412	403	0.18
346	340	0.12
214	209	0.10

$$q = 0.0362\ C^{1.390}$$

EFFECT OF OPTIMUM RATIO ON ADSORPTION

Type of clay used : Attacote

Compound : Cyclohexanol

Influent Conc. : 1046 mg/l of TOC

Wt. (gms)	Effluent Conc. (ppm)	X/M (mg/gm)
10	1024	0.86
15	1009	0.98
20	1000	0.90
25	1014	0.51

Optimum Ratio 15 gms : 400 ml

EFFECT OF CONTACT TIME ON ADSORPTION

Type of clay used : Attacote

Compound : Cyclohexanol

Influent Conc. : 982 mg/l of TOC

Wt. (gms)	Effluent Conc. (ppm)	X/M (mg/gm)
30	970	0.32
60	961	0.60
90	950	0.86
120	945	0.99
150	945	1.00
180	945	1.00

EFFECT OF pH ON ADSORPTION

Type of clay used : Attacote

Compound : Cyclohexanol

Influent Conc. : 940 mg/l of TOC

pH	Effluent Conc.	X/M (mg/gm)
5.7	950	0.18
6.0	932	0.22
6.7	924	0.43
7.1	919	0.84
7.3	902	1.03
8.1	922	0.50

EFFECT OF ISOTHERM ON ADSORPTION

Type of clay used : Attacote

Compound : Cyclohexanol

Influent Conc. (ppm)	Effluent Conc. (ppm)	X/M (mg/gm)
988	953	0.95
932	906	0.71
857	835	0.60
769	756	0.35
676	663	0.35
571	560	0.30
440	422	0.28
339	329	0.27
254	245	0.24

$$q = 1.752\ C^{0.8551}$$

EFFECT OF OPTIMUM RATIO ON ADSORPTION

Type of clay used : Attacote

Compound : Cresol

Influent Conc. : 976 mg/l of TOC

Wt. (gms)	Effluent Conc. (ppm)	X/M (mg/gm)
15	943	0.88
20	920	1.12
25	921	0.86
30	917	0.80

Optimum Ratio 20 gms : 400 ml

EFFECT OF CONTACT TIME ON ADSORPTION

Type of clay used : Attacote

Compound : Cresol

Influent Conc. : 1006 mg/l of TOC

Time (minutes)	Effluent Conc. (ppm)	X/M (mg/gm)
15	992	0.28
30	992	0.28
60	989	0.34
90	984	0.44
120	960	0.92
150	956	1.00
180	954	1.04

EFFECT OF pH ON ADSORPTION

Type of clay used : Attacote

Compound : Cresol

Influent Conc. : 1018 mg/l of TOC

pH	Effluent Conc. (ppm)	X/M (mg/gm)
7.13	984	0.68
7.86	980	0.76
8.05	963	1.10
8.25	971	0.92
8.55	979	0.78

EFFECT OF ISOTHERM ON ADSORPTION

Type of clay used : Attacote

Compound : Cresol

Influent Conc. (ppm)	Effluent Conc. (ppm)	X/M (mg/gm)
949	901	0.96
822	786	0.72
750	718	0.64
638	622	0.32
574	565	0.22
536	525	0.22
442	430	0.20
320	312	0.16
246	240	0.12

$$q = 0.0195\ C^{1.544}$$

EFFECT OF OPTIMUM RATIO ON ADSORPTION

Type of clay used : Attacote

Compound : Cyclohexanone

Influent Conc. : 1027 mg/l of TOC

Wt. (gms)	Effluent Conc. (ppm)	X/M (mg/gm)
15	1013	0.36
20	1008	0.38
25	1007	0.16

Optimum Ratio 20 gms : 400 ml

EFFECT OF CONTACT TIME ON ADSORPTION

Type of clay used : Attacote

Compound : Cyclohexanone

Influent Conc. : 1040 mg/l of TOC

Time (minutes)	Effluent Conc. (ppm)	X/M (mg/gm)
15	1037	0.05
30	1035	0.10
60	1032	0.16
90	1025	0.30
120	1020	0.39
150	1019	0.40
180	1019	0.40

EFFECT OF pH ON ADSORPTION

Type of clay used : Attacote

Compound : Cyclohexanone

Influent Conc. : 980 mg/l of TOC

pH	Effluent Conc. (ppm)	X/M (mg/gm)
6.3	974	0.12
6.9	969	0.22
7.2	961	0.38
8.1	965	0.30
8.9	969	0.22

EFFECT OF ISOTHERM ON ADSORPTION

Type of clay used : Attacote

Compound : Cyclohexanone

Influent Conc. (ppm)	Effluent Conc. (ppm)	X/M (mg/gm)
984	963	0.42
832	815	0.34
641	627	0.28
523	511	0.24
412	401	0.22
308	298	0.21
246	237	0.18

$$q = 8.331\ C^{0.55}$$

EFFECT OF OPTIMUM RATIO ON ADSORPTION

Type of clay used : Attacote

Compound : Monochlorophenol

Influent Conc. : 983 mg/l of TOC

Wt.(gms)	EffluentConc.(ppm)	X/M (mg/gm)
15	962	0.56
20	953	0.6
25	951	0.51
30	947	0.48

Optimum Ratio 20 gms : 400 ml

EFFECT OF CONTACT TIME ON ADSORPTION

Type of clay used : Attacote

Compound : Monochlorophenol

Influent Conc. : 1033 mg/l of TOC

Time (mts)	EffluentConc.(ppm)	X/M (mg/gm)
30	1022	0.22
60	1019	0.28
90	1014	0.38
120	1007	0.52
150	1007	0.52

EFFECT OF pH ON ADSORPTION

Type of clay used : Attacote

Compound : Monochlorophenol

Influent Conc. : 956 mg/l of TOC

pH	Effluent Conc. (ppm)	X/M (mg/gm)
5.9	940	0.32
6.4	931	0.50
7.1	925	0.62
7.4	924	0.65
7.8	930	0.52
8.2	939	0.34

EFFECT OF ISOTHERM ON ADSORPTION

Type of clay used : Attacote

Compound : Monochlorophenol

Influent Conc. (ppm)	Effluent Conc. (ppm)	X/M (mg/gm)
1008	977	0.62
933	904	0.58
818	798	0.40
729	709	0.40
630	614	0.32
512	501	0.22
400	389	0.22
307	300	0.14
209	200	0.18

$$q = 1.1372\ C^{0.8898}$$

EFFECT OF OPTIMUM RATIO ON ADSORPTION

Type of clay used : Hectorite

Compound : Phenol

Influent Conc. : 983 mg/l of TOC

Wt.(gms)	EffluentConc.(ppm)	X/M (mg/gm)
1.0	960	17.25
2.0	936	18.00
3.0	930	15.75
5.0	922	9.15

Optimum Ratio 2.0 gms : 750 ml

EFFECT OF CONTACT TIME ON ADSORPTION

Type of clay used : Hectorite

Compound : Phenol

Influent Conc. : 1105 mg/l of TOC

Time (mts)	EffluentConc.(ppm)	X/M (mg/gm)
30	1091	5.25
60	1089	6.00
105	1080	9.375
135	1059	17.25
180	1057	18.00

EFFECT OF pH ON ADSORPTION

Type of clay used : Hectorite

Compound : Phenol

Influent Conc. : 1227 mg/l of TOC

pH	Effluent Conc. (ppm)	X/M (mg/gm)
5.1	1205	8.25
5.8	1198	10.88
6.3	1182	17.25
7.0	1205	8.25
7.74	1207	7.5
8.34	1218	3.38

EFFECT OF ISOTHERM ON ADSORPTION

Type of clay used : Hectorite

Compound : Phenol

Influent Conc. (ppm)	Effluent Conc. (ppm)	X/M (mg/gm)
1010	964	17.25
880	845	13.13
810	781	10.88
704	678	9.75
640	615	9.38
533	512	7.88
398	379	7.13
215	199	6.00

$$q = 26.04\ C^{0.572}$$

EFFECT OF OPTIMUM RATIO ON ADSORPTION

Type of clay used : Hectorite

Compound : Aniline

Influent Conc. : 1243 mg/l of TOC

Wt.(gms)	EffluentConc.(ppm)	X/M (mg/gm)
1.0	1224	14.38
2.0	1207	13.65
3.0	1199	10.8
5.0	1170	10.95

Optimum Ratio 2 gms : 750 ml

EFFECT OF CONTACT TIME ON ADSORPTION

Type of clay used : Hectorite

Compound : Aniline

Influent Conc. : 980 mg/l of TOC

Time (mts)	EffluentConc.(ppm)	X/M (mg/gm)
30	969	4.13
60	960	7.50
90	952	10.3
120	941	15.0
150	940	15.2
180	939	15.25

EFFECT OF pH ON ADSORPTION

Type of clay used : Hectorite

Compound : Aniline

Influent Conc. : 993 mg/l of TOC

pH	Effluent Conc. (ppm)	X/M (mg/gm)
4.9	971	8.3
5.8	963	11.4
6.4	952	15.2
7.2	953	15.26
8.0	961	12.1
8.4	972	7.9

EFFECT OF ISOTHERM ON ADSORPTION

Type of clay used : Hectorite

Compound : Aniline

Influent Conc. (ppm)	Effluent Conc. (ppm)	X/M (mg/gm)
1004	961	16.1
901	860	15.38
815	781	12.75
701	670	11.63
609	583	9.75
502	481	7.88
420	403	6.38
324	307	6.38
250	241	3.38

$$q = 13.199\ C^{1.03}$$

EFFECT OF OPTIMUM RATIO ON ADSORPTION

Type of clay used : Hectorite

Compound : Cyclohexanol

Influent Conc. : 996 mg/l of TOC

Wt.(gms)	EffluentConc.(ppm)	X/M (mg/gm)
2.0	975	7.88
3.0	971	6.25
4.0	966	5.63
5.0	961	5.25

Optimum Ratio 2 gms : 750 ml

EFFECT OF CONTACT TIME ON ADSORPTION

Type of clay used : Hectorite

Compound : Cyclohexanol

Influent Conc. : 980 mg/l of TOC

Time (mts)	EffluentConc.(ppm)	X/M (mg/gm)
30	974	2.25
60	970	3.75
90	969	4.13
120	969	4.13
150	966	5.25
180	960	7.5
210	960	7.5

EFFECT OF pH ON ADSORPTION

Type of clay used : Hectorite

Compound : Cyclohexanol

Influent Conc. : 1009 mg/l of TOC

pH	Effluent Conc. (ppm)	X/M (mg/gm)
4.3	998	4.13
5.9	993	6.00
6.4	991	6.75
7.0	992	6.38
7.9	999	3.75
8.8	1003	2.25

EFFECT OF ISOTHERM ON ADSORPTION

Type of clay used : Hectorite

Compound : Cyclohexanol

Influent Conc. (ppm)	Effluent Conc. (ppm)	X/M (mg/gm)
992	973	7.13
791	777	5.25
704	690	5.25
612	598	5.25
510	501	3.38
432	424	3.00
301	295	2.25
248	243	1.88

$$q = 8.994\ C^{0.969}$$

EFFECT OF OPTIMUM RATIO ON ADSORPTION

Type of clay used : Hectorite

Compound : Cresol

Influent Conc. : 1095 mg/l of TOC

Wt.(gms)	EffluentConc.(ppm)	X/M (mg/gm)
1.0	1076	18.00
2.0	1050	16.88
3.0	1036	15.00

Optimum Ratio 2.0 gms : 750 ml

EFFECT OF CONTACT TIME ON ADSORPTION

Type of clay used : Hectorite

Compound : Cresol

Influent Conc. : 1004 mg/l of TOC

Time (mts)	EffluentConc.(ppm)	X/M (mg/gm)
30	980	9.00
60	966	14.25
90	963	15.38
120	960	16.50
150	956	18.00
180	955	18.38

EFFECT OF pH ON ADSORPTION

Type of clay used : Hectorite

Compound : Cresol

Influent Conc. : 910 mg/l of TOC

pH	Effluent Conc. (ppm)	X/M (mg/gm)
4.9	885	9.07
5.3	876	12.58
6.5	864	17.25
6.8	865	17.00
7.8	872	14.38
8.1	883	10.13

EFFECT OF ISOTHERM ON ADSORPTION

Type of clay used : Hectorite

Compound : Cresol

Influent Conc. (ppm)	Effluent Conc. (ppm)	X/M (mg/gm)
1123	1072	19.13
1008	969	14.63
856	822	12.60
701	670	11.63
628	601	10.13
502	481	7.88
407	390	6.38
283	272	4.13
243	238	2.25

$$q = 4.259\ C^{1.202}$$

EFFECT OF OPTIMUM RATIO ON ADSORPTION

Type of clay used : Hectorite

Compound : Cyclohexanone

Influent Conc. : 1104 mg/l of TOC

Wt.(gms)	EffluentConc.(ppm)	X/M (mg/gm)
1.0	1097	7.00
2.0	1085	7.13
3.0	1071	8.25
4.0	1070	6.38

Optimum Ratio 3 gms : 750 ml

EFFECT OF CONTACT TIME ON ADSORPTION

Type of clay used : Hectorite

Compound : Cyclohexanone

Influent Conc. : 997 mg/l of TOC

Time (mts)	EffluentConc.(ppm)	X/M (mg/gm)
30	978	4.75
60	978	4.75
90	975	5.5
120	969	7.00
150	968	7.25
180	968	7.25

EFFECT OF pH ON ADSORPTION

Type of clay used : Hectorite

Compound : Cyclohexanone

Influent Conc. : 1083 mg/l of TOC

pH	Effluent Conc. (ppm)	X/M (mg/gm)
5.1	1071	5.5
5.8	1060	5.75
6.6	1053	7.50
7.1	1051	8.00
7.8	1059	6.00
8.2	1074	2.25

EFFECT OF ISOTHERM ON ADSORPTION

Type of clay used : Hectorite

Compound : Cyclohexanone

Influent Conc. (ppm)	Effluent Conc. (ppm)	X/M (mg/gm)
1043	1010	8.25
883	854	7.25
804	784	5.00
721	702	4.75
609	596	3.25
454	441	3.25
321	309	3.00
208	196	3.00

$$q = 9.849\ C^{0.6019}$$

EFFECT OF OPTIMUM RATIO ON ADSORPTION

Type of clay used : Hectorite

Compound : Monochlorophenol

Influent Conc. : 1123 mg/l of TOC

Wt.(gms)	EffluentConc.(ppm)	X/M (mg/gm)
1.0	1107	12.00
2.0	1085	14.25
3.0	1069	13.50
5.0	1048	11.25

Optimum Ratio 2 gms : 750 ml

EFFECT OF CONTACT TIME ON ADSORPTION

Type of clay used : Hectorite

Compound : Monochlorophenol

Influent Conc. : 987 mg/l of TOC

Time (mts)	EffluentConc.(ppm)	X/M (mg/gm)
30	972	5.63
60	969	6.75
90	963	9.00
120	955	12.00
150	949	14.25
180	948	14.63

EFFECT OF pH ON ADSORPTION

Type of clay used : Hectorite

Compound : Monochlorophenol

Influent Conc. : 1040 mg/l of TOC

pH	EffluentConc.(ppm)	X/M (mg/gm)
5.4	1018	8.25
6.0	1003	13.88
6.5	1000	15.00
6.9	1007	12.38
7.8	1013	10.13

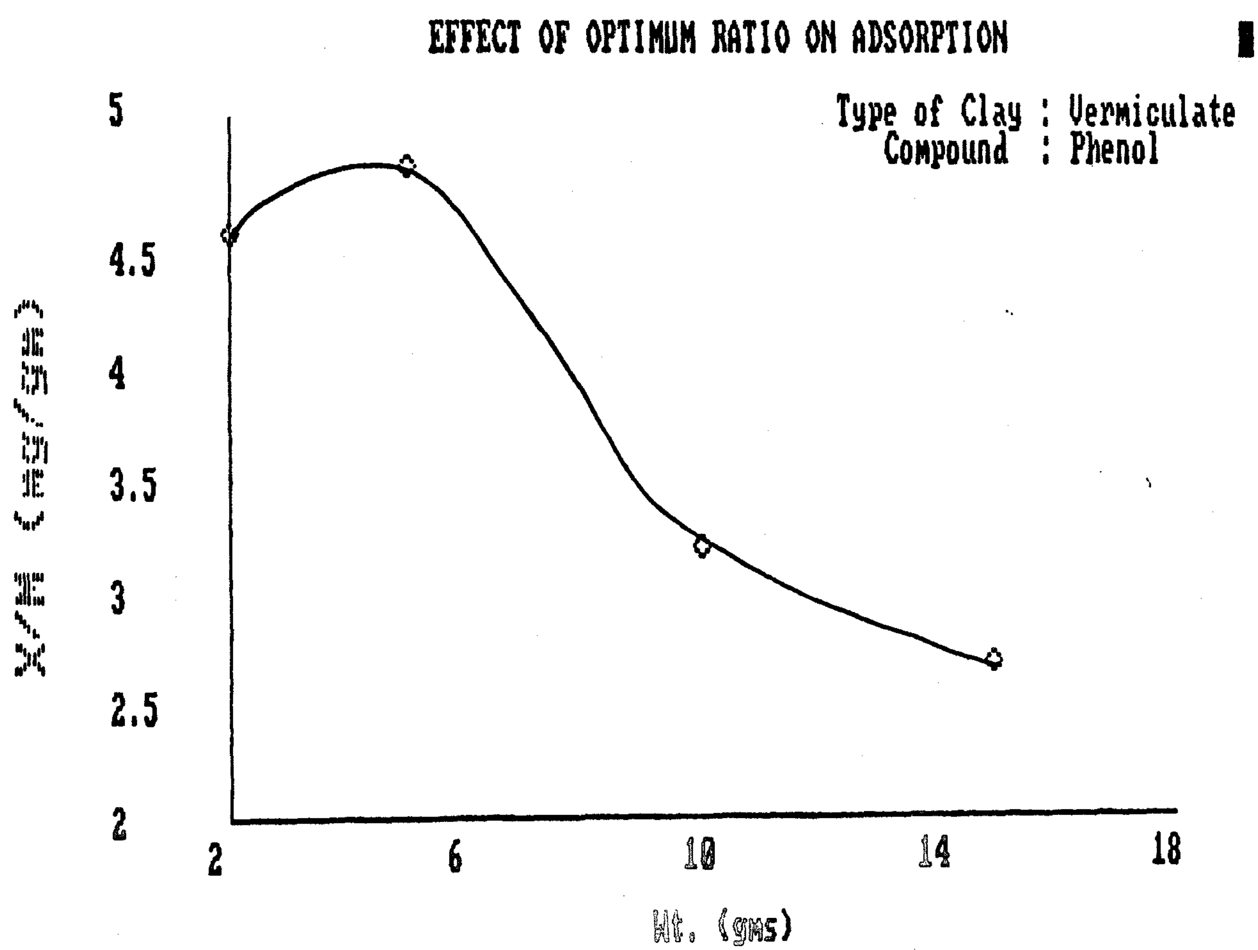
EFFECT OF ISOTHERM ON ADSORPTION

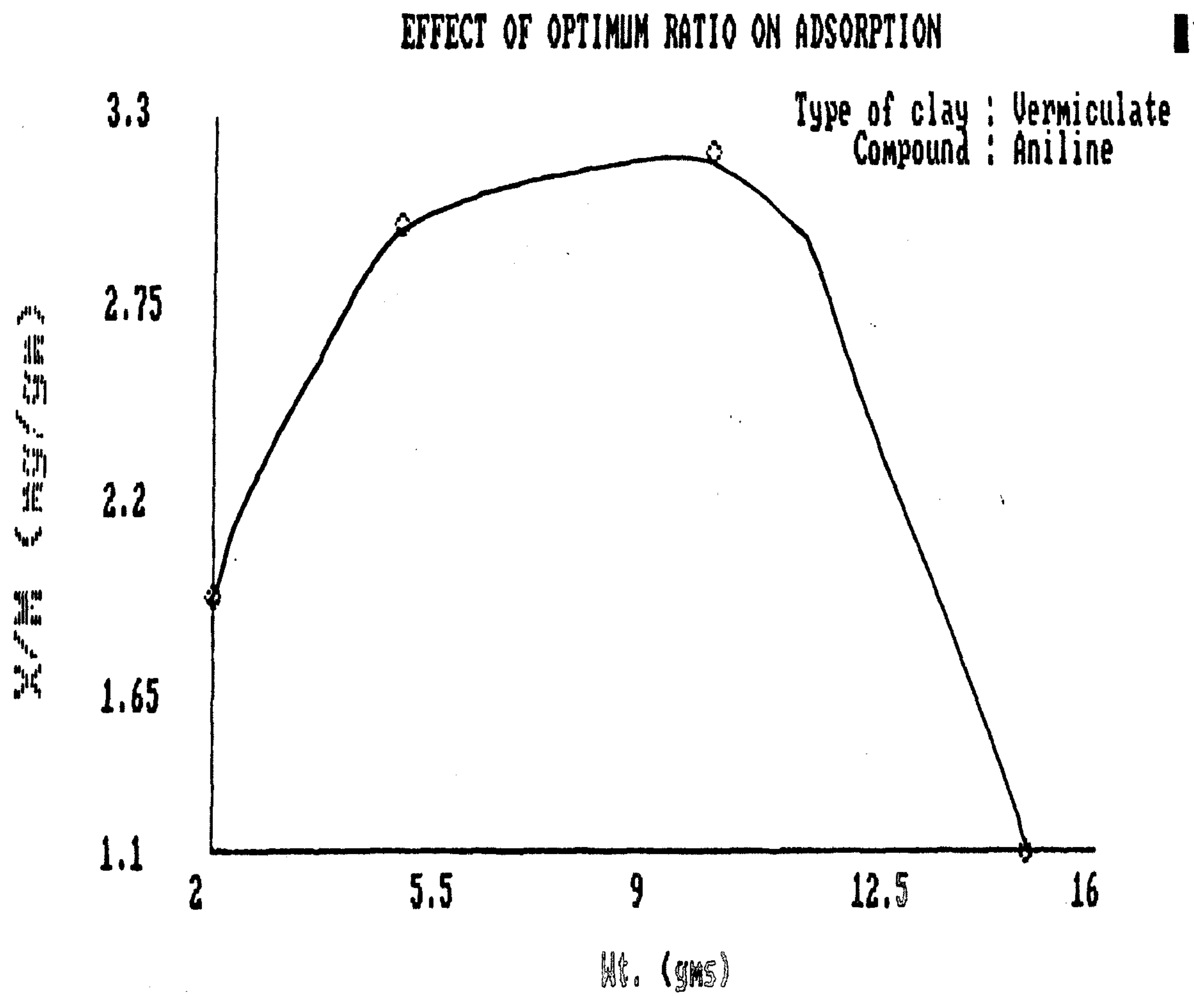
Type of clay used : Hectorite

Compound : Monochlorophenol

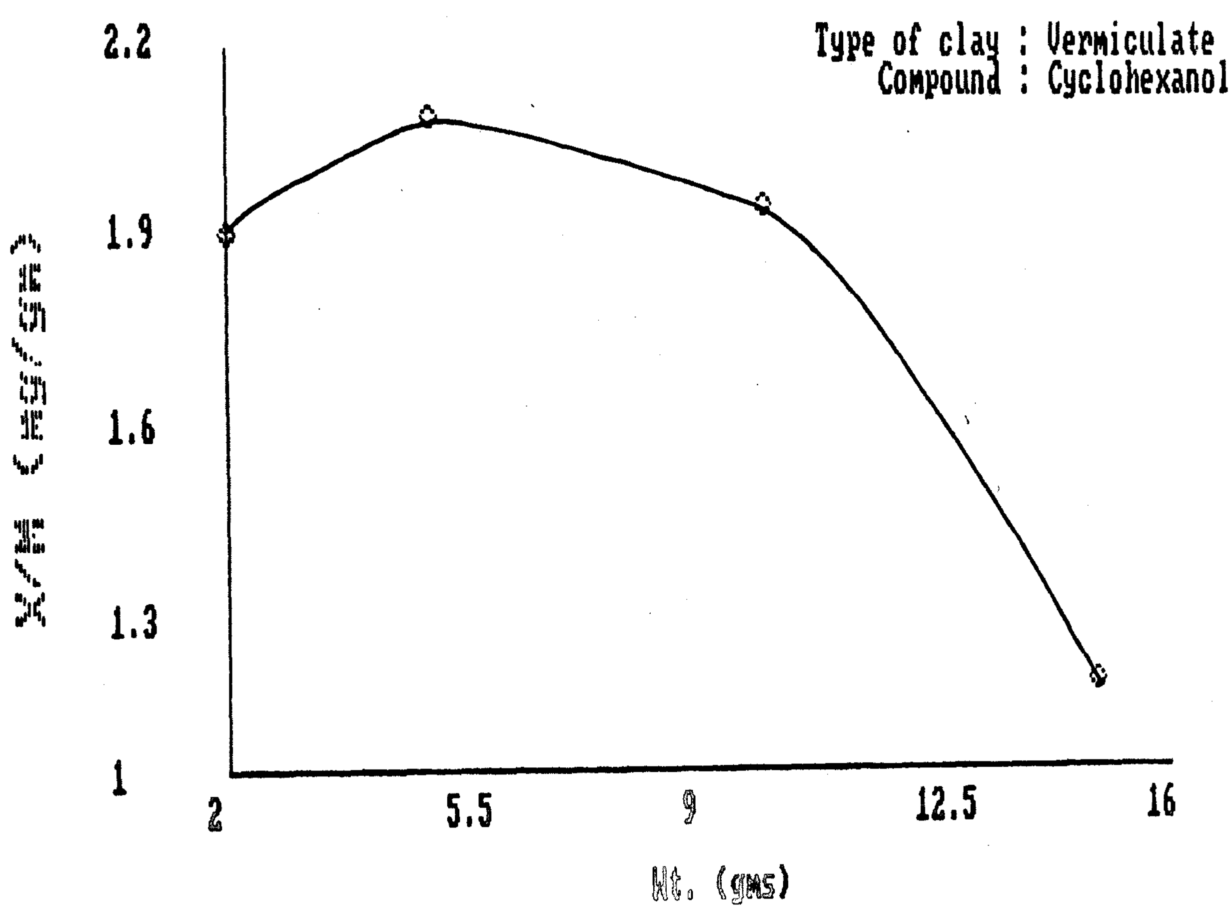
Influent Conc. (ppm)	EffluentConc.(ppm)	X/M (mg/gm)
997	956	15.38
901	863	14.25
842	808	12.38
721	692	10.88
609	585	9.00
530	509	7.88
401	383	6.75
323	308	5.63
256	249	2.63

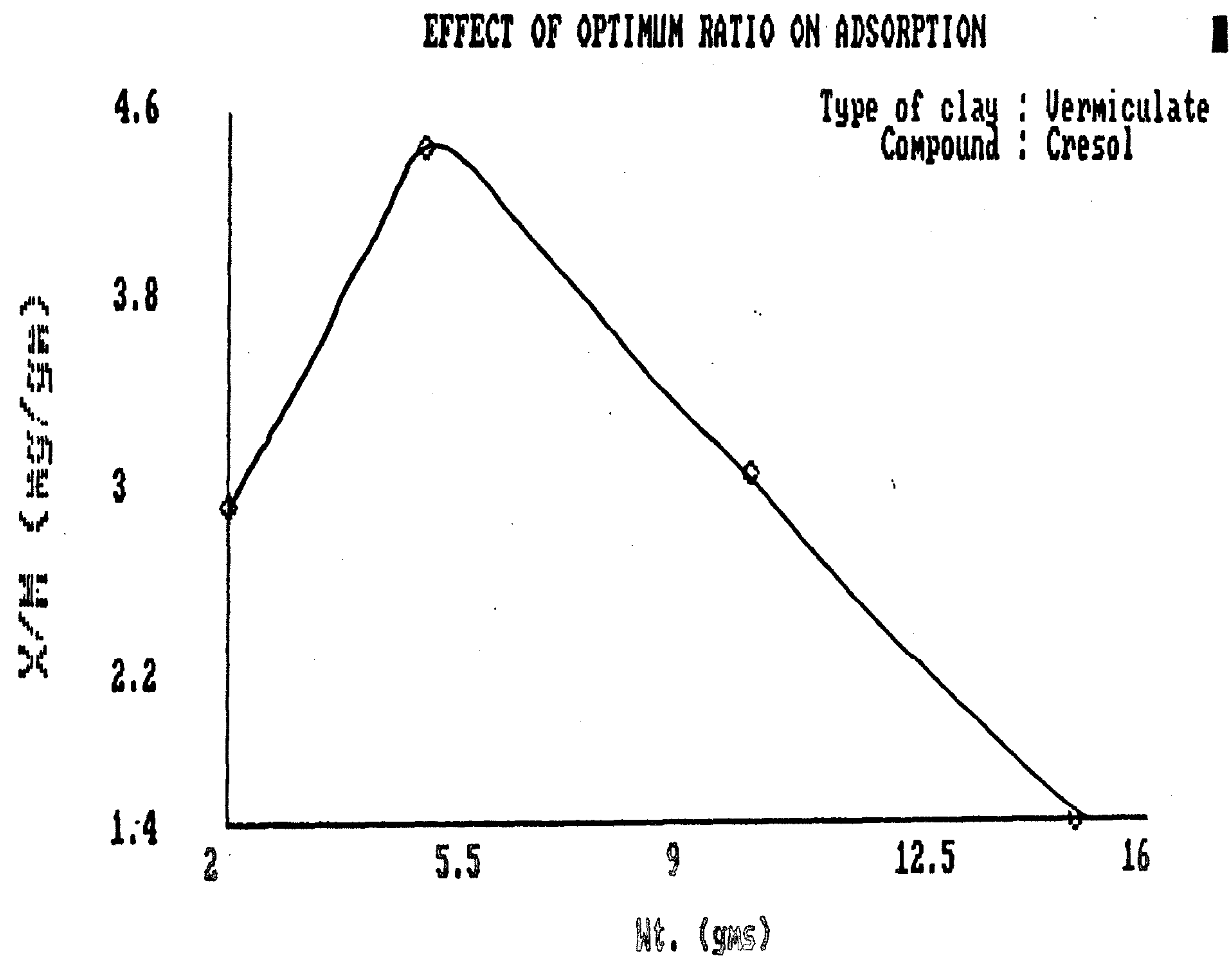
$$q = 7.498\ C^{1.114}$$


EFFECT OF OPTIMUM RATIO ON ADSORPTION
Type of Clay : Vermiculate
Compound : Phenol
X/M (mg/gm)
5
4.5
4
3.5
3
2.5
2
2
6
10
14
18
Wt. (gms)

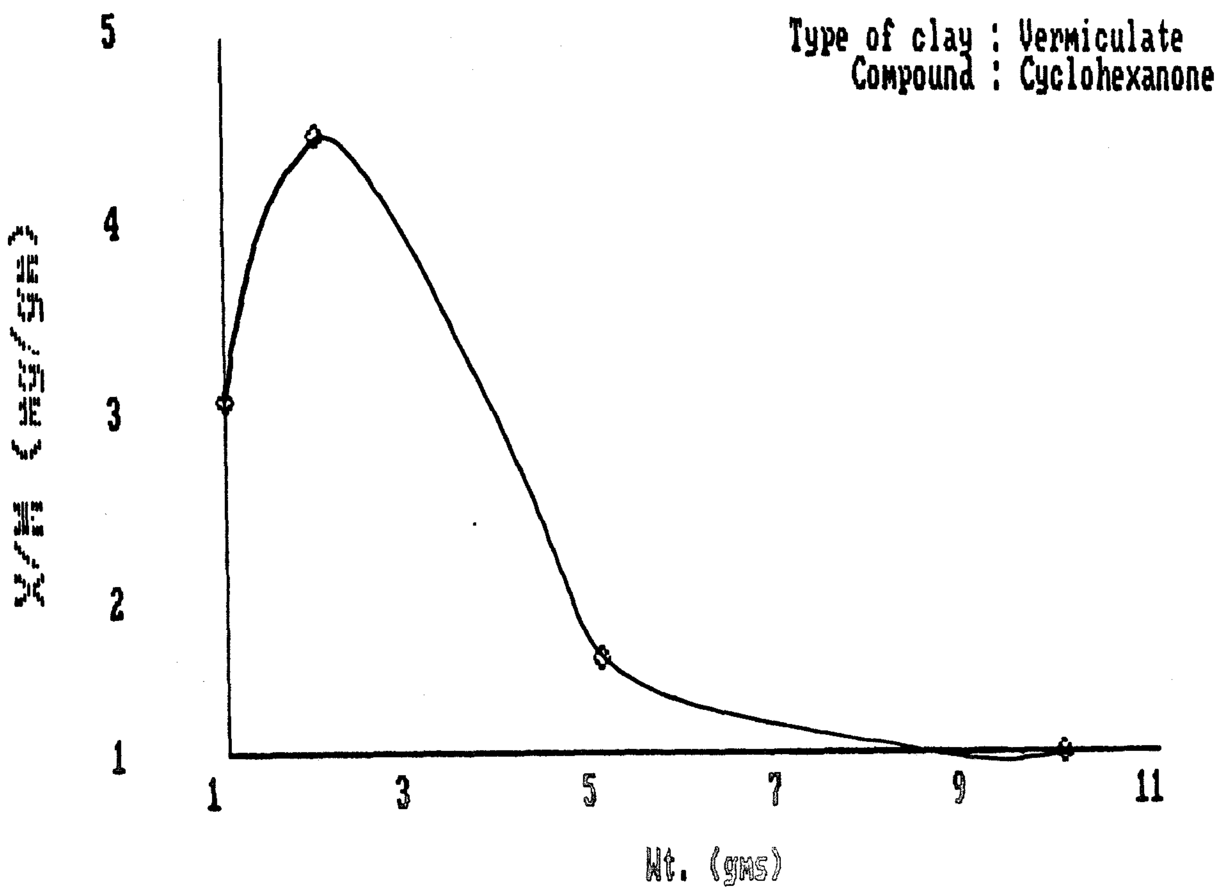

EFFECT OF OPTIMUM RATIO ON ADSORPTION
Type of clay : Vermiculate
Compound : Aniline
3.3
2.75
2.2
1.65
1.1
X/M
2
5.5
9
12.5
16
Wt. (gms)

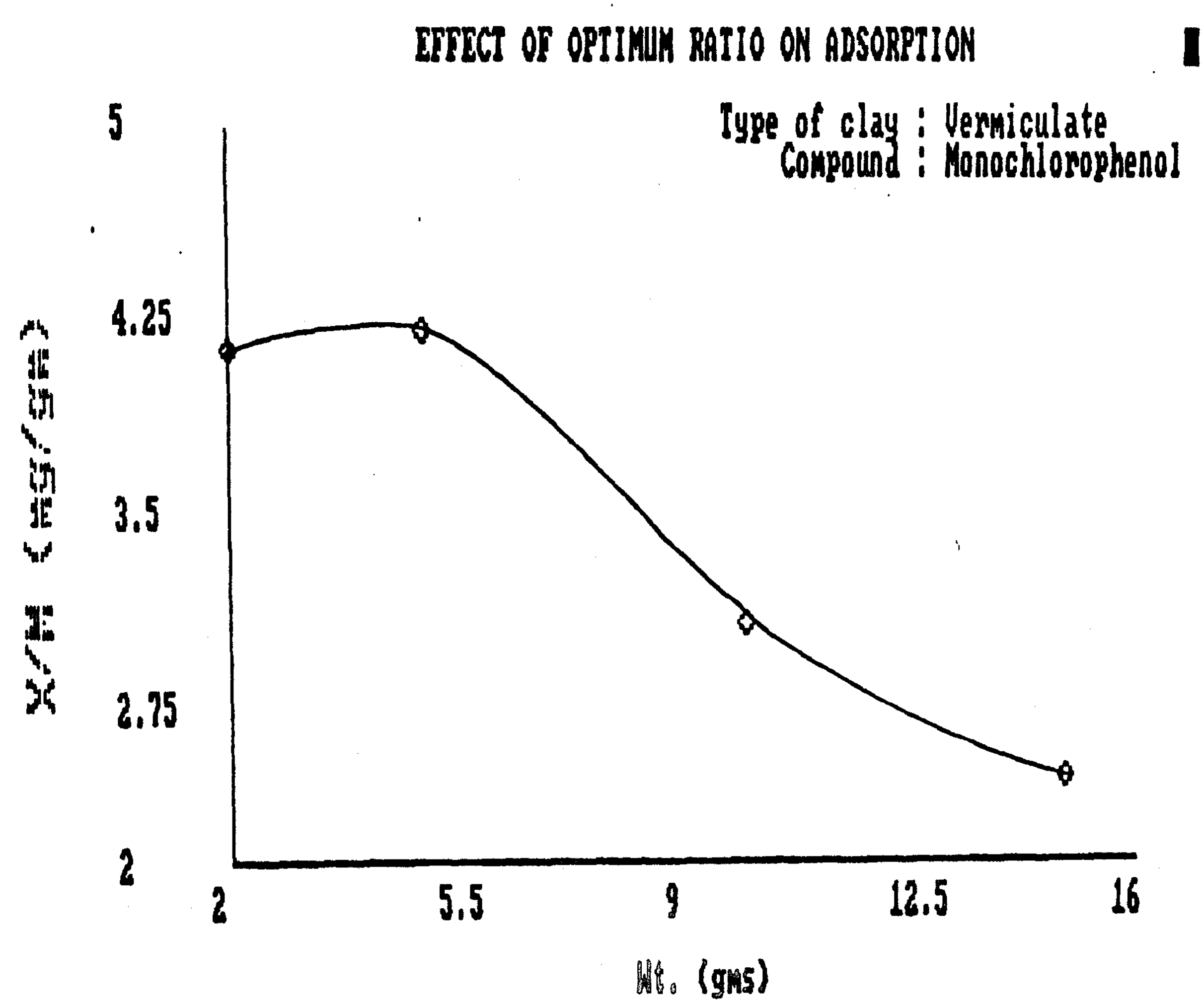
EFFECT OF OPTIMUM RATIO ON ADSORPTION



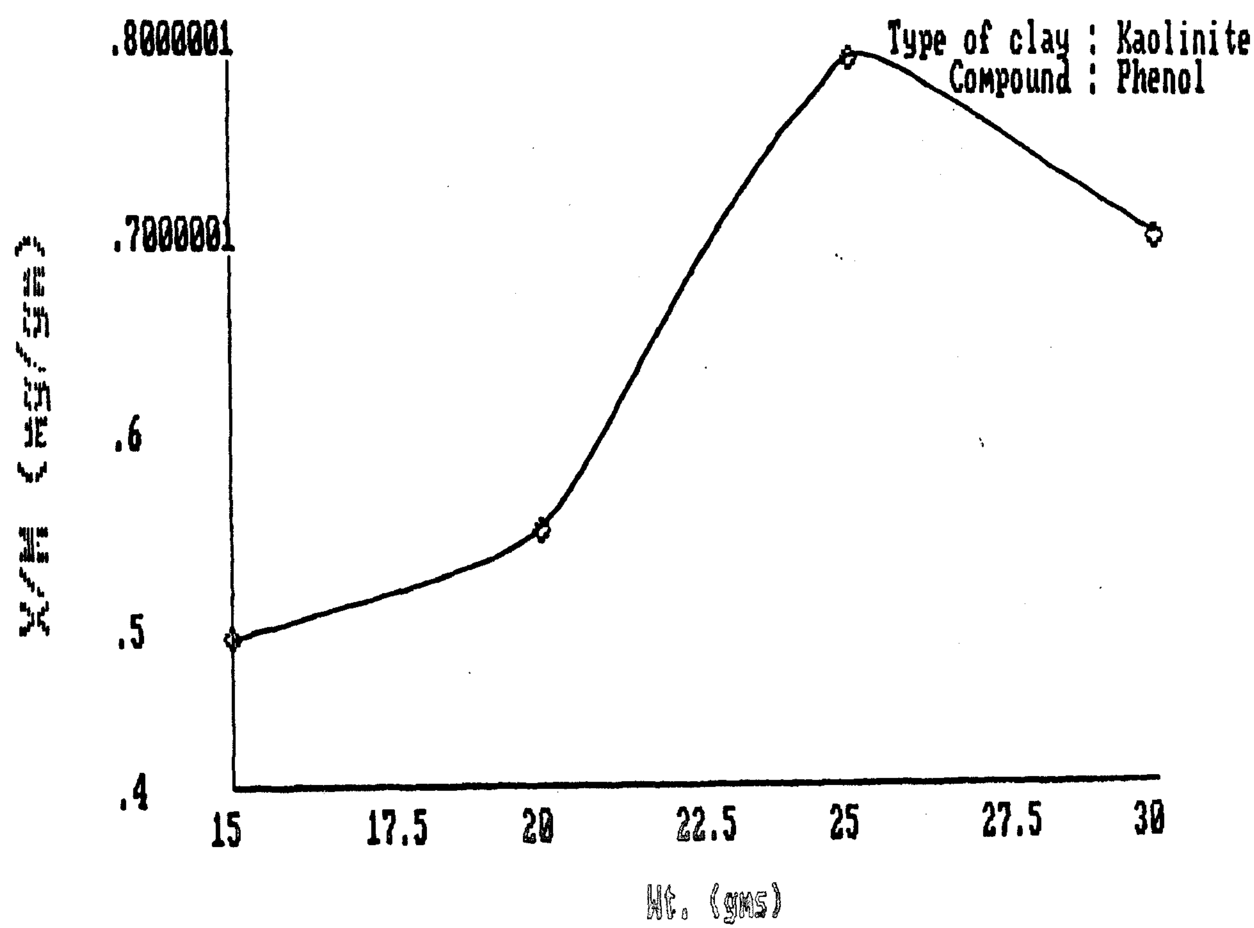

EFFECT OF OPTIMUM RATIO ON ADSORPTION
Type of clay : Vermiculate
Compound : Cresol
4.6
3.8
3
2.2
1.4
X/M (mg/gm)
2
5.5
9
12.5
16
Wt. (gms)

EFFECT OF OPTIMUM RATIO ON ADSORPTION

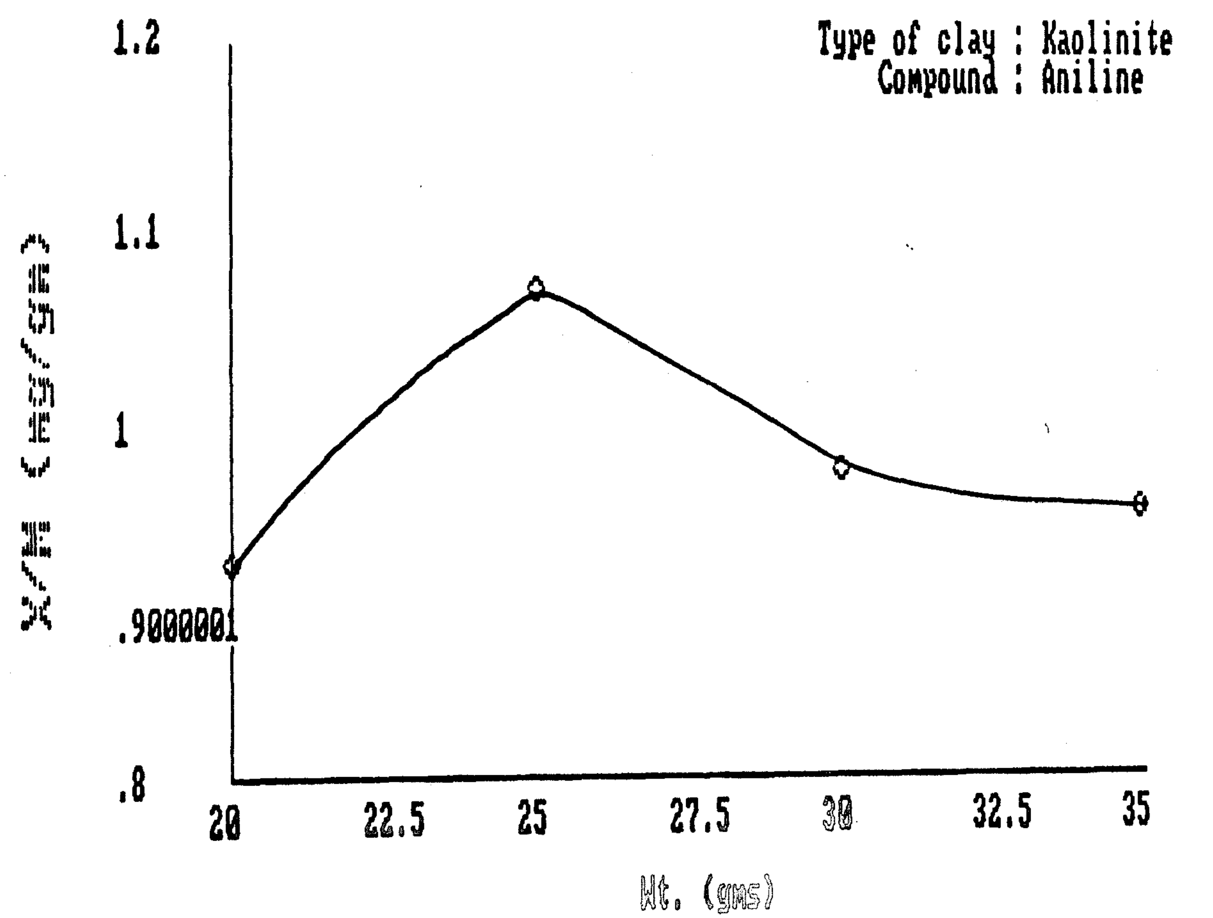


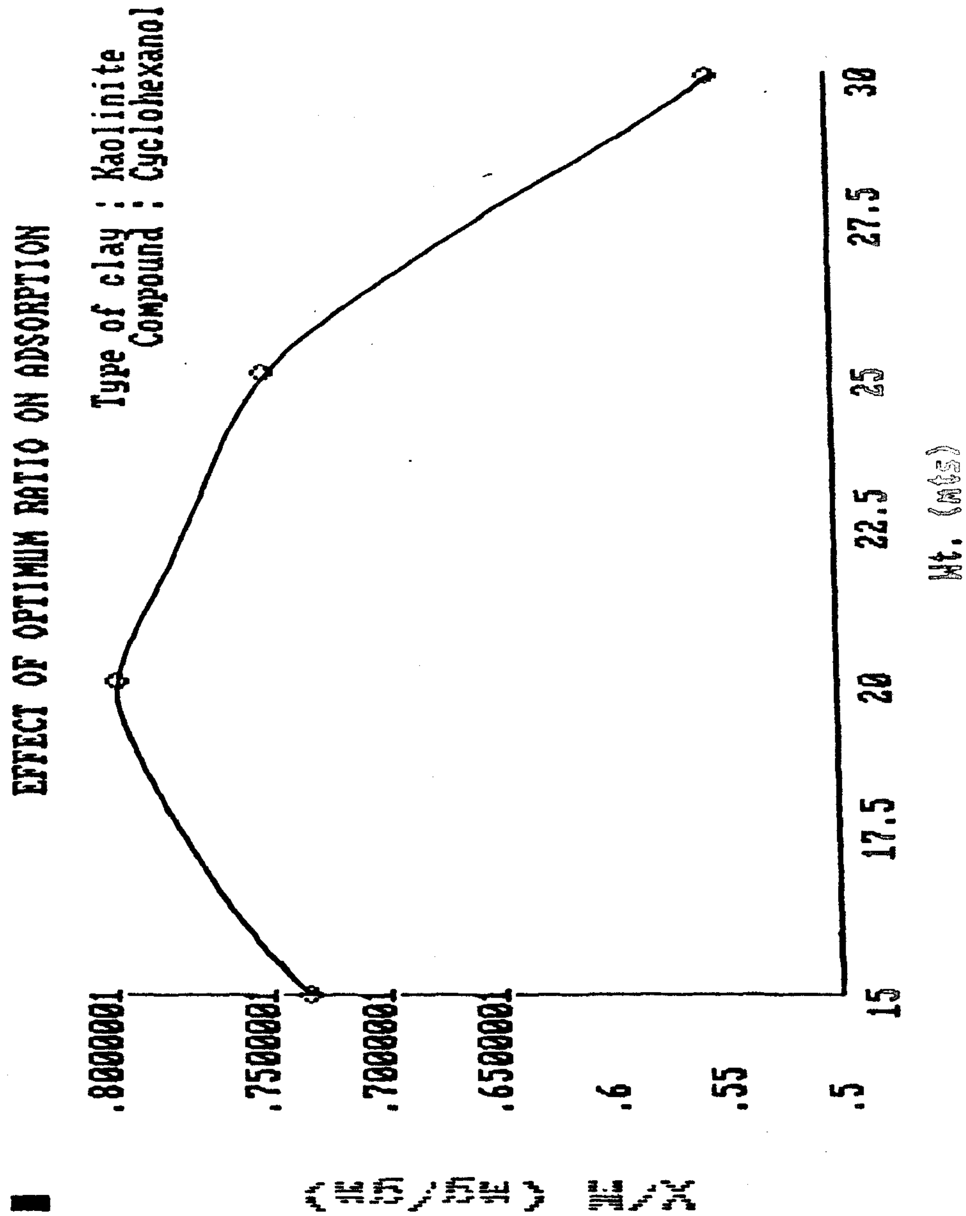

EFFECT OF OPTIMUM RATIO ON ADSORPTION
Type of clay : Vermiculate
Compound : Monochlorophenol
X/M (mg/gm)
5
4.25
3.5
2.75
2
2
5.5
9
12.5
16
Wt. (gms)

EFFECT OF OPTIMUM RATIO ON ADSORPTION

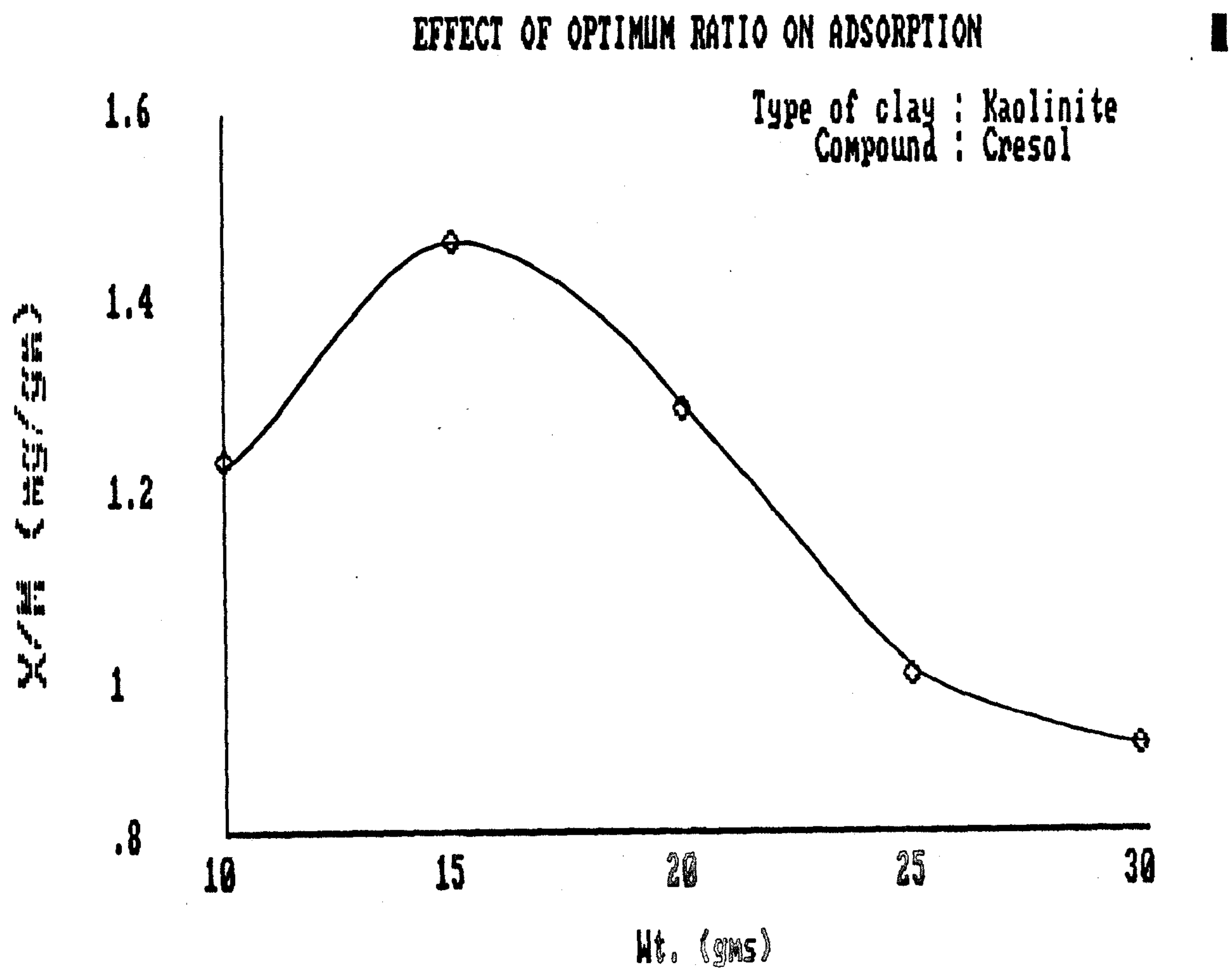


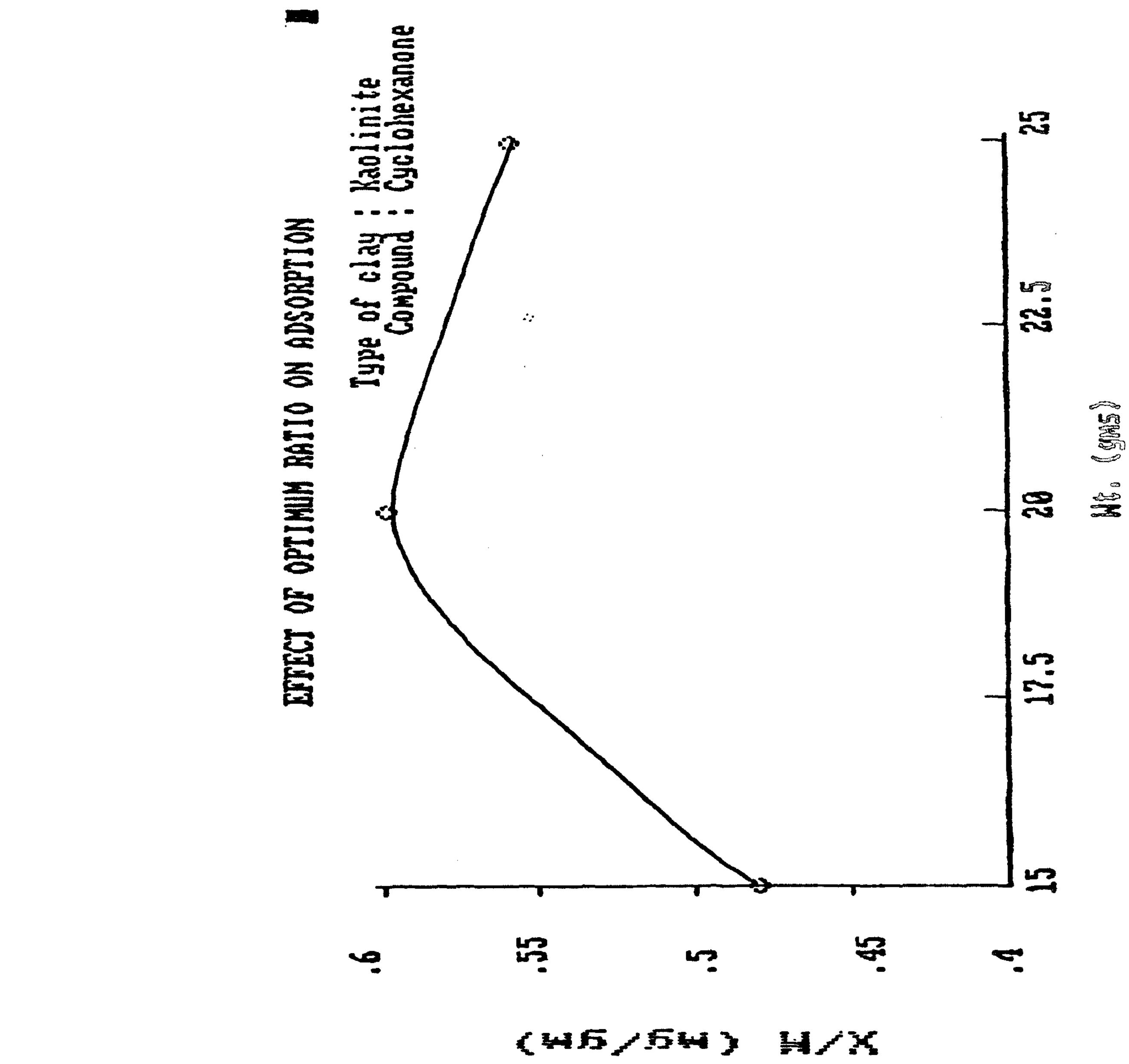
EFFECT OF OPTIMUM RATIO ON ADSORPTION



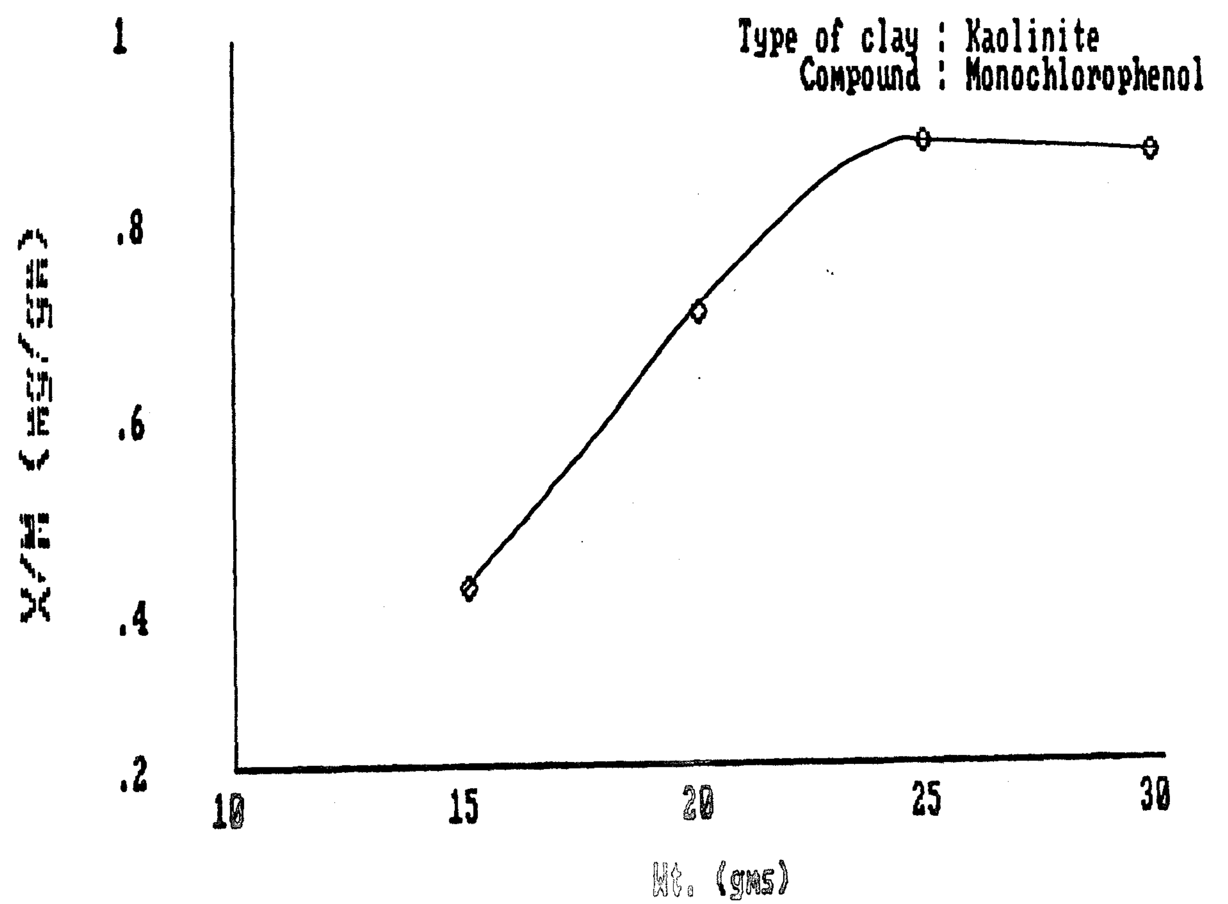


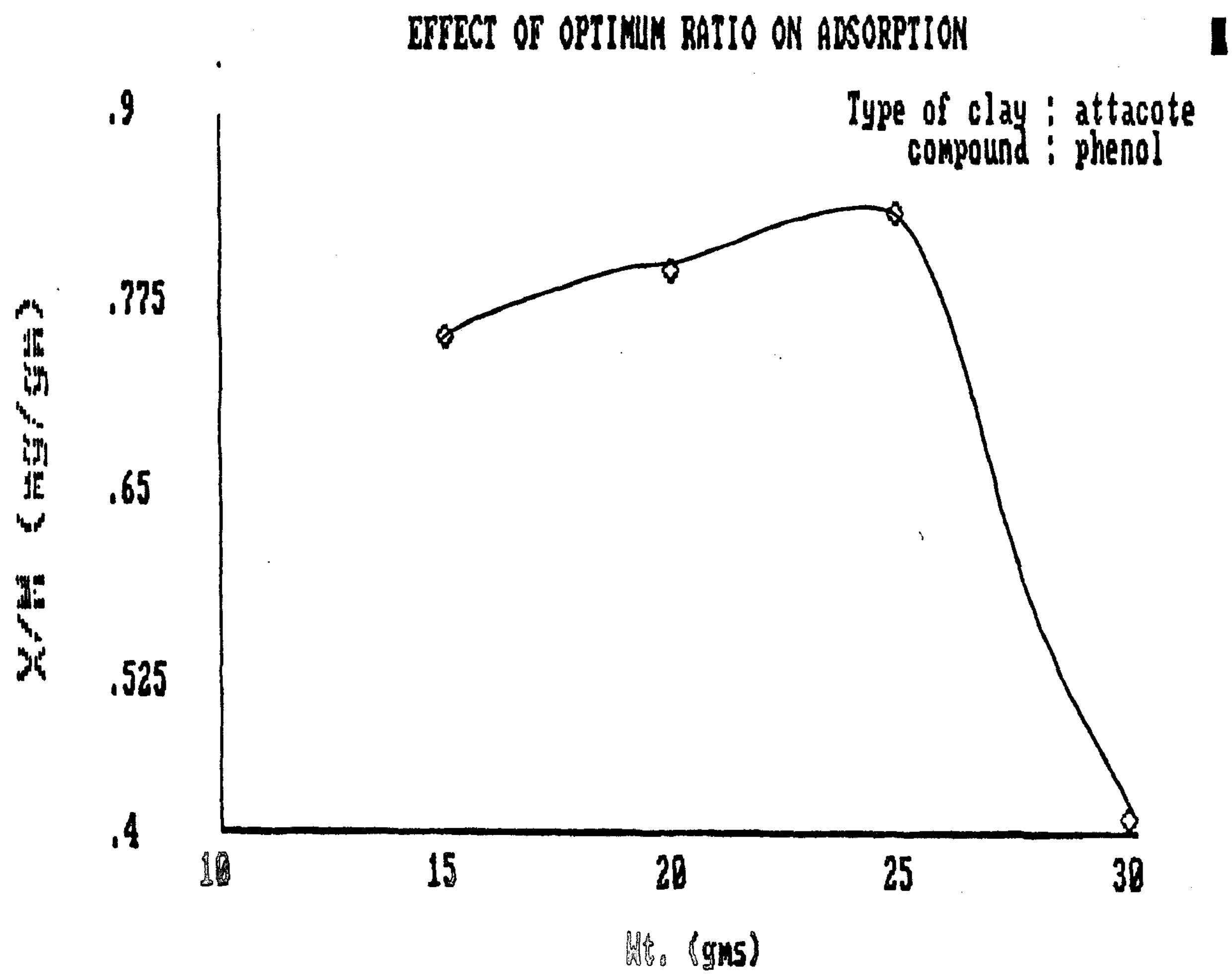
EFFECT OF OPTIMUM RATIO ON ADSORPTION
Type of clay : Kaolinite
Compound : Cyclohexanol
X/M (mg/gm)
.8000001
.7500001
.7000001
.6500001
.6
.55
.5
15
17.5
20
22.5
25
27.5
30
Wt. (gms)


EFFECT OF OPTIMUM RATIO ON ADSORPTION
Type of clay : Kaolinite
Compound : Cresol
X/M (mg/gm)
1.6
1.4
1.2
1
.8
10
15
20
25
30
Wt. (gms)

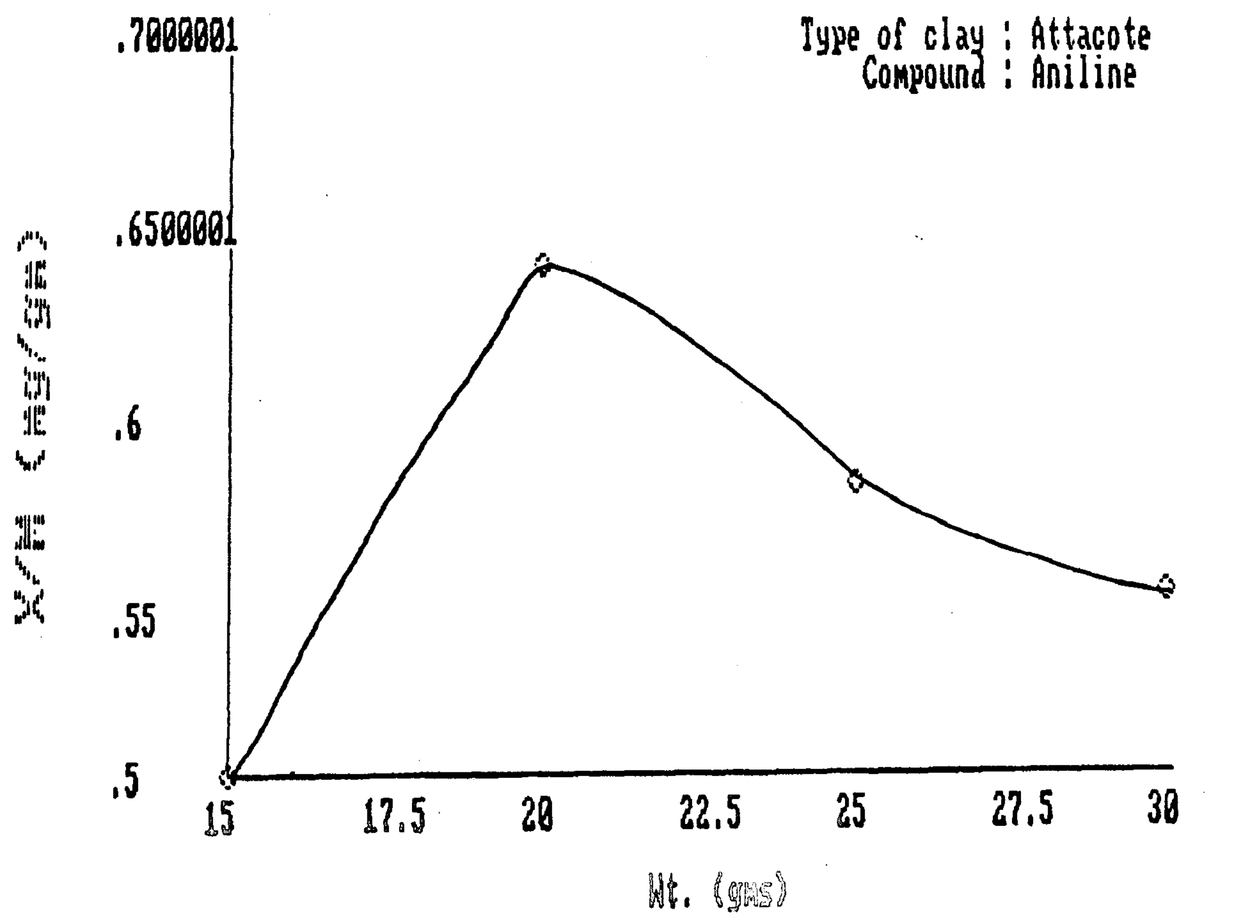

EFFECT OF OPTIMUM RATIO ON ADSORPTION
Type of clay : Kaolinite
Compound : Cyclohexanone
X/M (mg/gm)
.6
.55
.5
.45
.4
15
17.5
20
22.5
25
Wt. (gms)

EFFECT OF OPTIMUM RATIO ON ADSORPTION

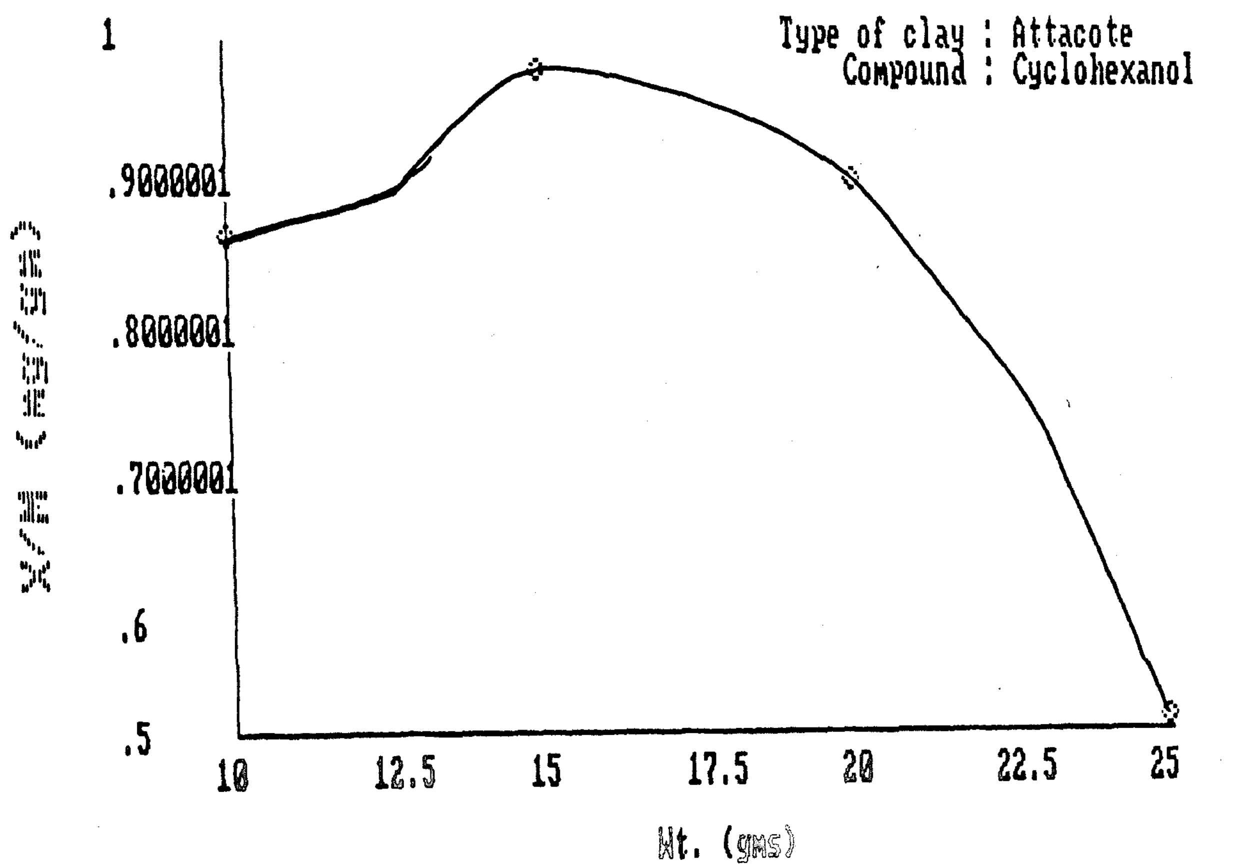


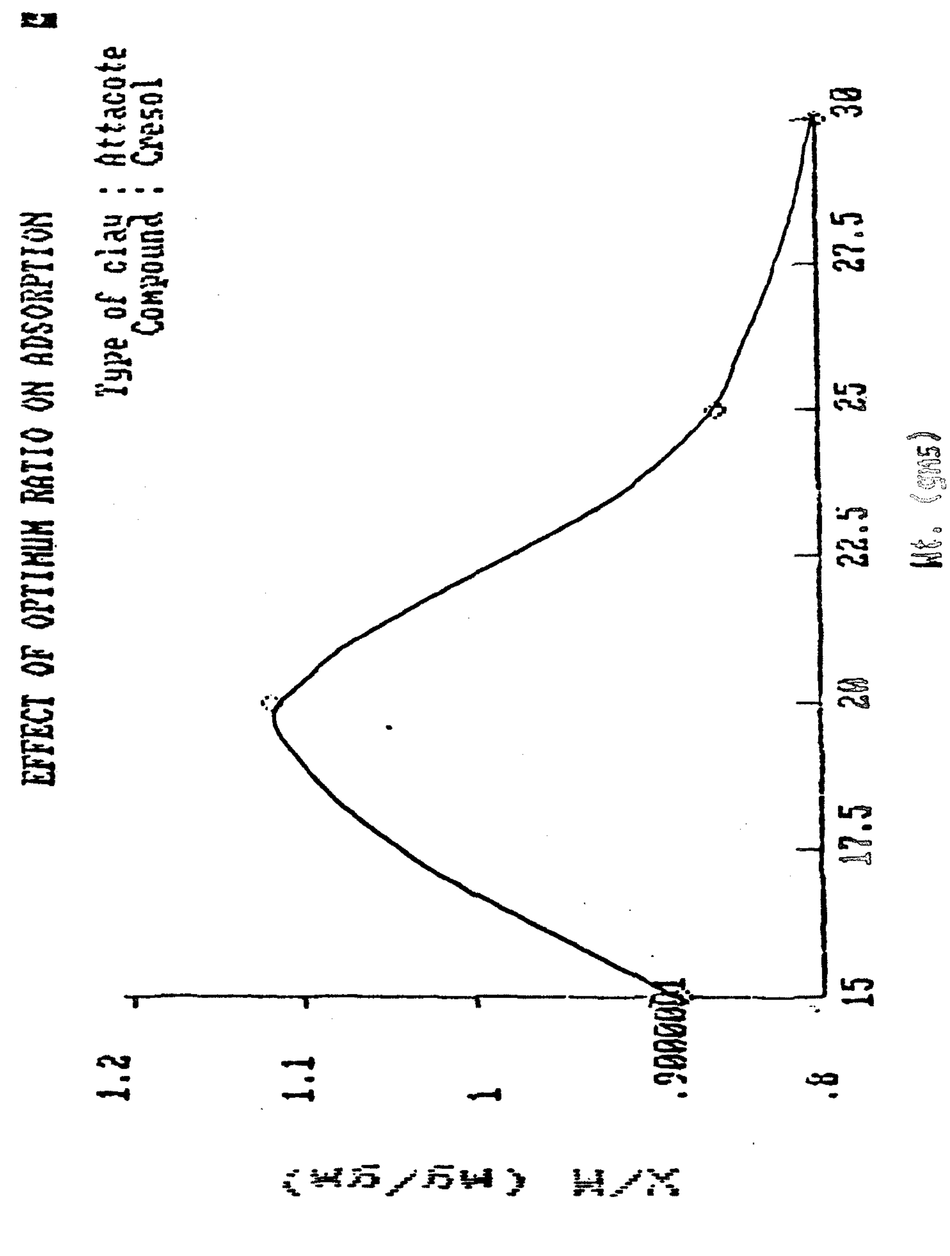

EFFECT OF OPTIMUM RATIO ON ADSORPTION
Type of clay : attacote
compound : phenol
X/M (mg/gm)
.9
.775
.65
.525
.4
10
15
20
25
30
Wt. (gms)

EFFECT OF OPTIMUM RATIO ON ADSORPTION

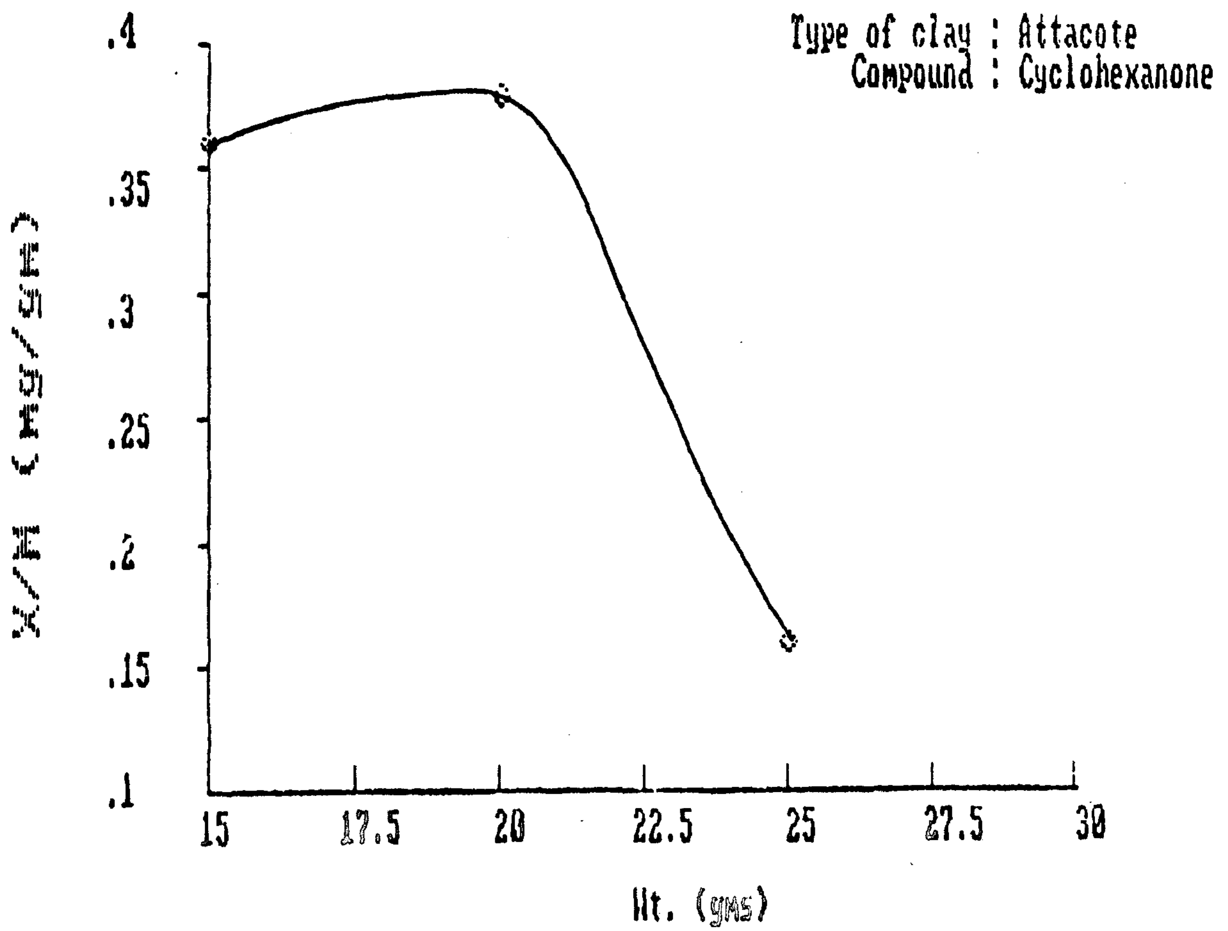


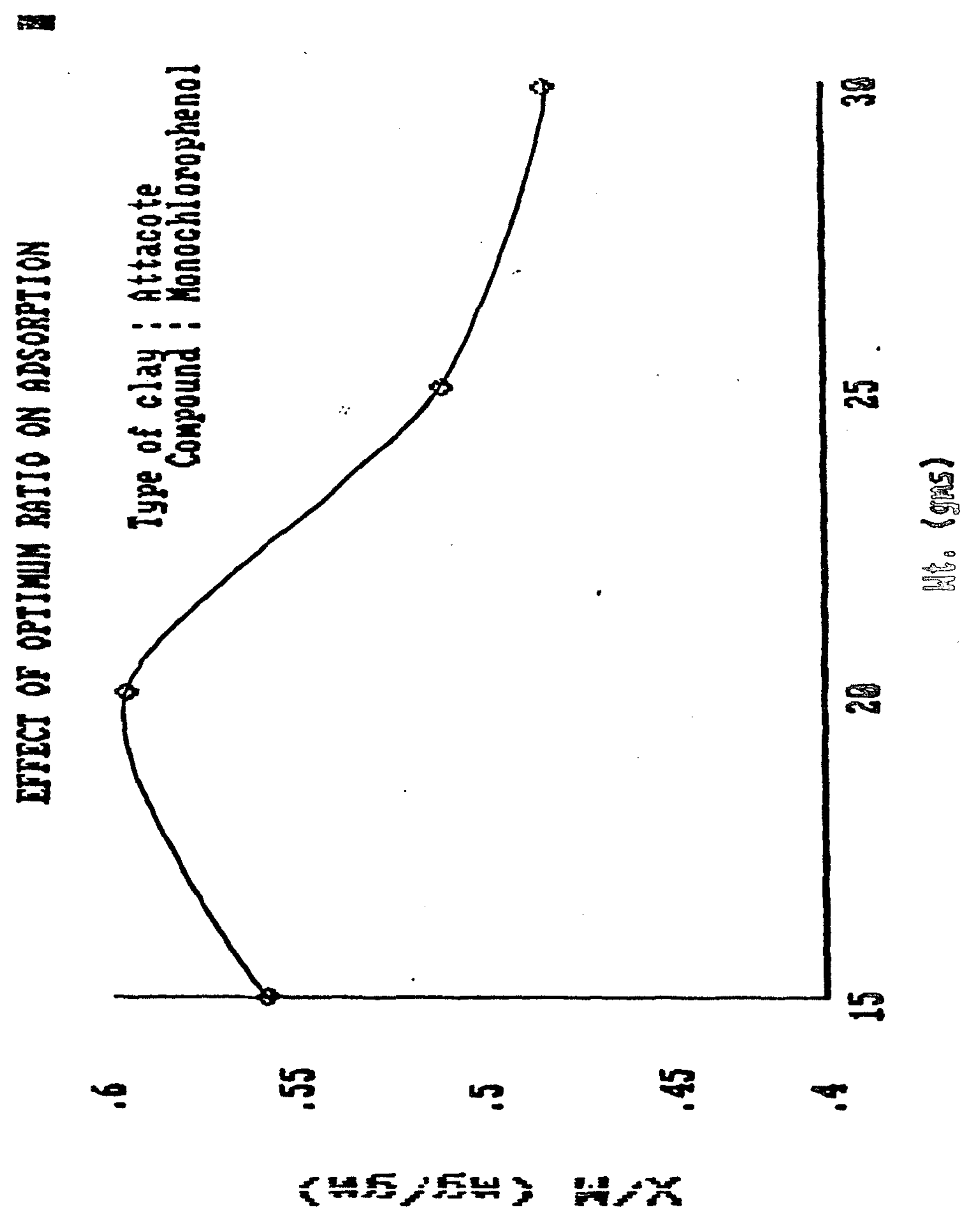
EFFECT OF OPTIMUM RATIO ON ADSORPTION



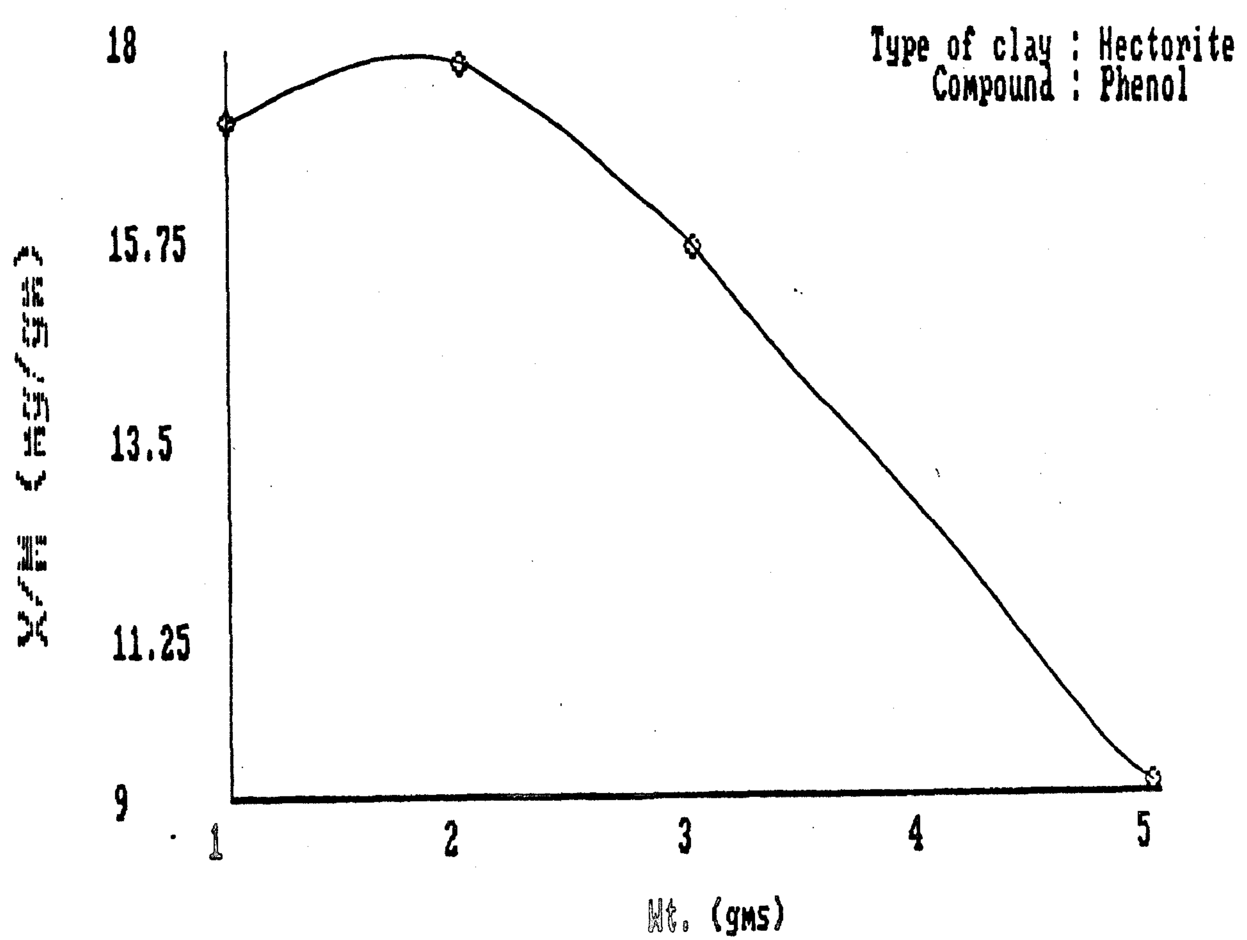

EFFECT OF OPTIMUM RATIO ON ADSORPTION
Type of clay : Attacote
Compound : Cresol
X/M (mg/gm)
1.2
1.1
1
.9000001
.8
15
17.5
20
22.5
25
27.5
30
Wt. (gms)

EFFECT OF OPTIMUM RATIO ON ADSORPTION

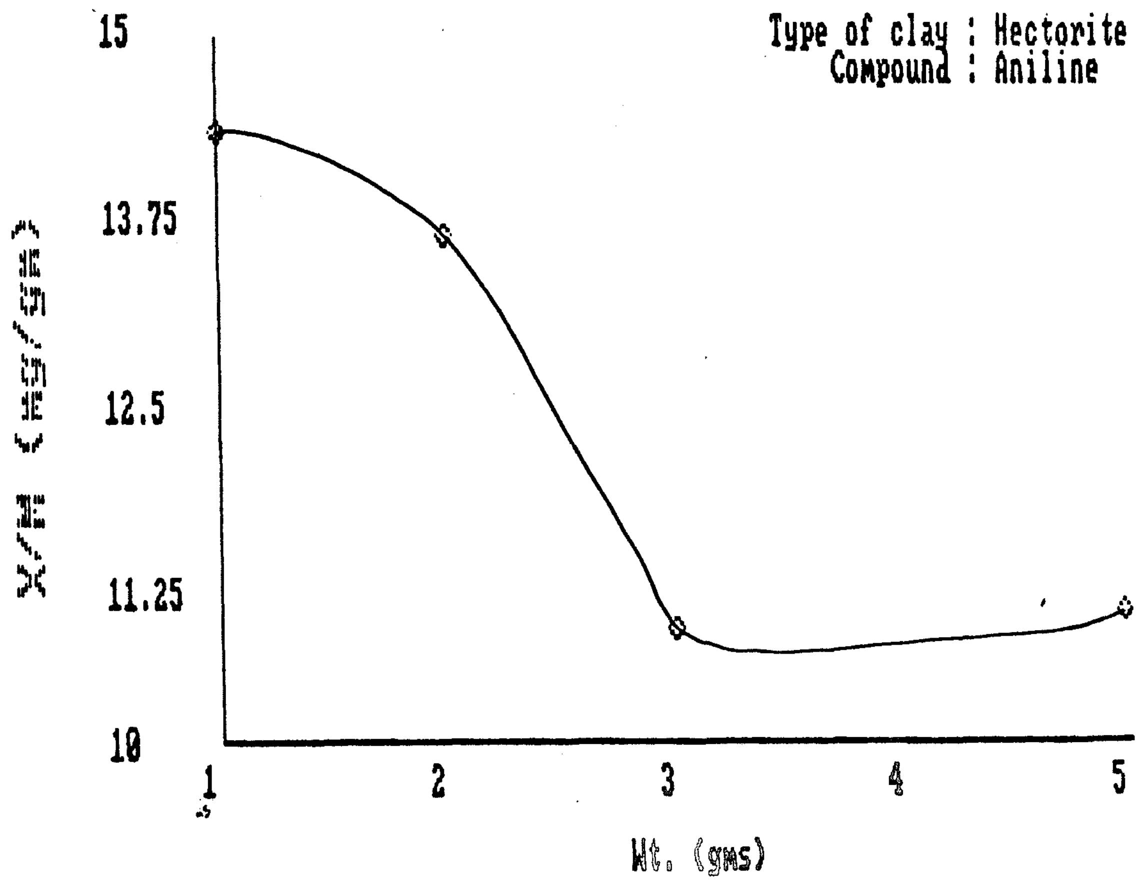



EFFECT OF OPTIMUM RATIO ON ADSORPTION
Type of clay : Attacote
Compound : Monochlorophenol
X/M (mg/gm)
.6
.55
.5
.45
.4
15
20
25
30
Wt. (gms)

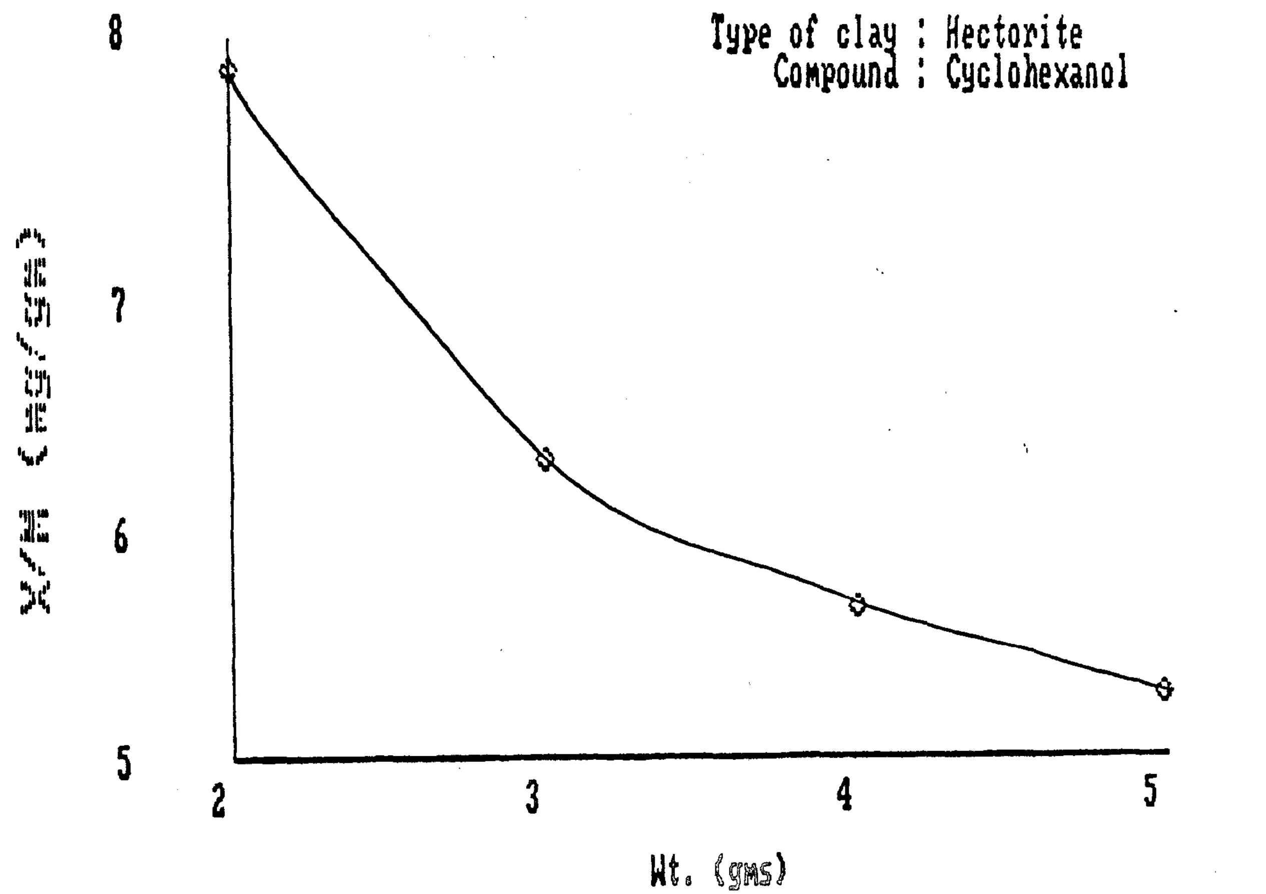
EFFECT OF OPTIMUM RATIO ON ADSORPTION



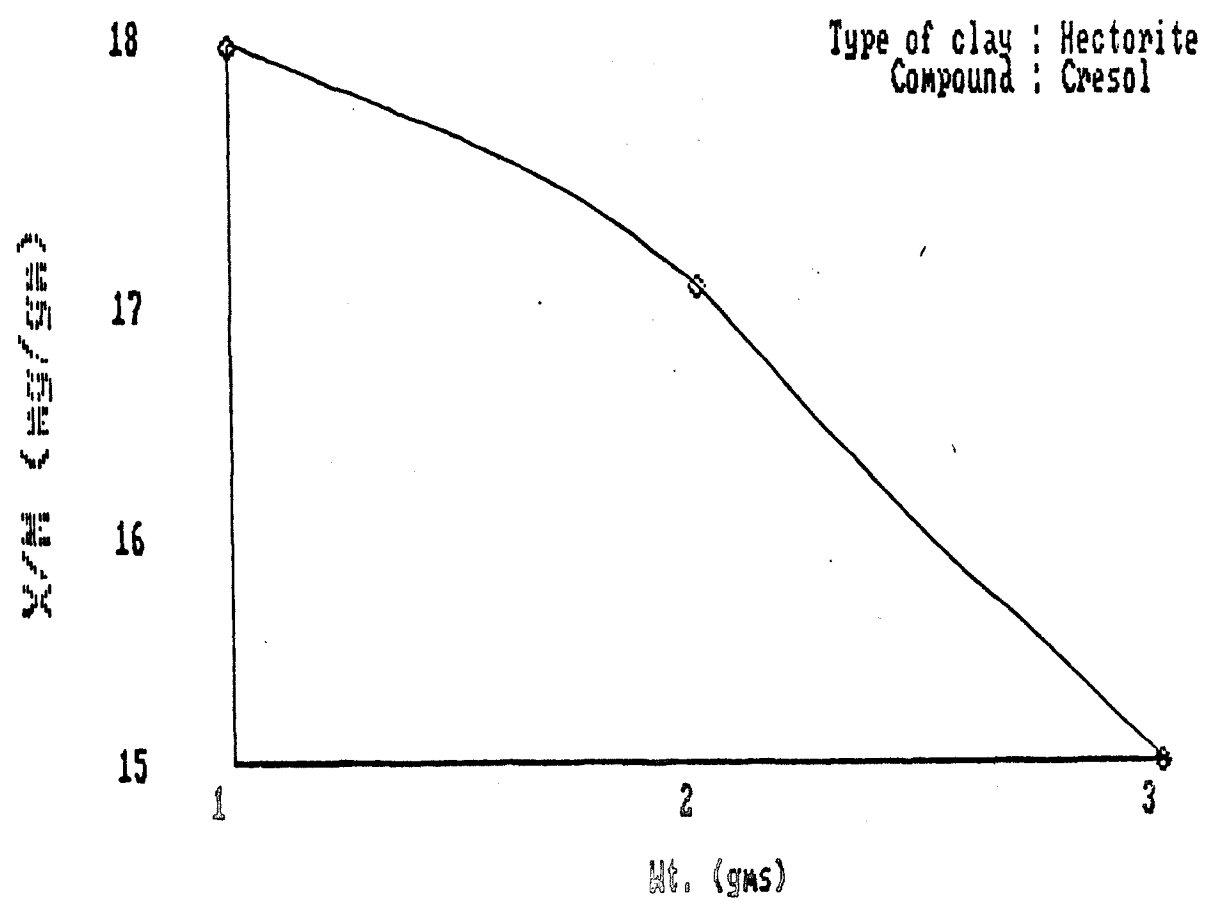
EFFECT OF OPTIMUM RATIO ON ADSORPTION

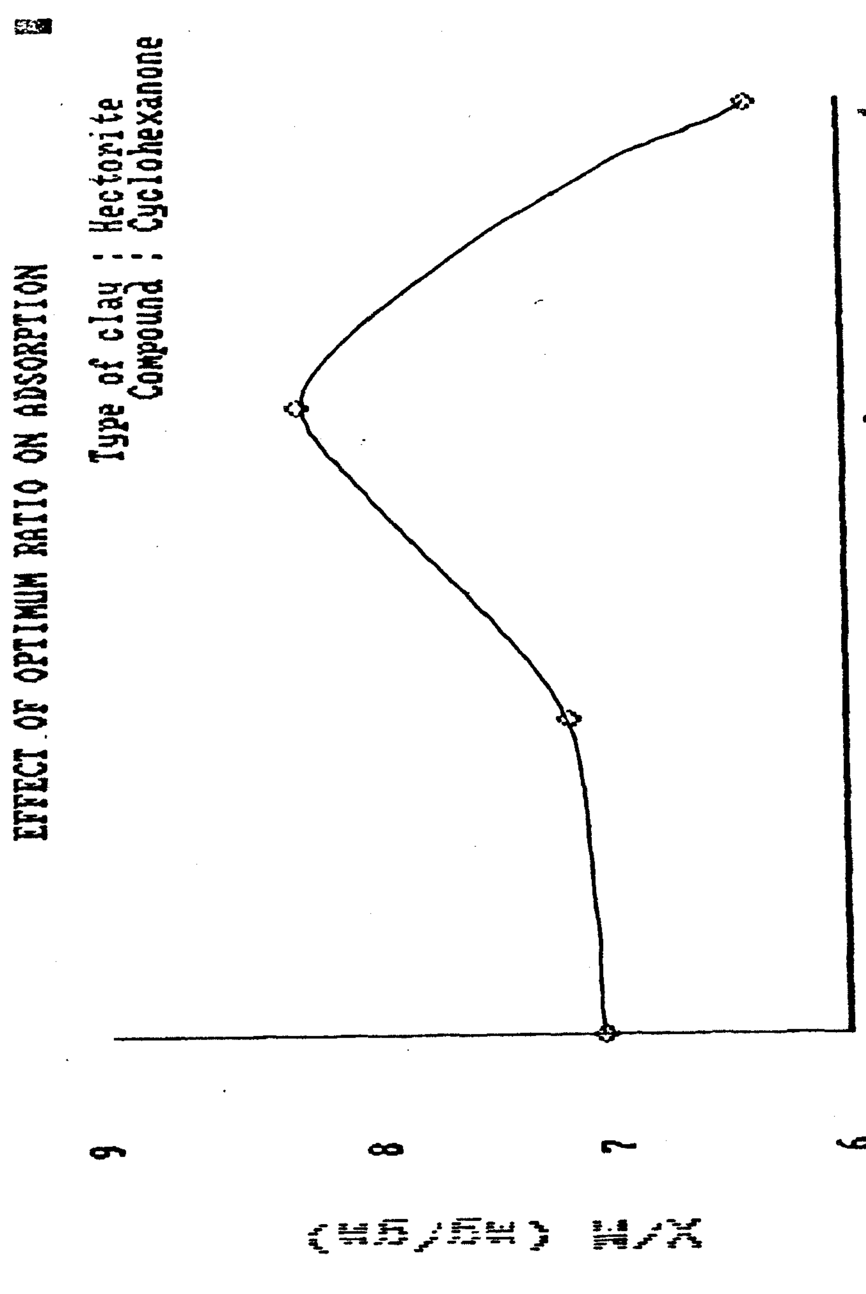


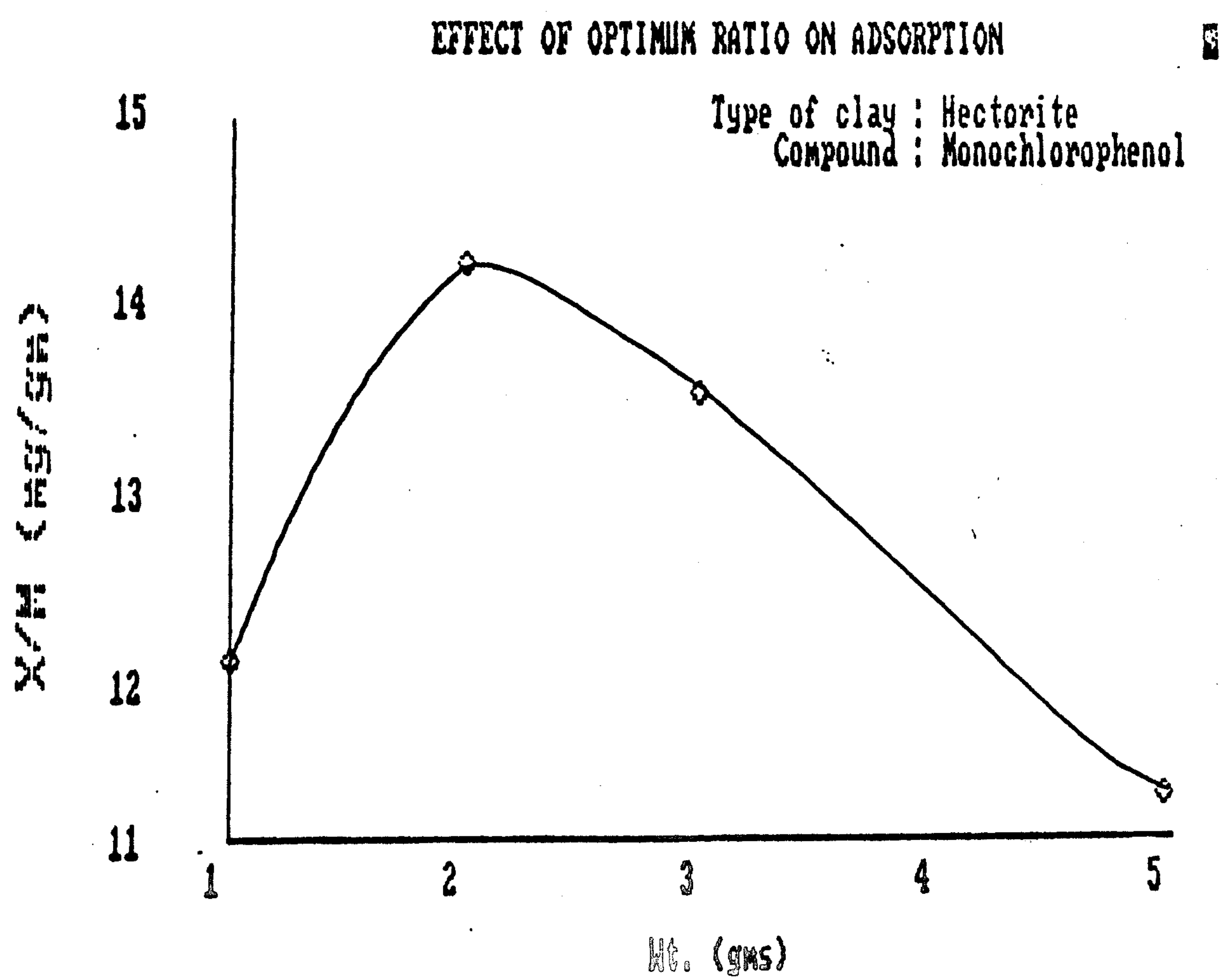
EFFECT OF OPTIMUM RATIO ON ADSORPTION

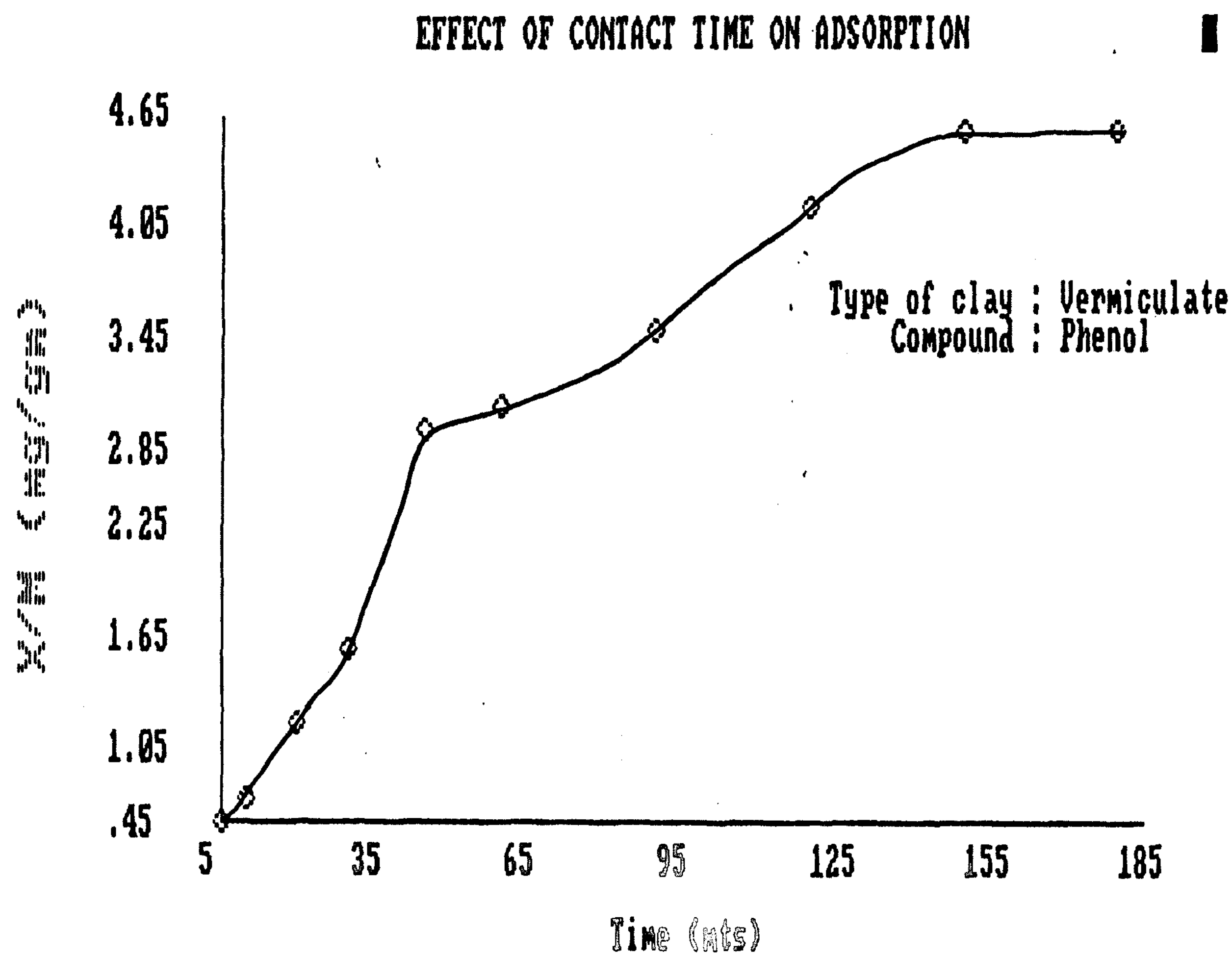


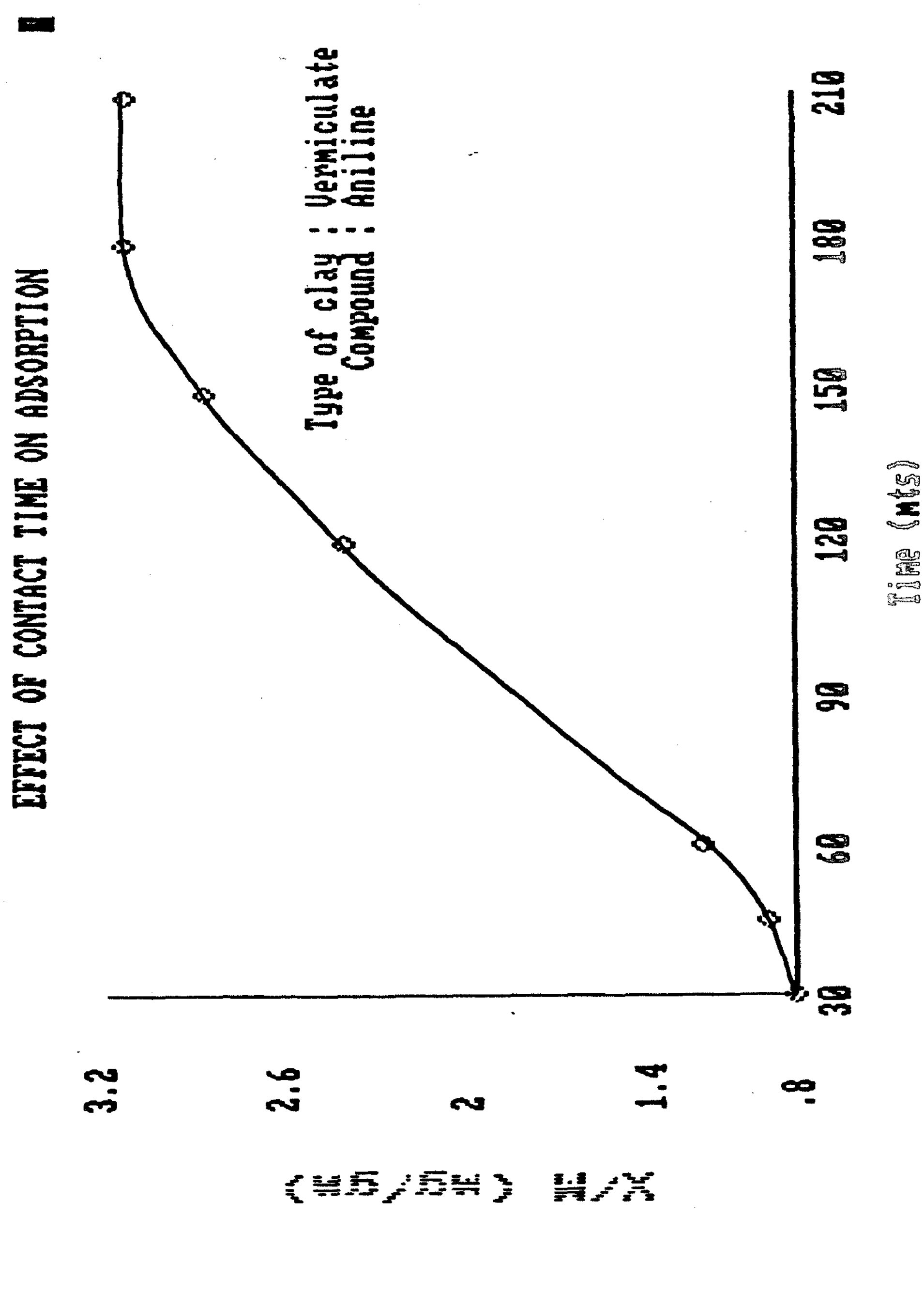
EFFECT OF OPTIMUM RATIO ON ADSORPTION




EFFECT OF OPTIMUM RATIO ON ADSORPTION
Type of clay : Hectorite
Compound : Cyclohexanone
X/M (mg/gm)
Wt. (gms)
9
8
7
6
1
2
3
4

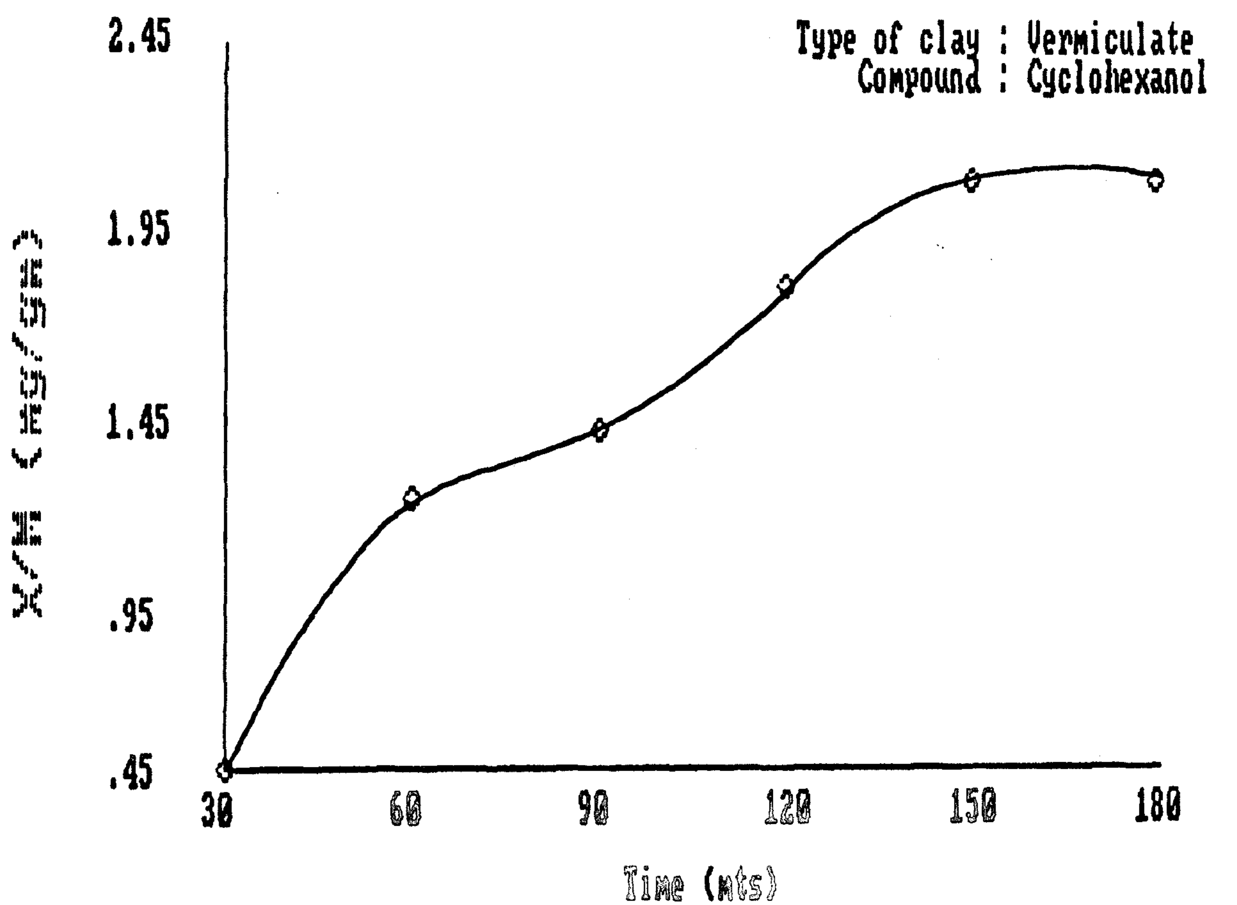

EFFECT OF OPTIMUM RATIO ON ADSORPTION
Type of clay : Hectorite
Compound : Monochlorophenol
X/M (mg/gm)
15
14
13
12
11
1
2
3
4
5
Wt. (gms)

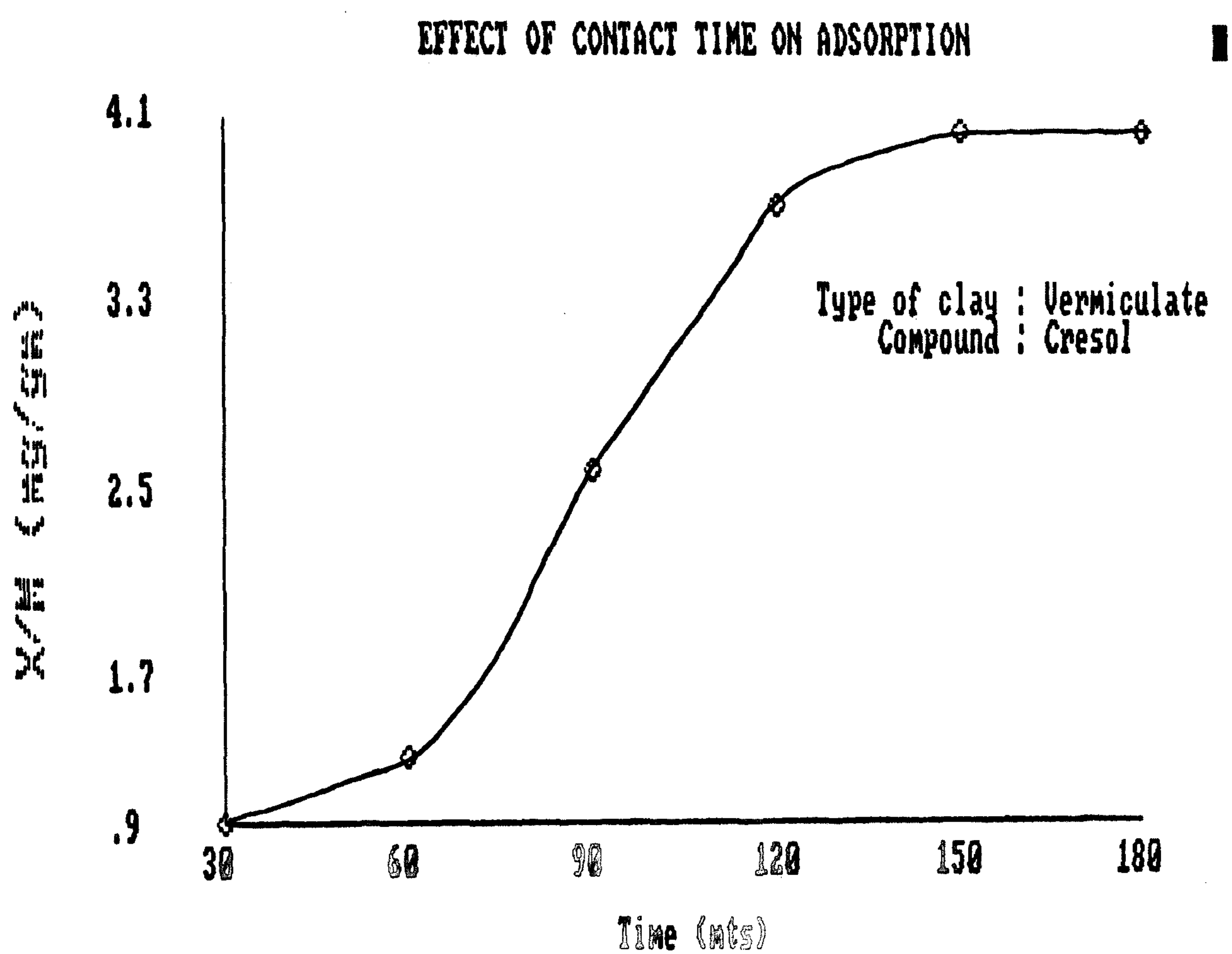

EFFECT OF CONTACT TIME ON ADSORPTION
X/M (mg/gm)
4.65
4.05
3.45
2.85
2.25
1.65
1.05
.45
5
35
65
95
125
155
185
Time (mts)
Type of clay : Vermiculate
Compound : Phenol

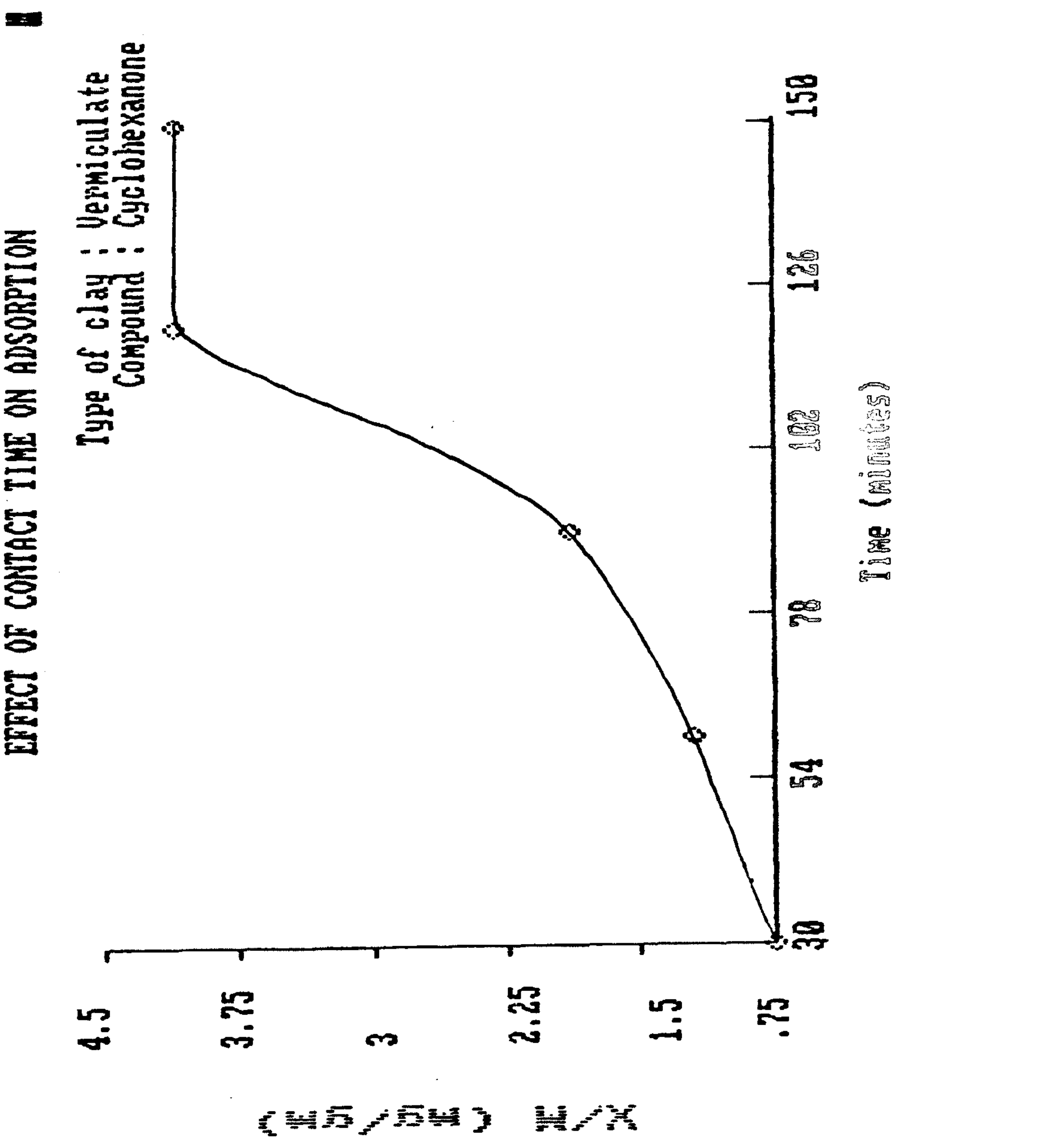


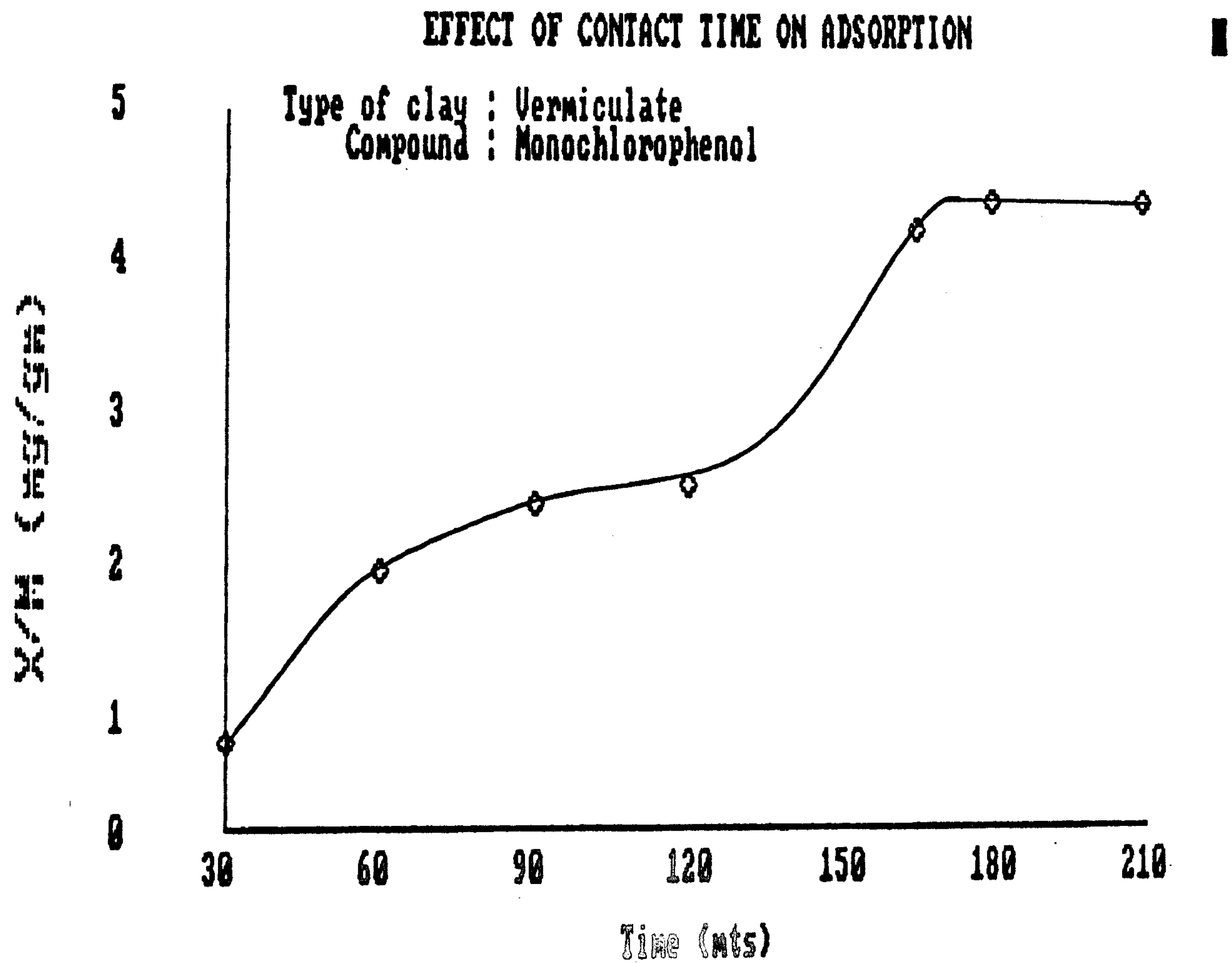
EFFECT OF CONTACT TIME ON ADSORPTION
Type of clay : Vermiculate
Compound : Aniline
X/M (mg/gm)
.8
1.4
2
2.6
3.2
30
60
90
120
150
180
210
Time (mts)

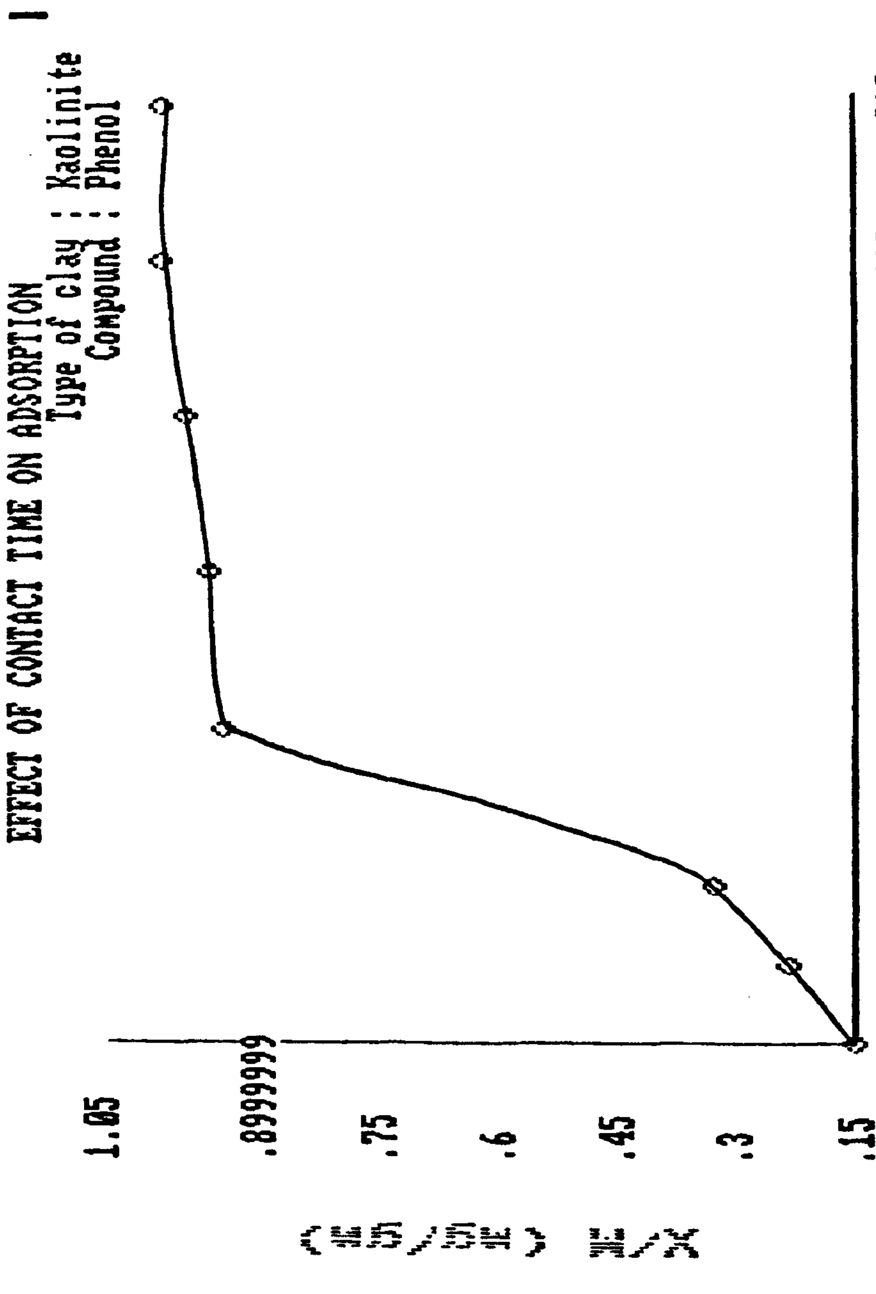
EFFECT OF CONTACT TIME ON ADSORPTION

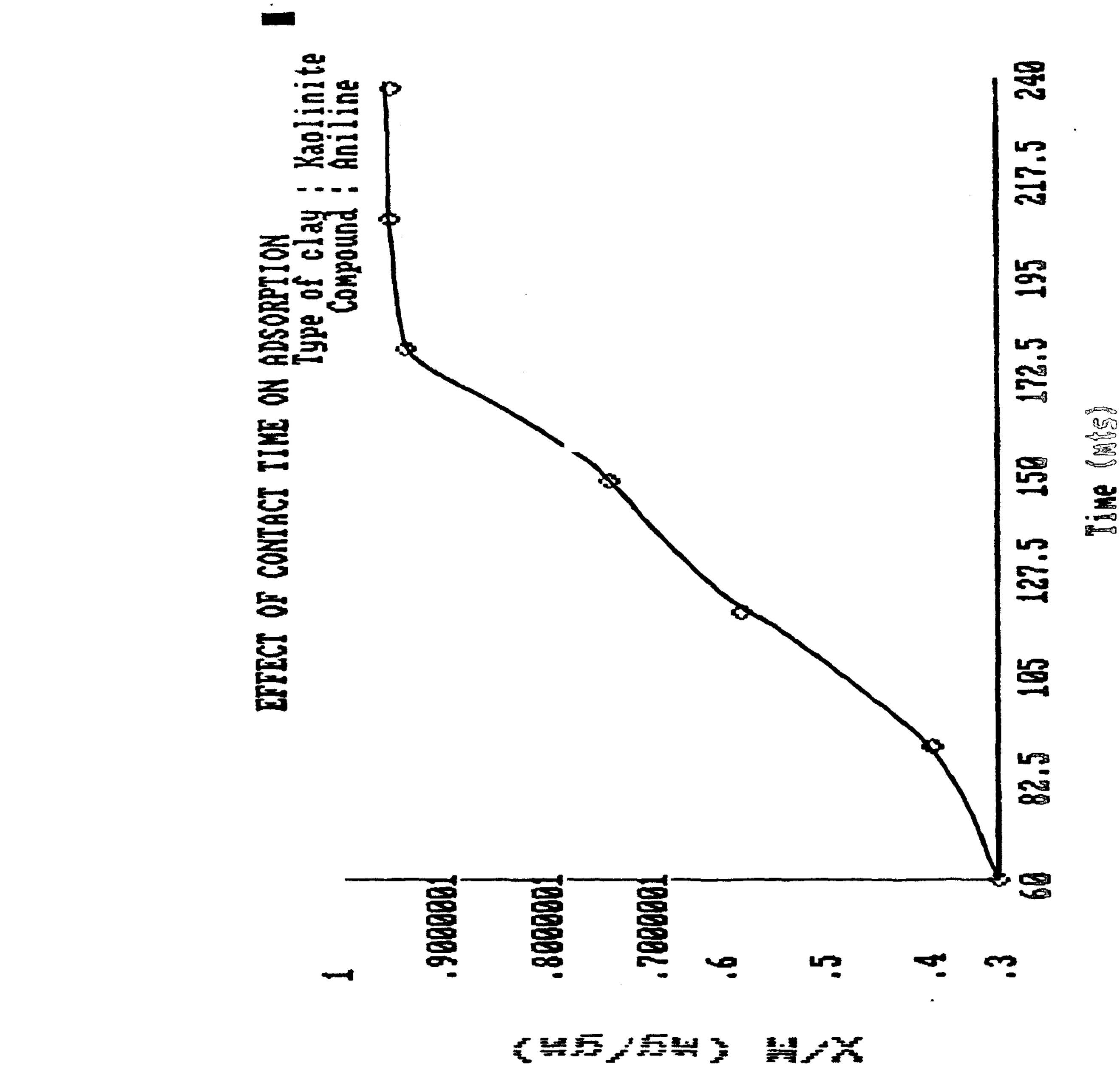


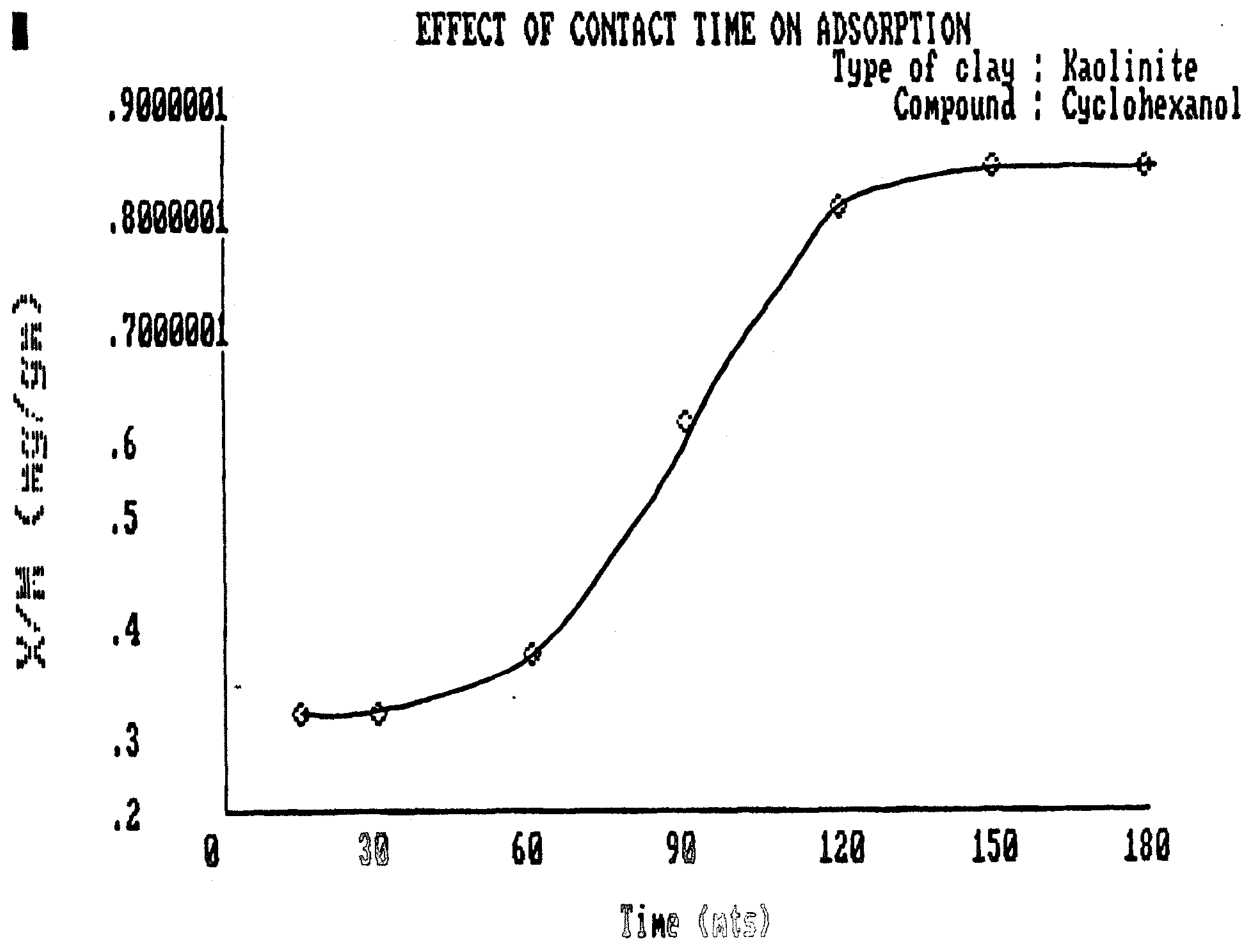

EFFECT OF CONTACT TIME ON ADSORPTION
4.1
3.3
2.5
1.7
.9
30
60
90
120
150
180
Time (mts)
Type of clay : Vermiculate
Compound : Cresol

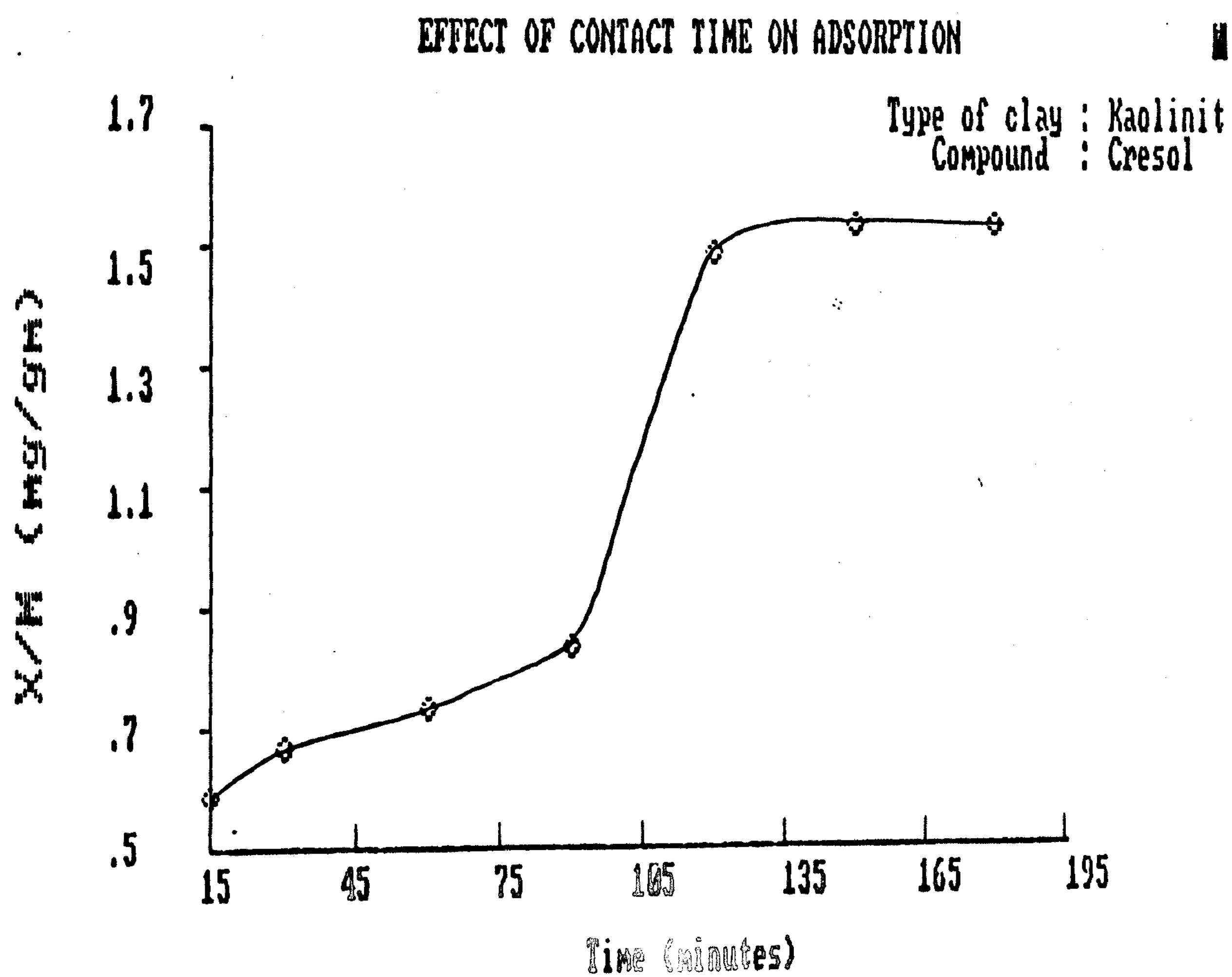

EFFECT OF CONTACT TIME ON ADSORPTION
Type of clay : Vermiculate
Compound : Cyclohexanone
X/M (mg/gm)
4.5
3.75
3
2.25
1.5
.75
30
54
78
102
126
150
Time (minutes)


EFFECT OF CONTACT TIME ON ADSORPTION
Type of clay : Vermiculate
Compound : Monochlorophenol
X/M (mg/gm)
0
1
2
3
4
5
30
60
90
120
150
180
210
Time (mts)

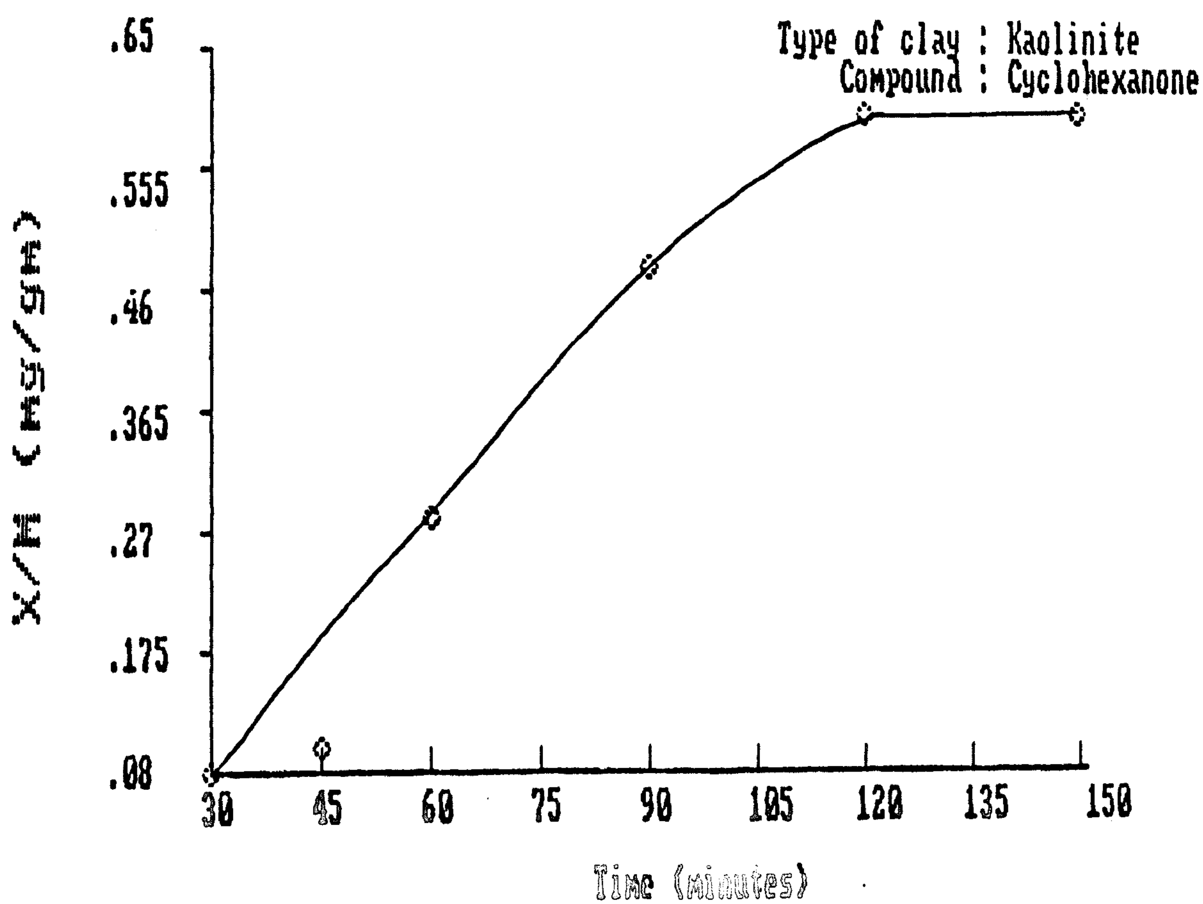

EFFECT OF CONTACT TIME ON ADSORPTION
Type of clay : Kaolinite
Compound : Phenol
1.05
.8999999
.75
.6
.45
.3
.15
X/M (MG/GM)
30
60
90
120
150
180
210
Time (mts.)

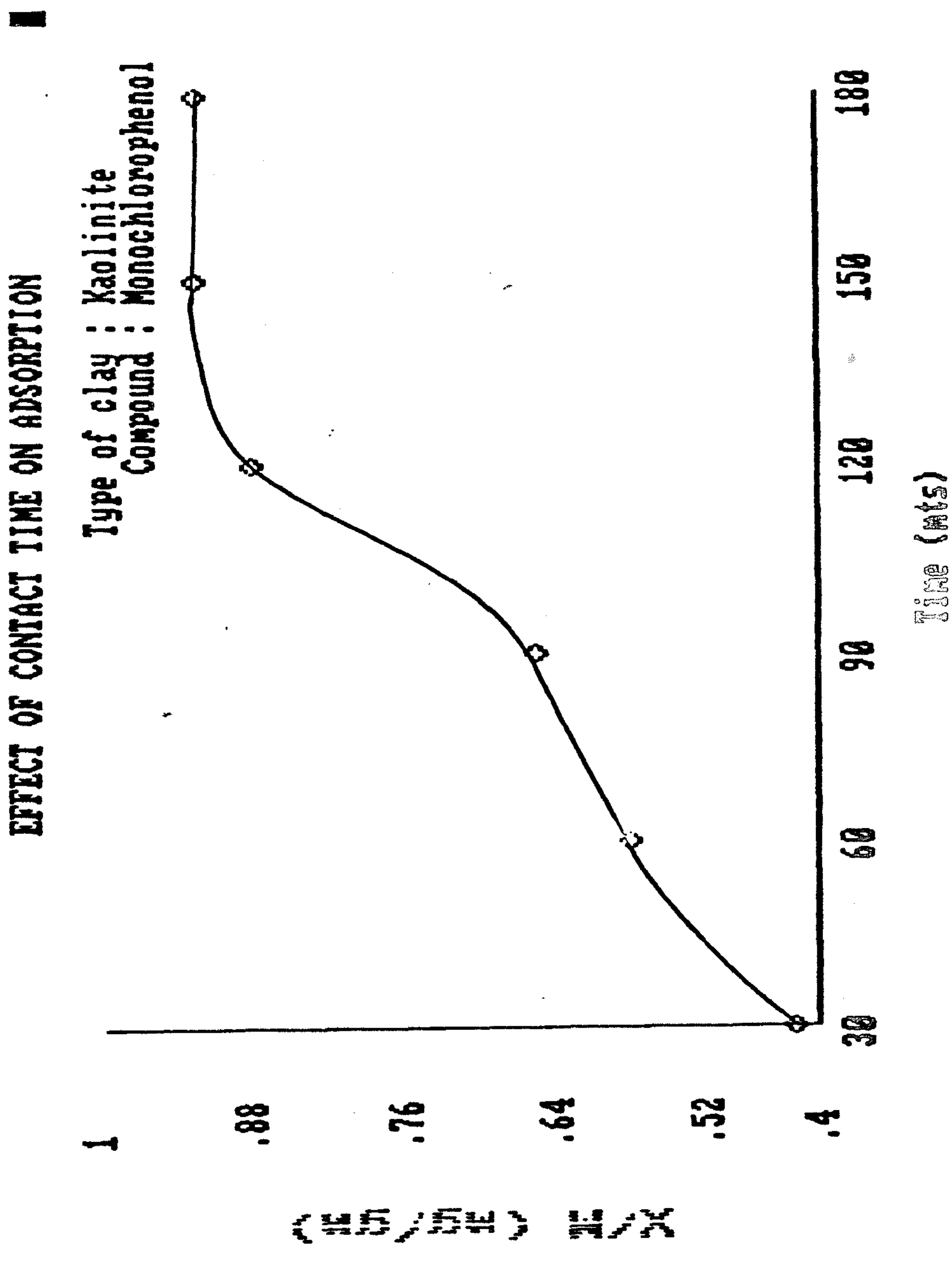

EFFECT OF CONTACT TIME ON ADSORPTION
Type of clay : Kaolinite
Compound : Aniline
X/M (MG/GM)
1
.9000001
.8000001
.7000001
.6
.5
.4
.3
60
82.5
105
127.5
150
172.5
195
217.5
240
Time (Mts)

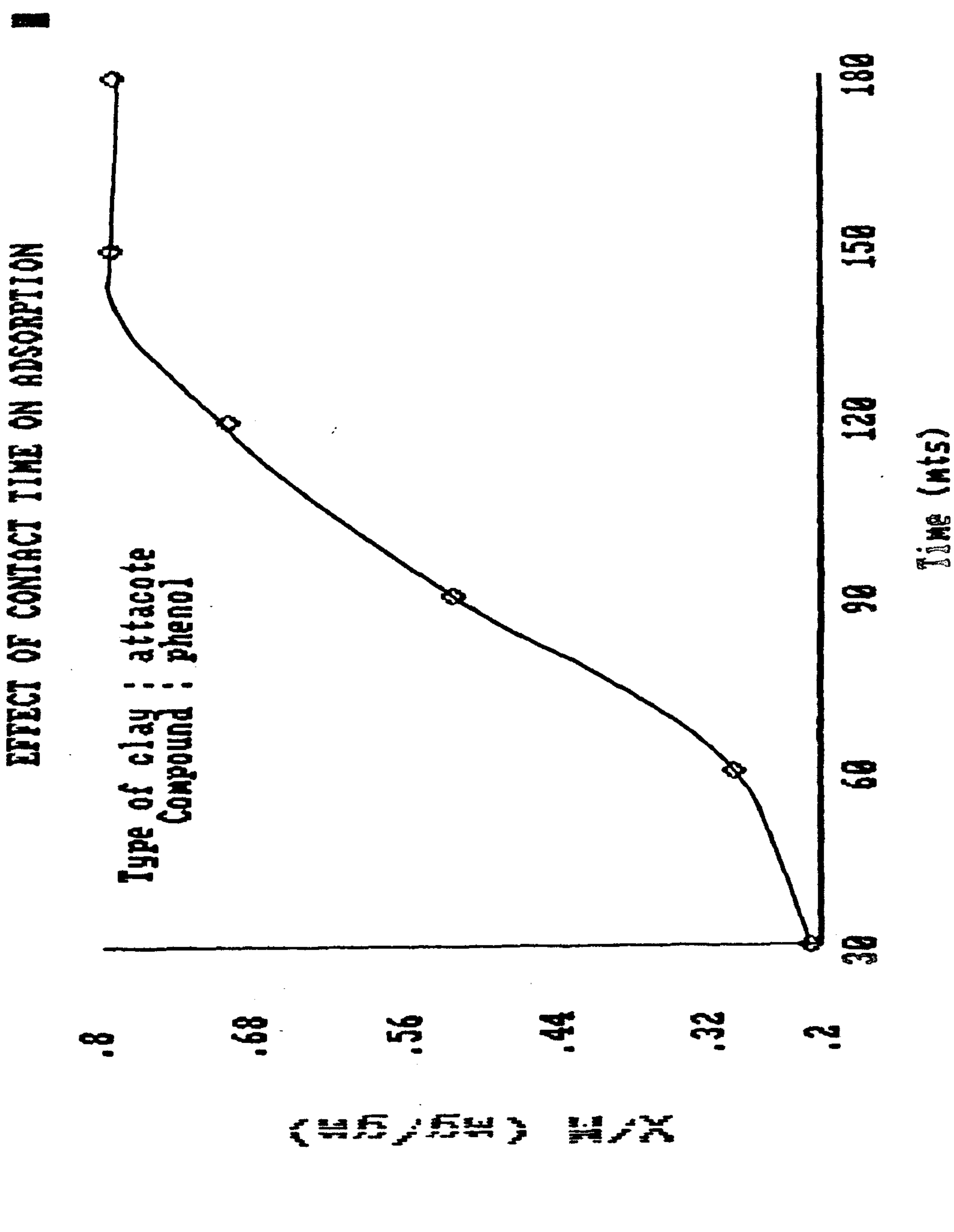

EFFECT OF CONTACT TIME ON ADSORPTION
Type of clay : Kaolinite
Compound : Cyclohexanol
.9000001
.8000001
.7000001
.6
.5
.4
.3
.2
X/M (mg/gm)
0
30
60
90
120
150
180
Time (mts)

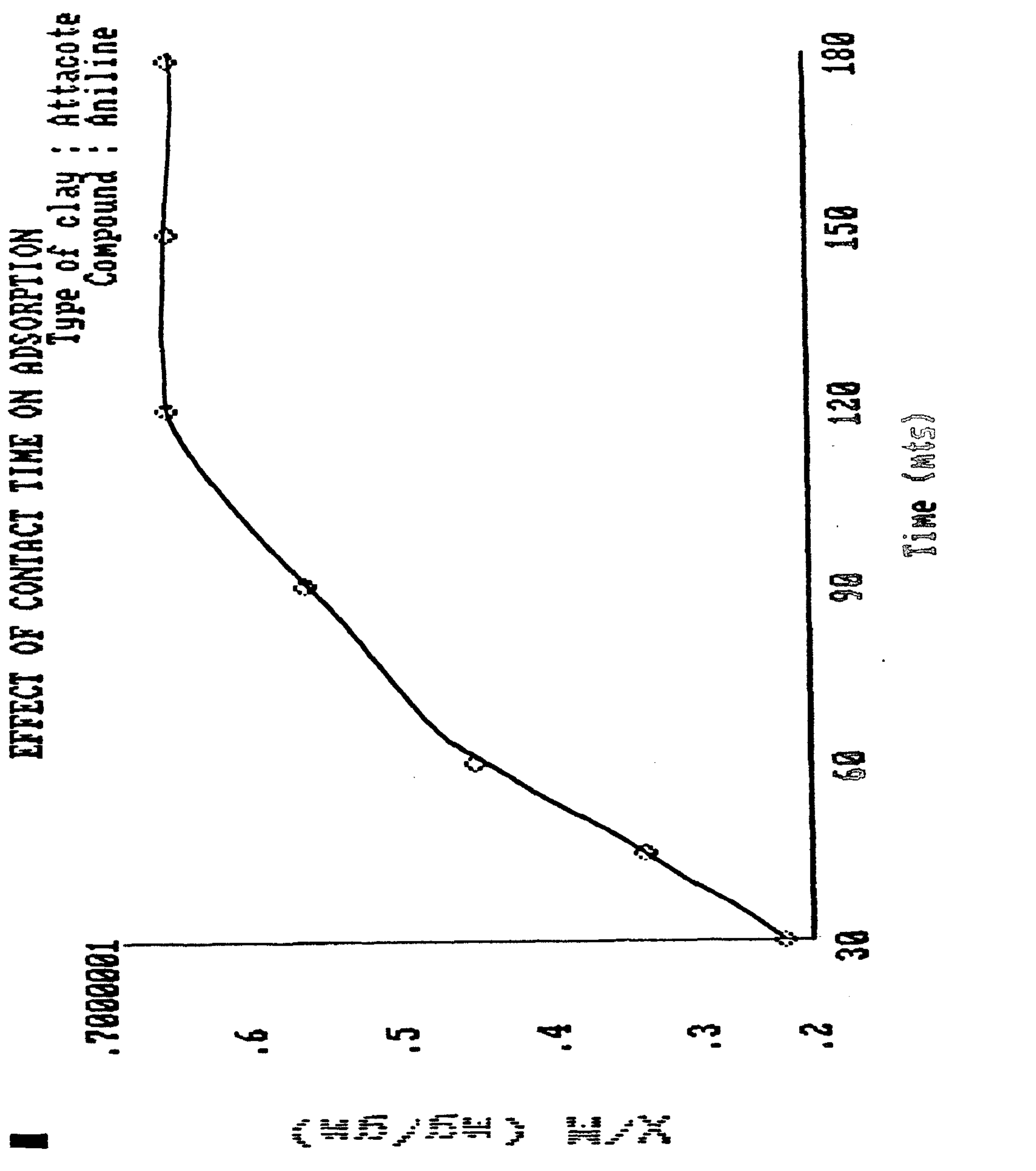

EFFECT OF CONTACT TIME ON ADSORPTION
Type of clay : Kaolinit
Compound : Cresol
X/M (mg/gm)
1.7
1.5
1.3
1.1
.9
.7
.5
15
45
75
105
135
165
195
Time (minutes)

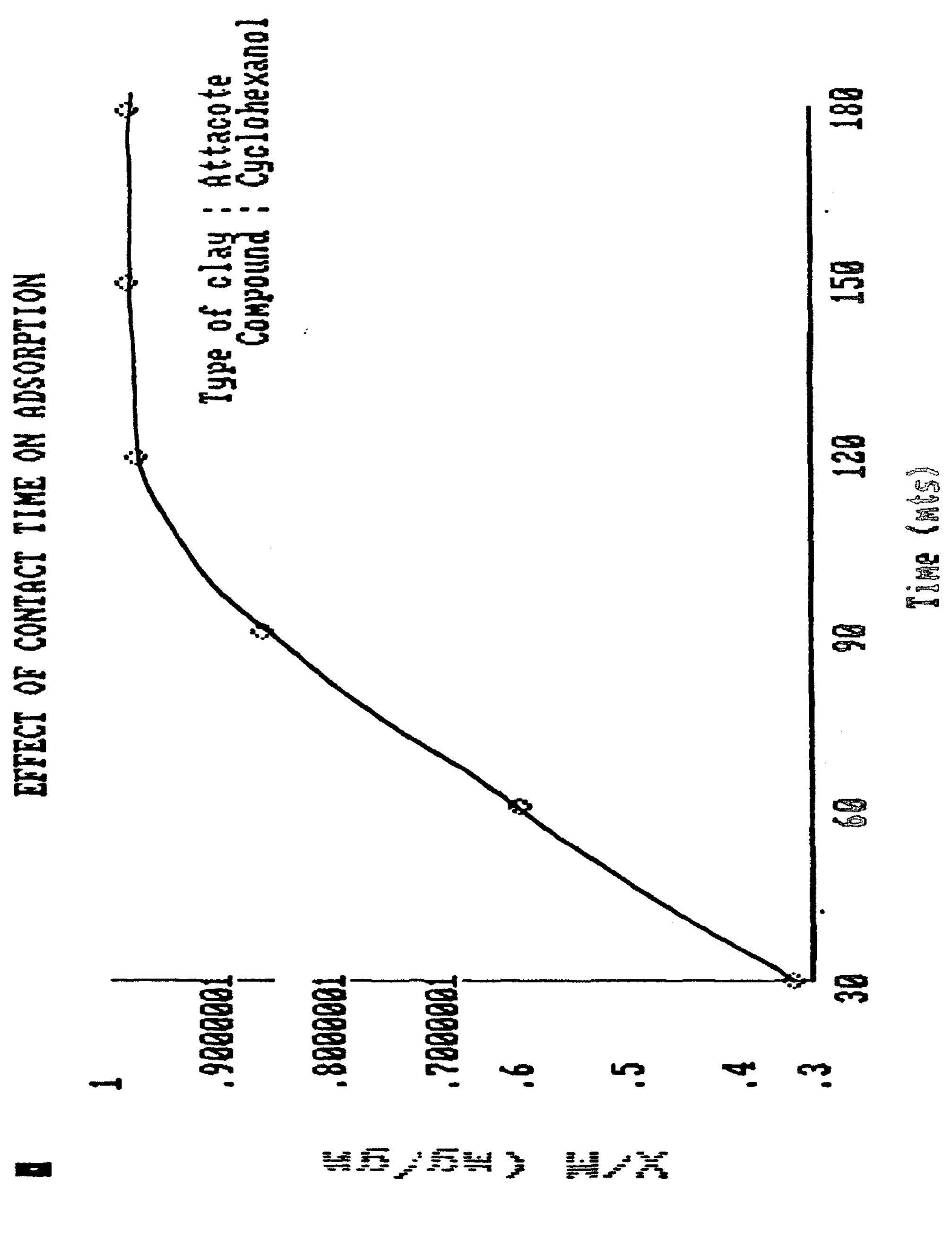
EFFECT OF CONTACT TIME ON ADSORPTION

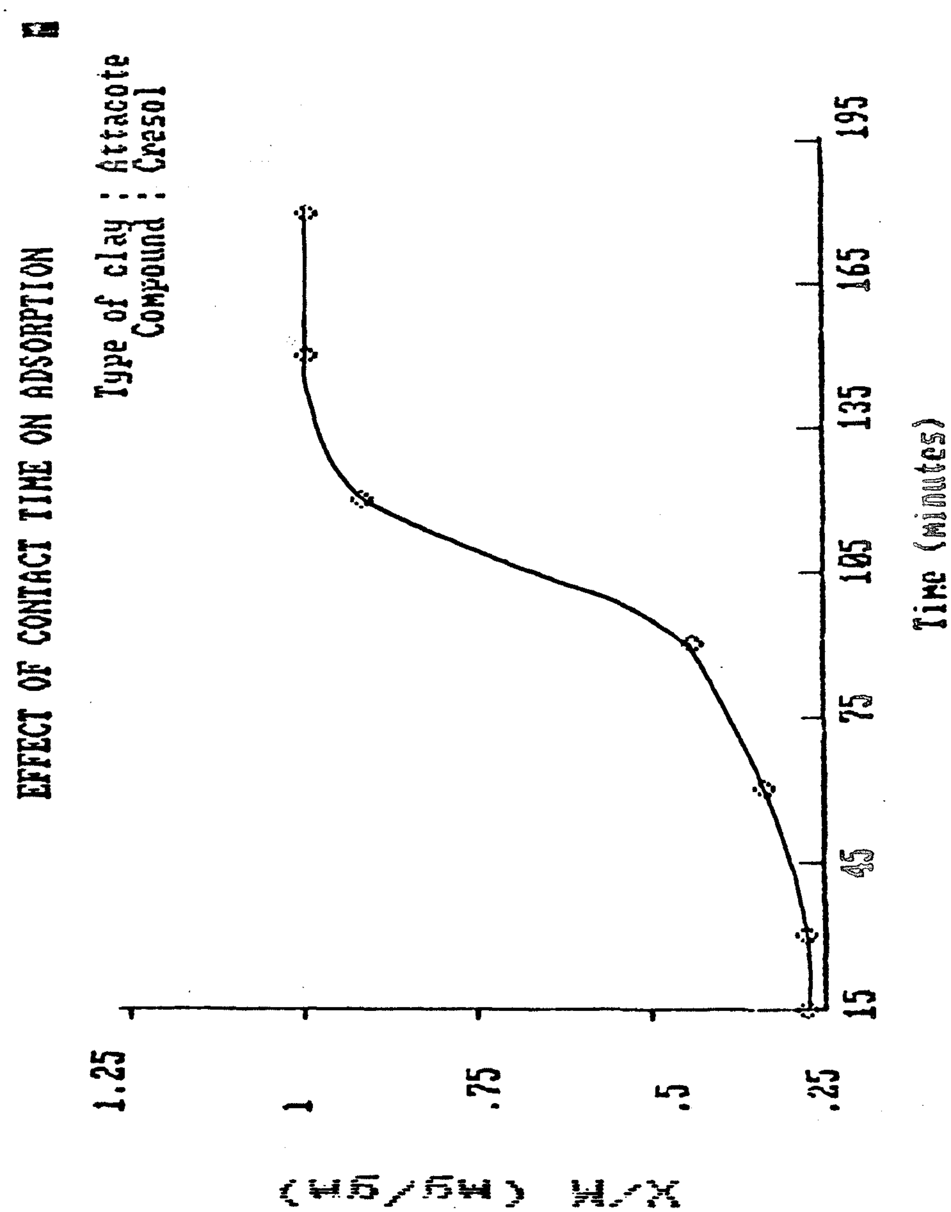



EFFECT OF CONTACT TIME ON ADSORPTION
Type of clay : Kaolinite
Compound : Monochlorophenol
X/M (mg/gm)
1
.88
.76
.64
.52
.4
30
60
90
120
150
180
Time (mts)

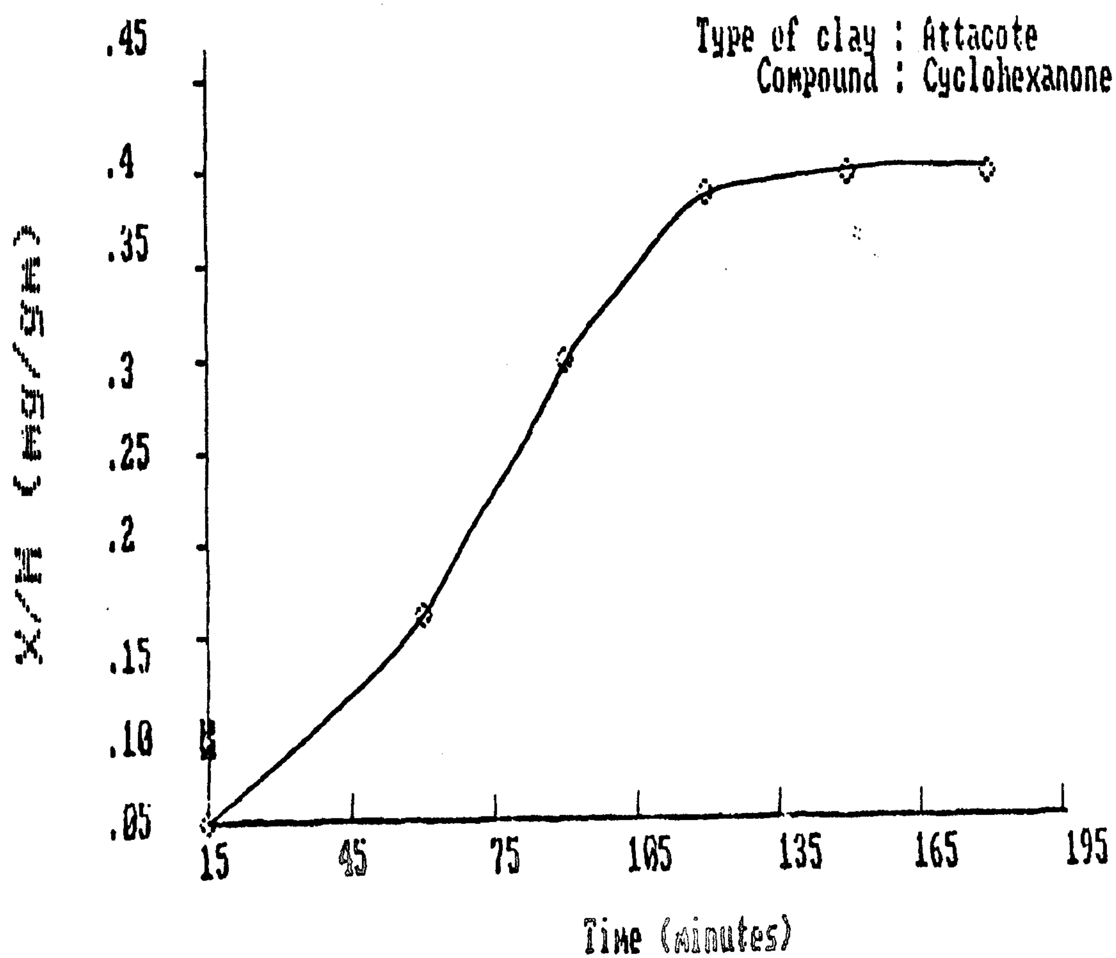

EFFECT OF CONTACT TIME ON ADSORPTION
Type of clay : attacote
Compound : phenol
X/M (mg/gm)
.8
.68
.56
.44
.32
.2
30
60
90
120
150
180
Time (mts)

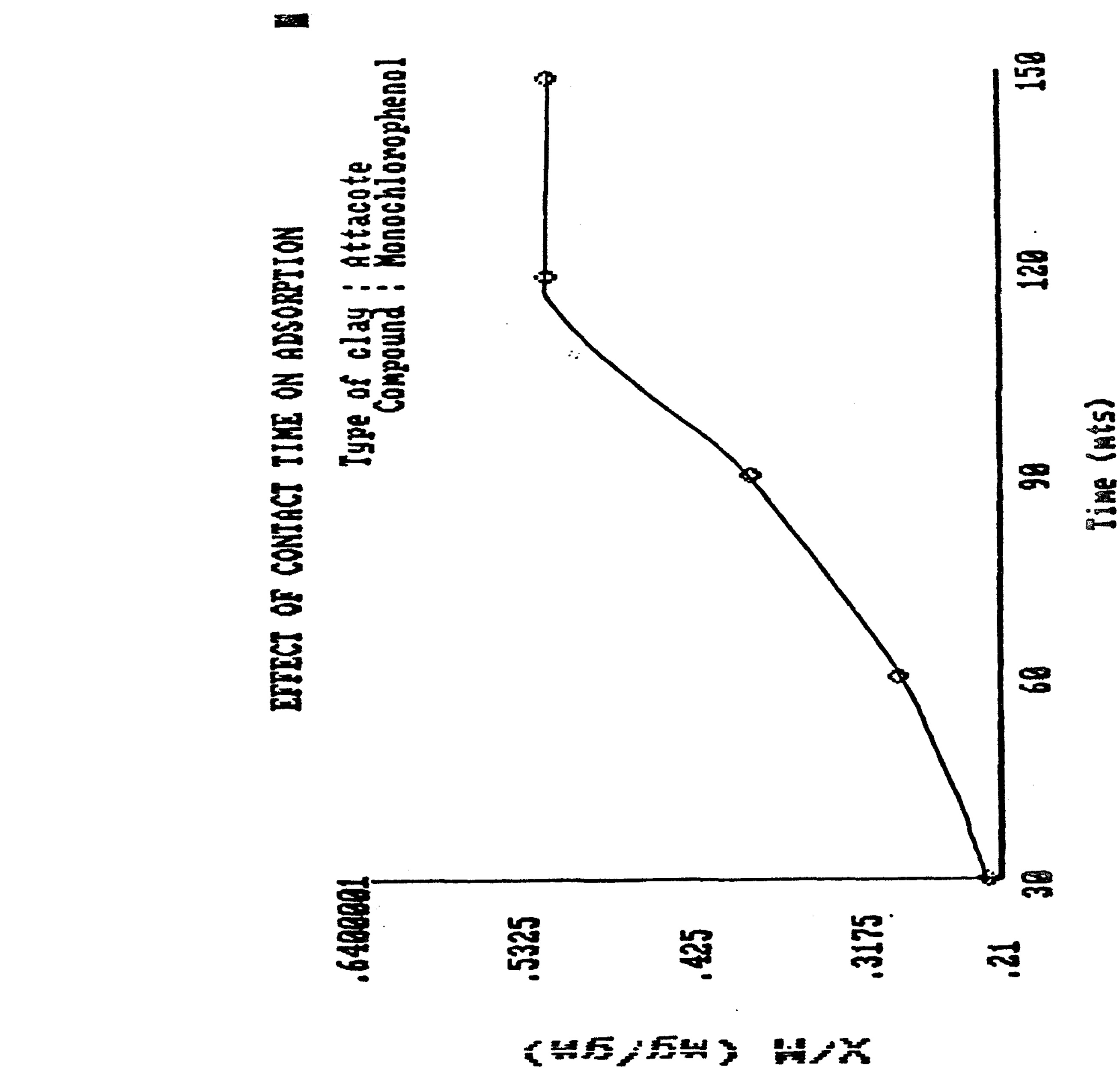

EFFECT OF CONTACT TIME ON ADSORPTION
Type of clay : Attacote
Compound : Aniline
X/M (MG/GM)
.7000001
.6
.5
.4
.3
.2
30
60
90
120
150
180
Time (mts)

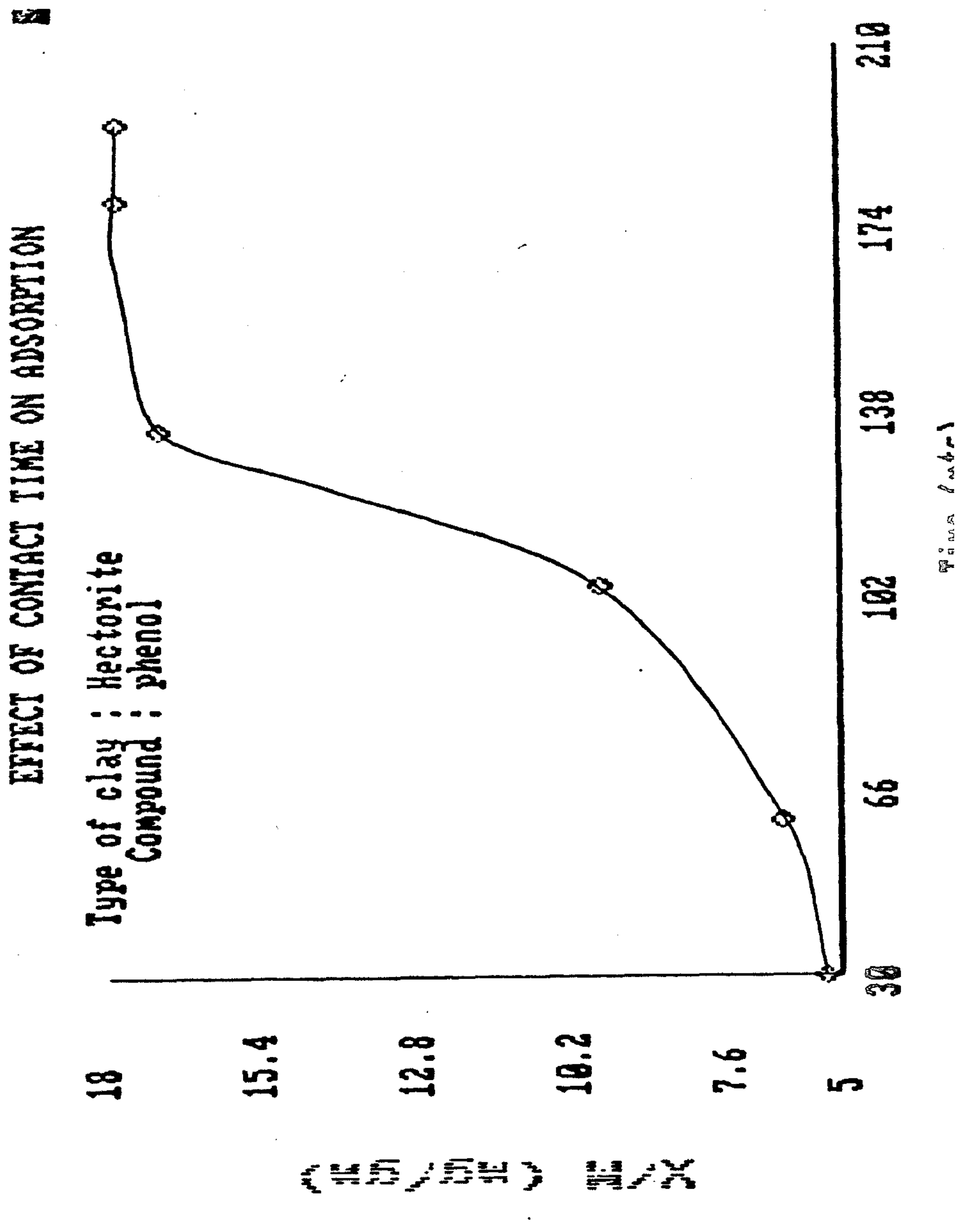

EFFECT OF CONTACT TIME ON ADSORPTION
Type of clay : Attacote
Compound : Cyclohexanol
X/M (mg/gm)
1
.9000001
.8000001
.7000001
.6
.5
.4
.3
30
60
90
120
150
180
Time (mts)

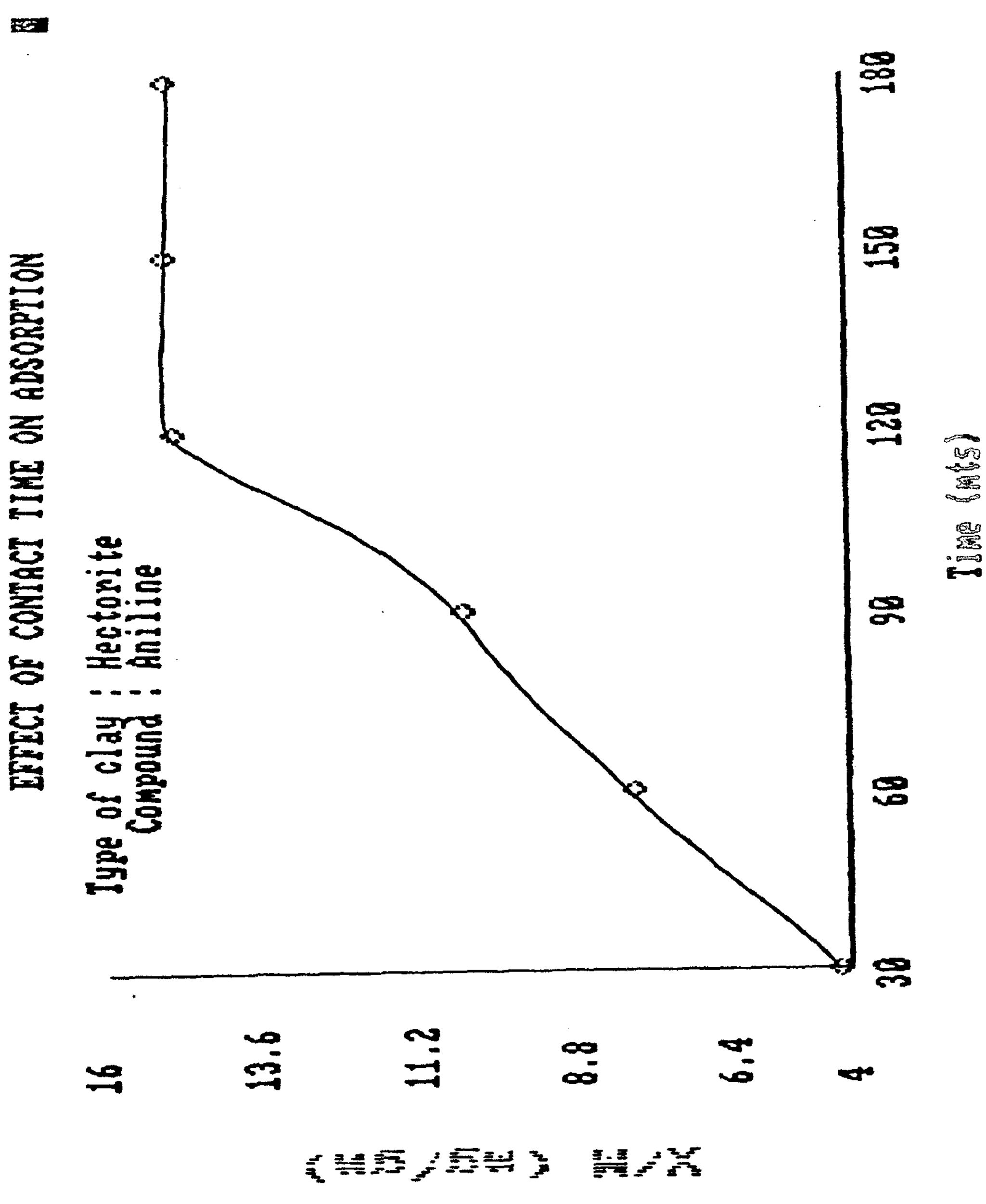

EFFECT OF CONTACT TIME ON ADSORPTION
Type of clay : Attacote
Compound : Cresol
1.25
1
.75
.5
.25
X/M (mg/gm)
15
45
75
105
135
165
195
Time (minutes)

EFFECT OF CONTACT TIME ON ADSORPTION

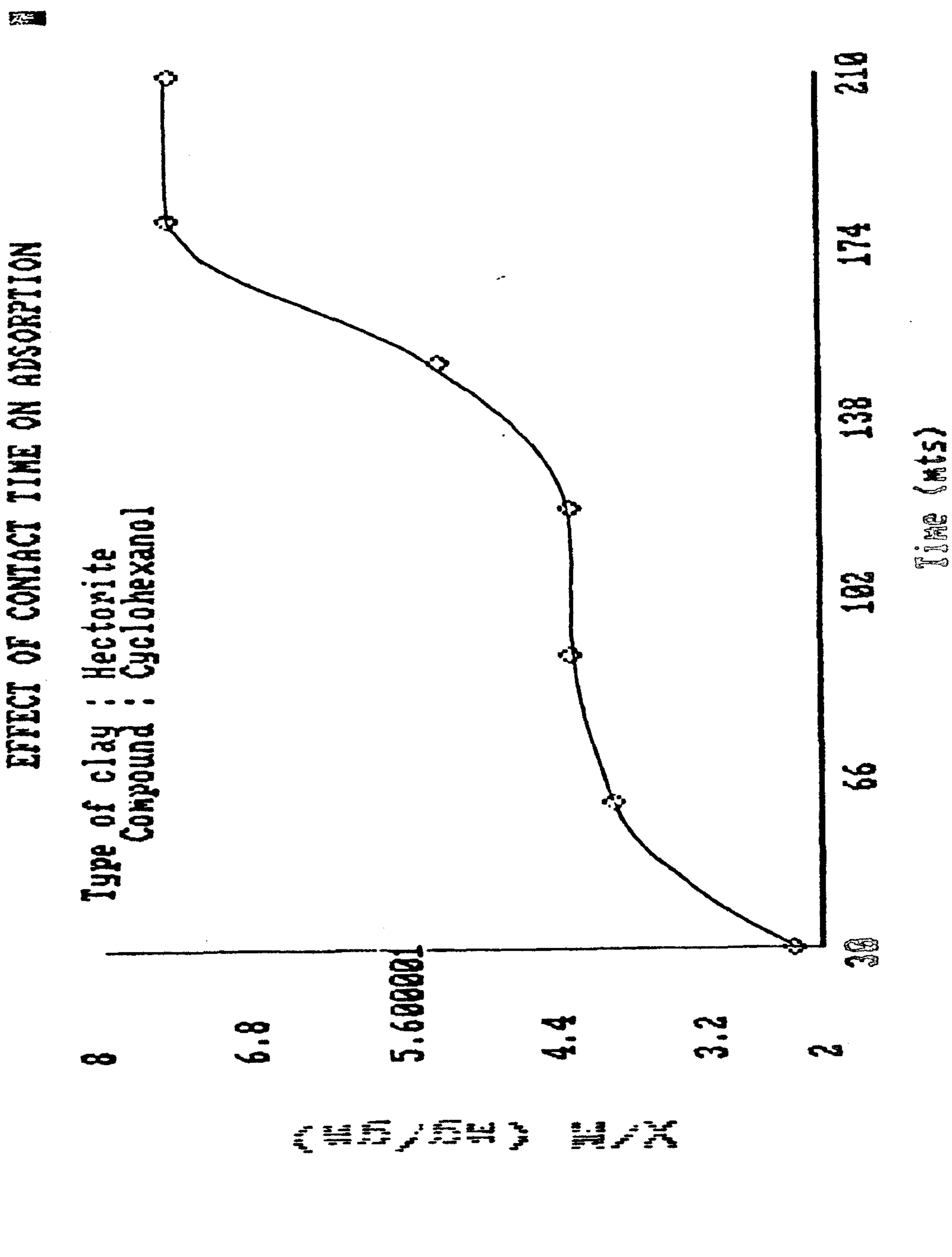


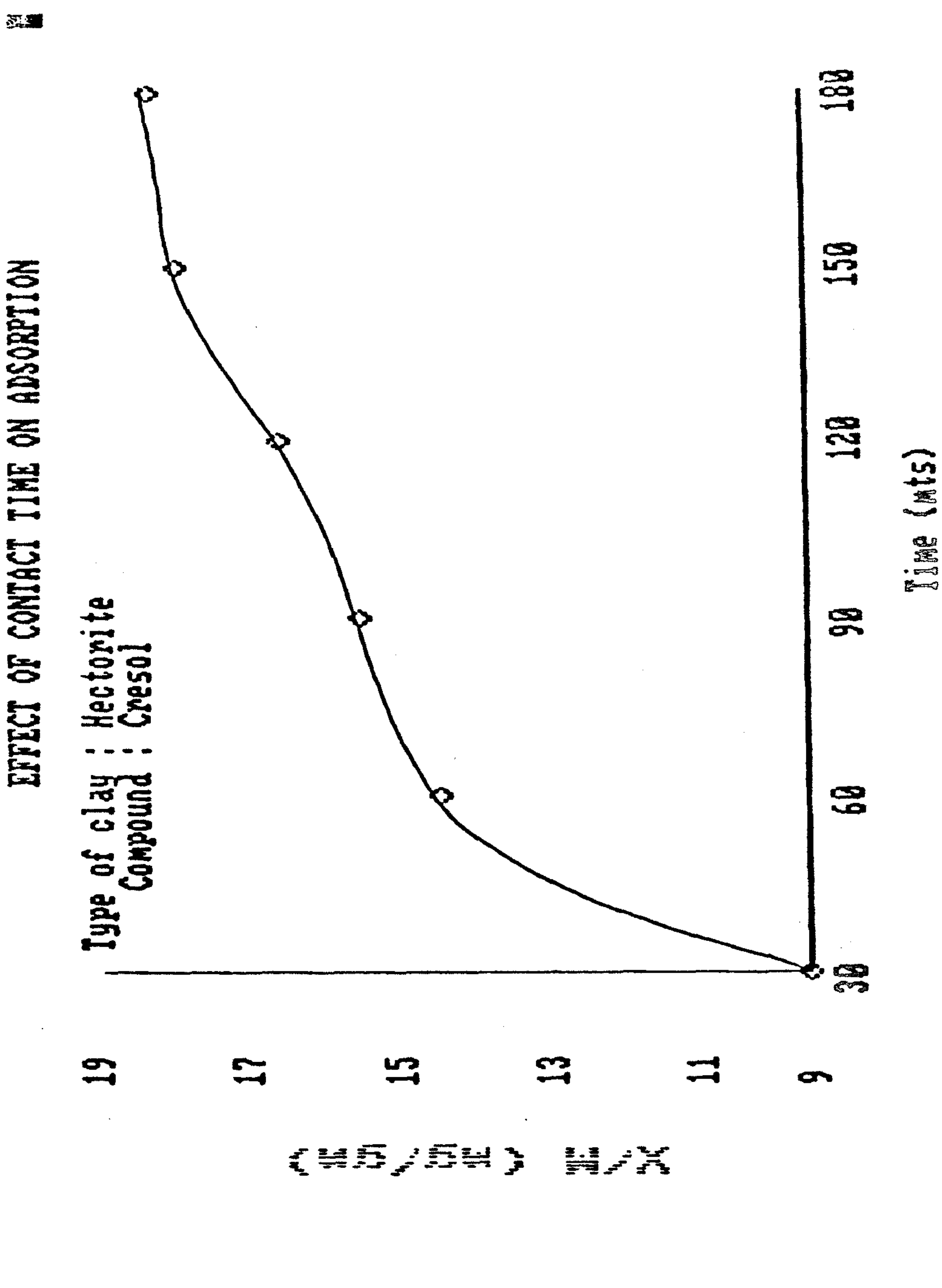

EFFECT OF CONTACT TIME ON ADSORPTION
Type of clay : Attacote
Compound : Monochlorophenol
.6400001
.5325
.425
.3175
.21
X/M (mg/gm)
30
60
90
120
150
Time (mts)

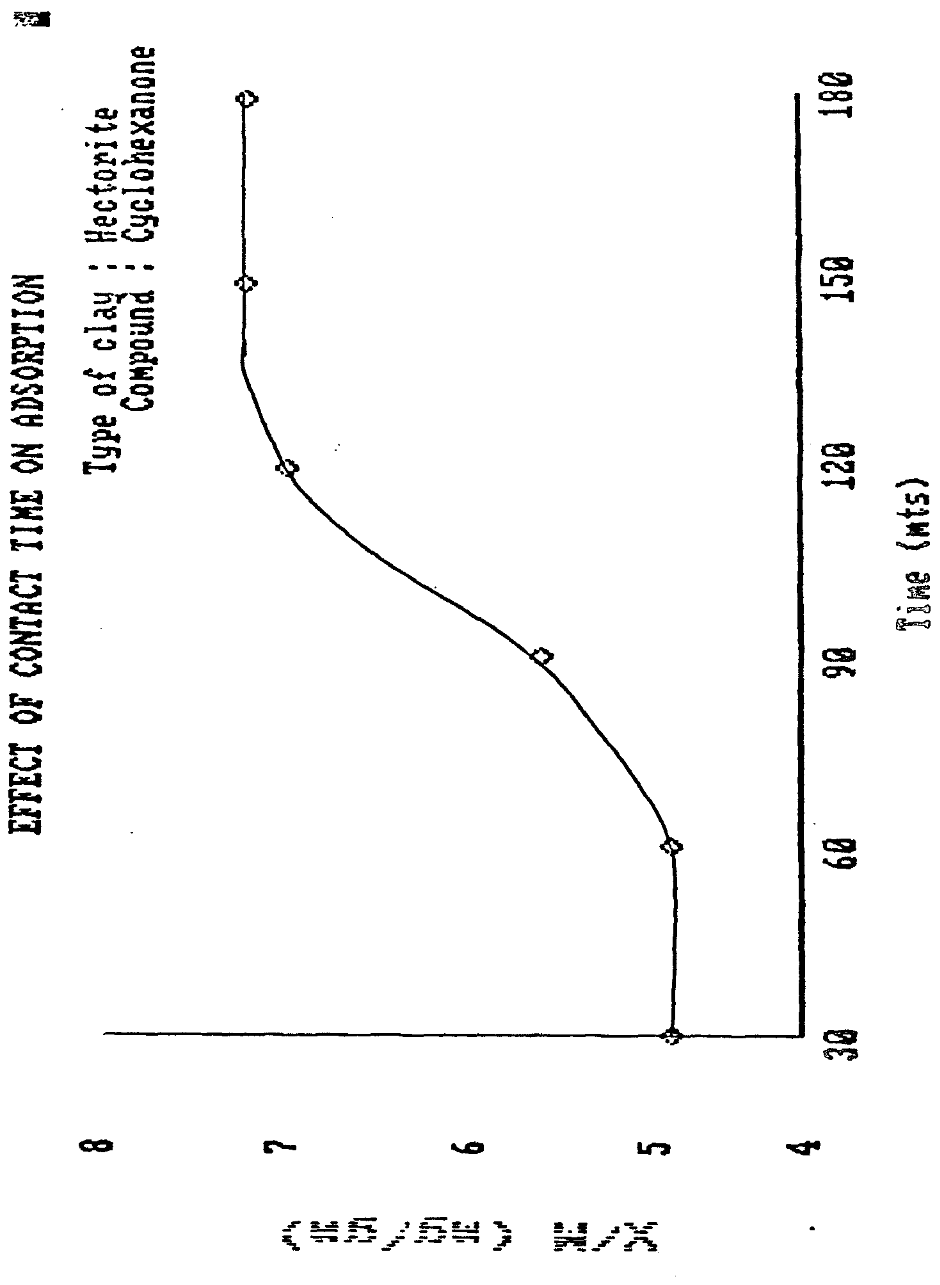

EFFECT OF CONTACT TIME ON ADSORPTION
Type of clay : Hectorite
Compound : phenol
18
15.4
12.8
10.2
7.6
5
30
66
102
138
174
210

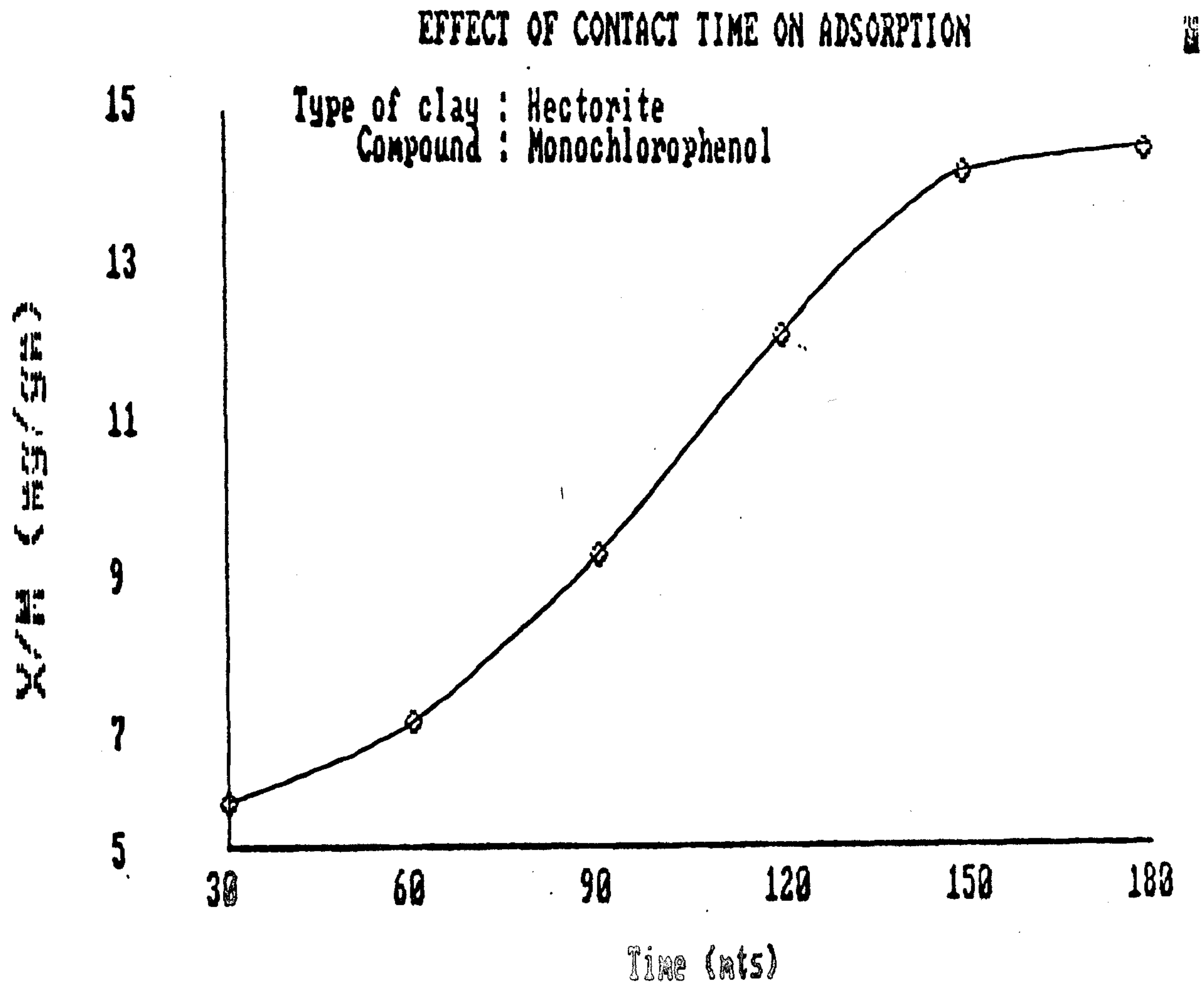


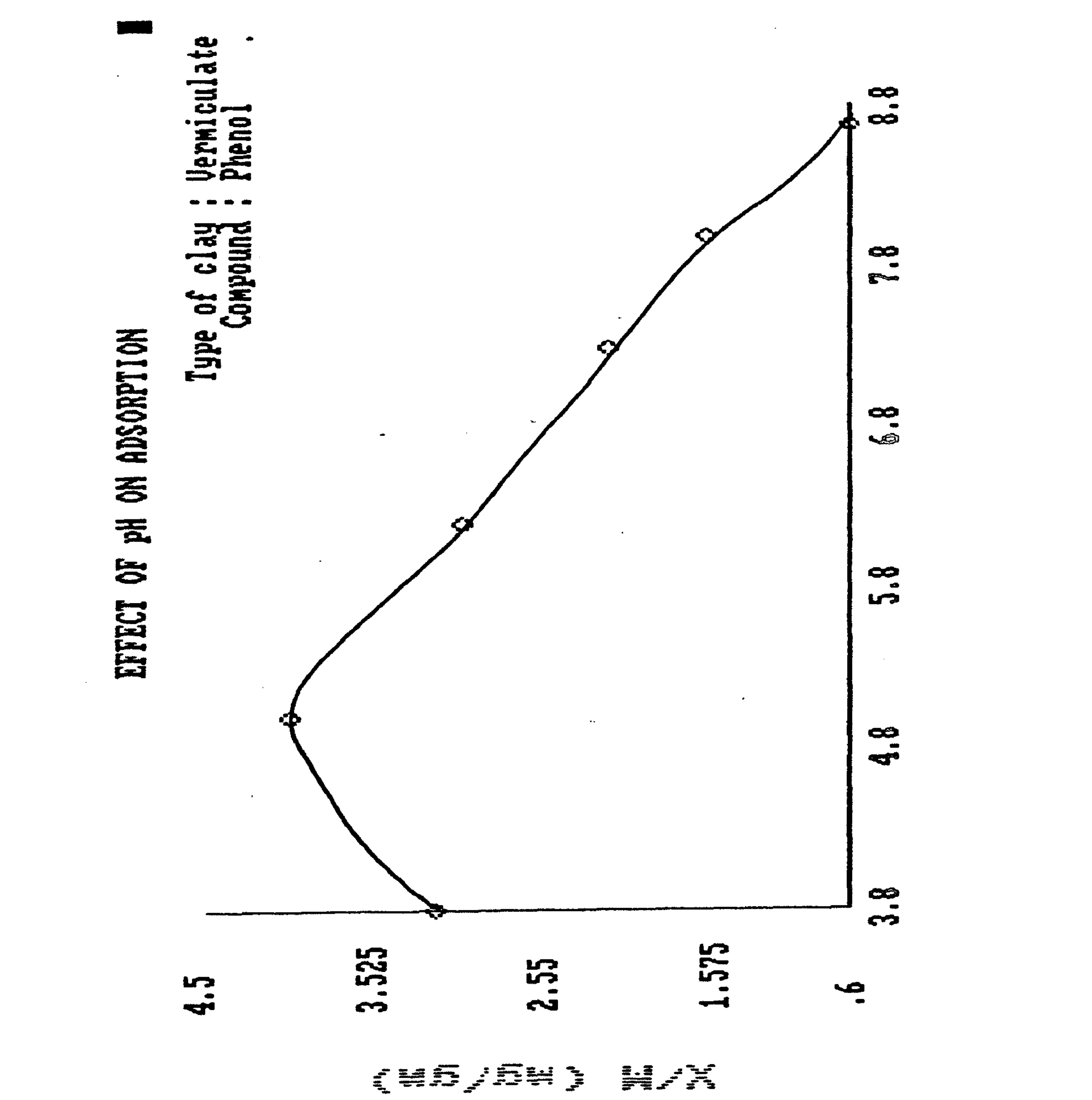
EFFECT OF CONTACT TIME ON ADSORPTION
Type of clay : Hectorite
Compound : Aniline
X/M (MG/GM)
16
13.6
11.2
8.8
6.4
4
30
60
90
120
150
180
Time (mts)

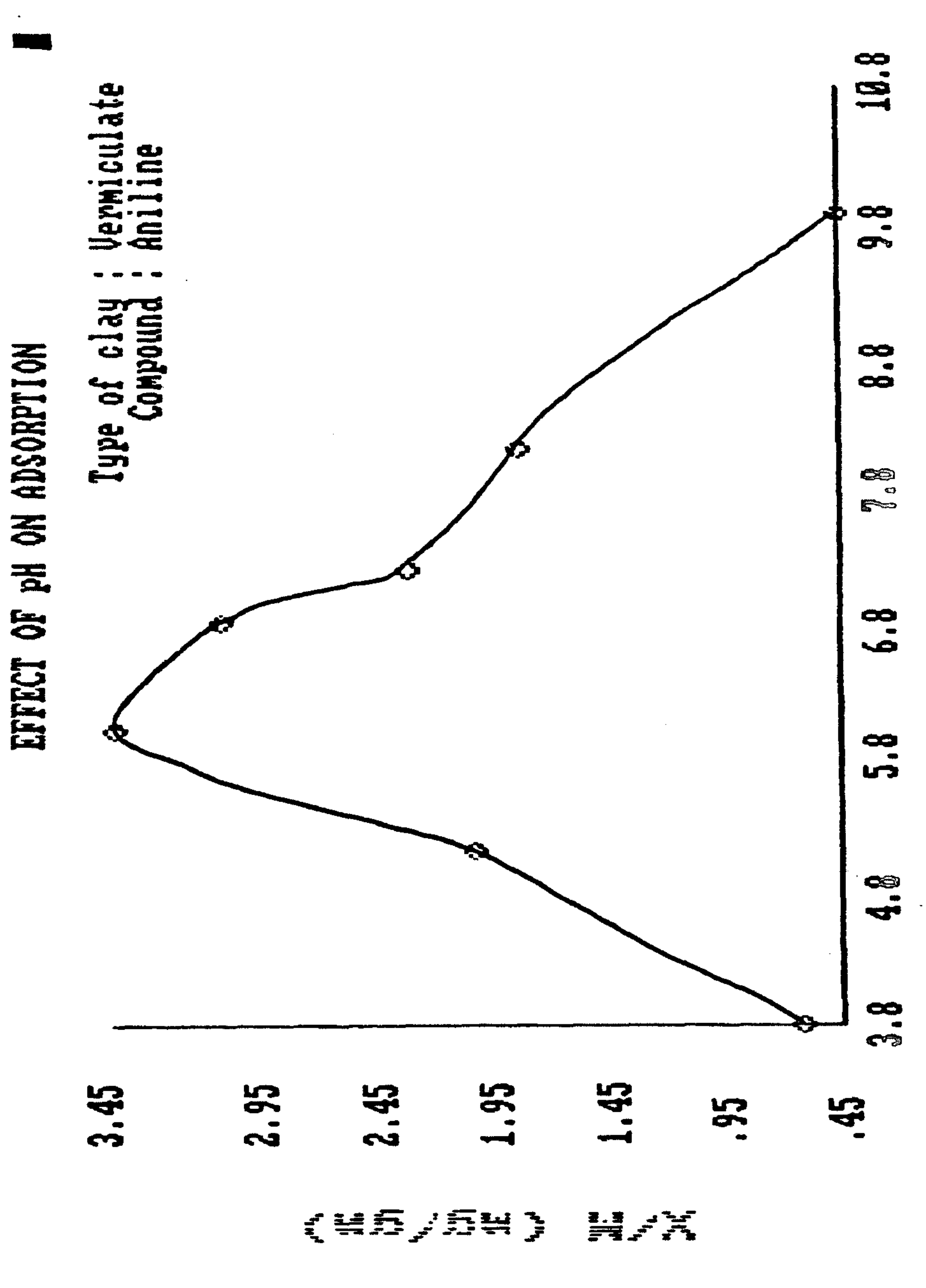

EFFECT OF CONTACT TIME ON ADSORPTION
Type of clay : Hectorite
Compound : Cyclohexanol
X/M (mg/gm)
8
6.8
5.600001
4.4
3.2
2
30
66
102
138
174
210
Time (mts)

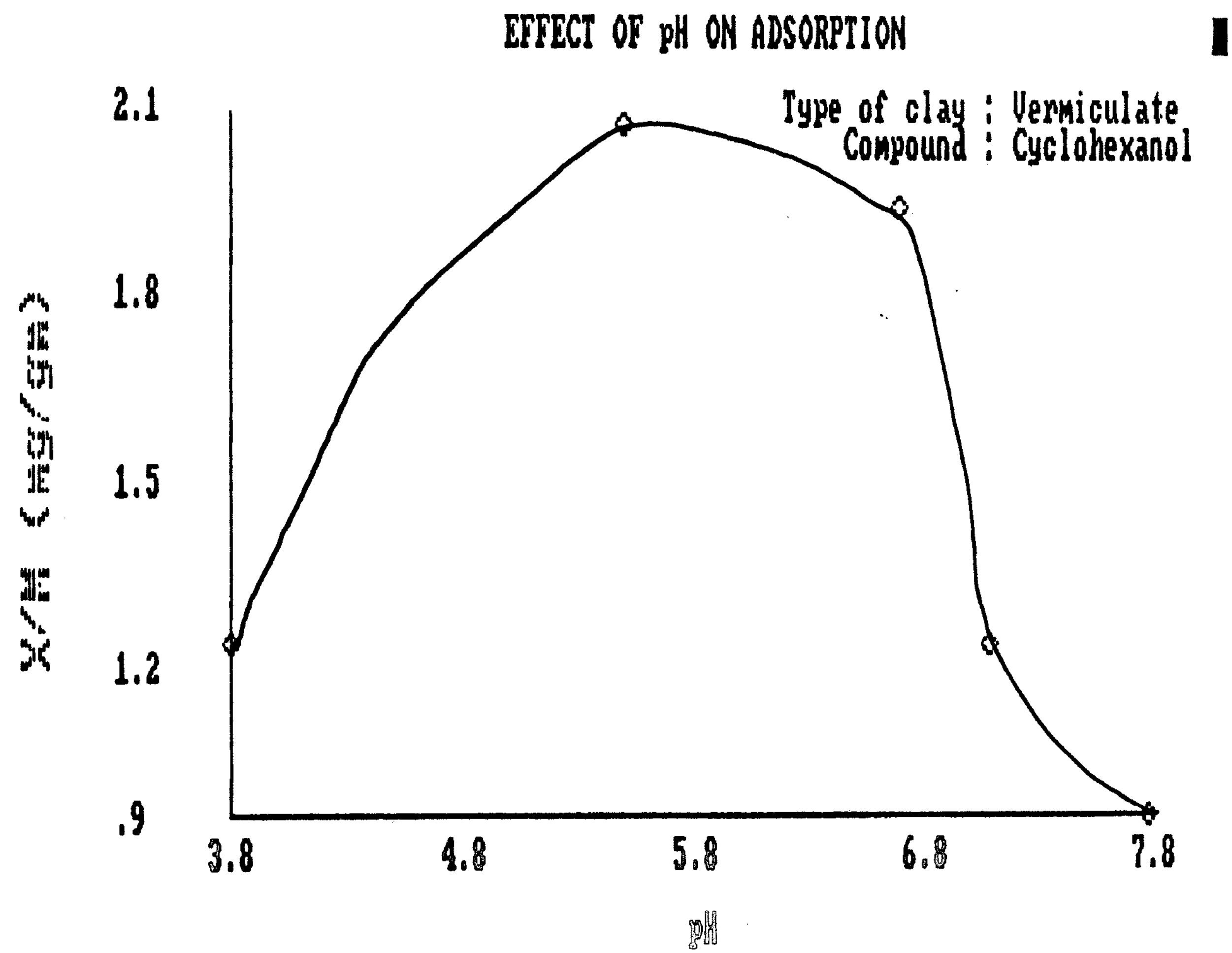

EFFECT OF CONTACT TIME ON ADSORPTION
Type of clay : Hectorite
Compound : Cresol
X/M (MG/GM)
19
17
15
13
11
9
30
60
90
120
150
180
Time (mts)

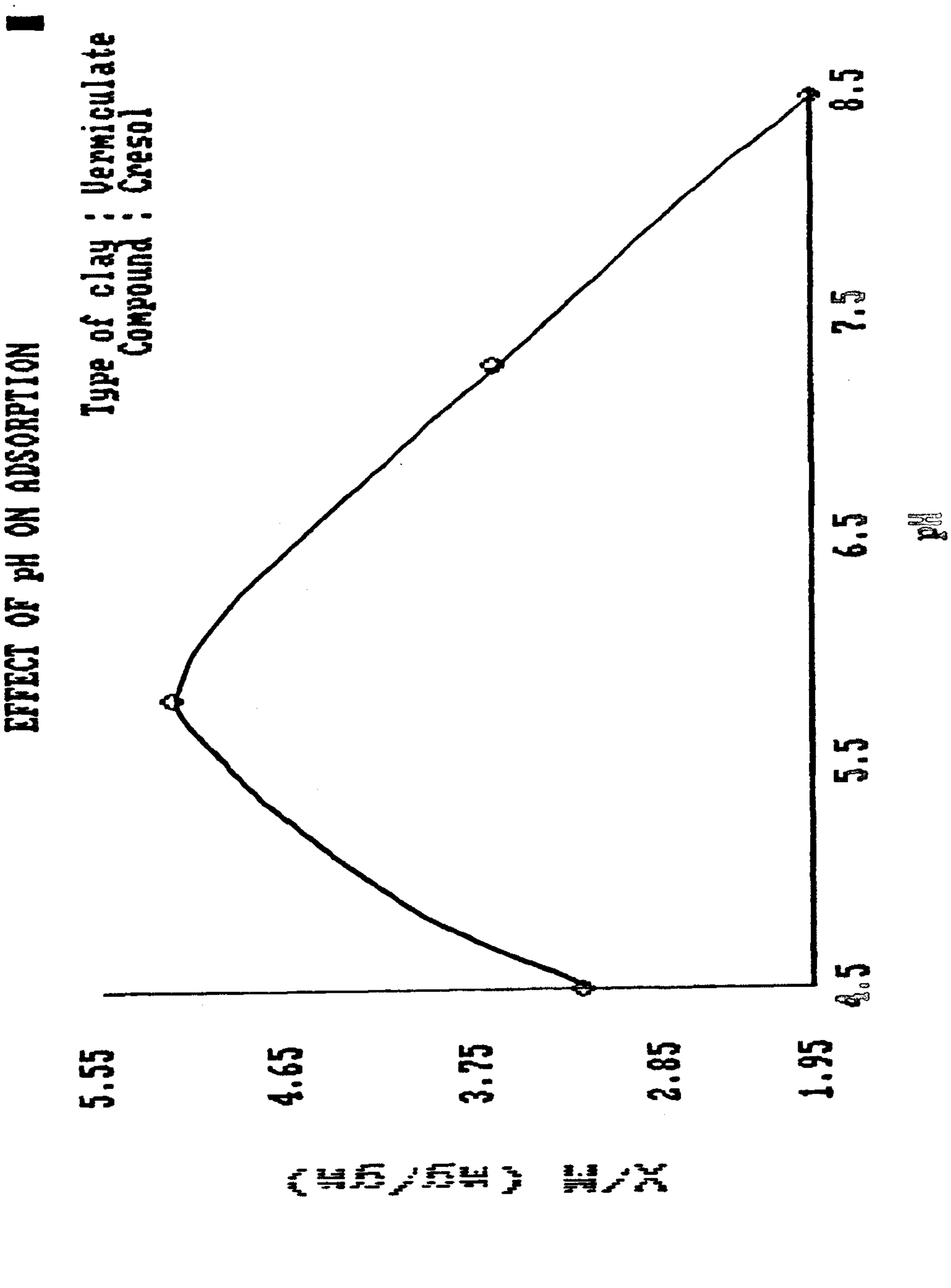

EFFECT OF CONTACT TIME ON ADSORPTION
Type of clay : Hectorite
Compound : Cyclohexanone
X/M (mg/gm)
8
7
6
5
4
30
60
90
120
150
180
Time (mts)


EFFECT OF CONTACT TIME ON ADSORPTION
Type of clay : Hectorite
Compound : Monochlorophenol
15
13
11
9
7
5
X/M (mg/gm)
30
60
90
120
150
180
Time (mts)


EFFECT OF pH ON ADSORPTION
Type of clay : Vermiculate
Compound : Phenol
X/M (MG/GM)
4.5
3.525
2.55
1.575
.6
3.8
4.8
5.8
6.8
7.8
8.8

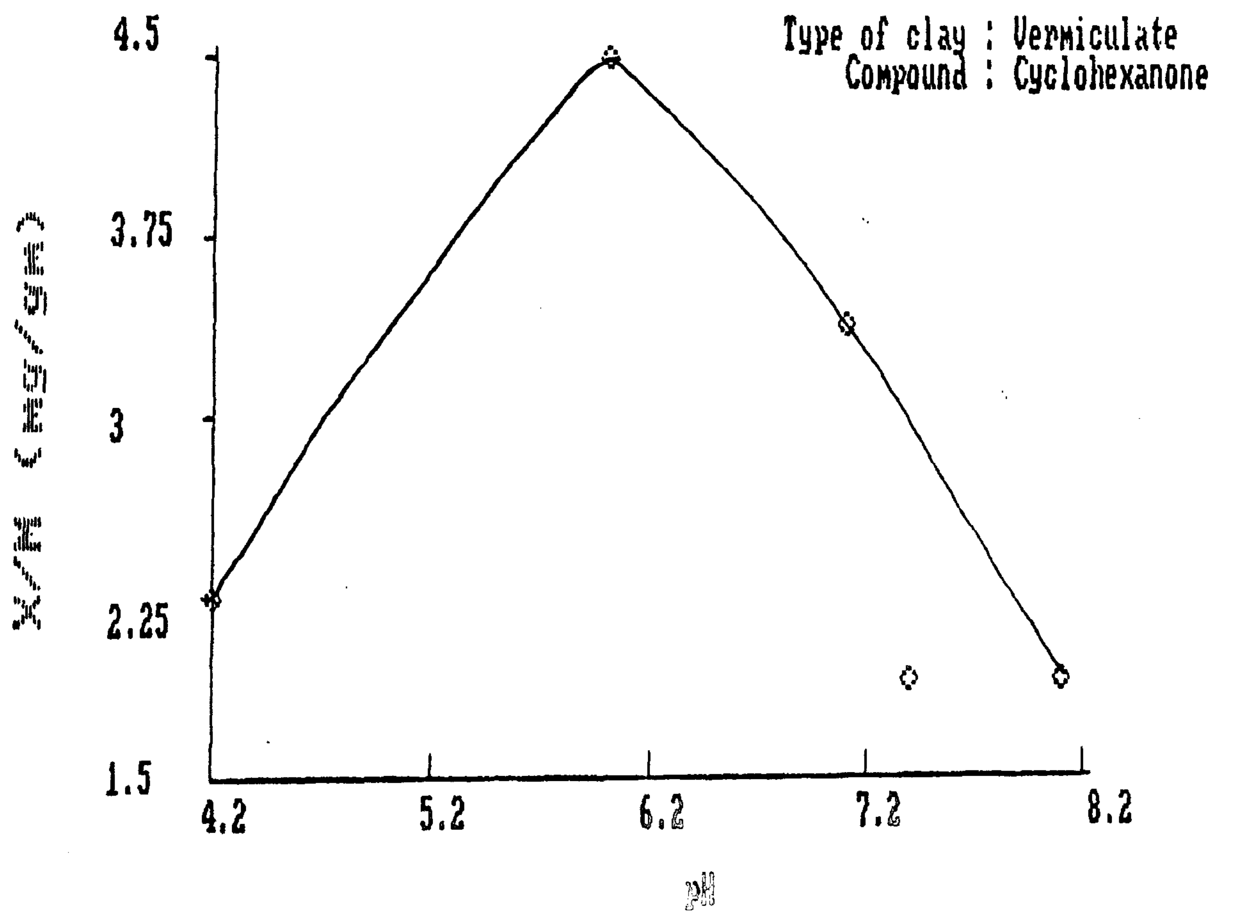

EFFECT OF pH ON ADSORPTION
Type of clay : Vermiculate
Compound : Aniline
3.45
2.95
2.45
1.95
1.45
.95
.45
3.8
4.8
5.8
6.8
7.8
8.8
9.8
10.8
pH

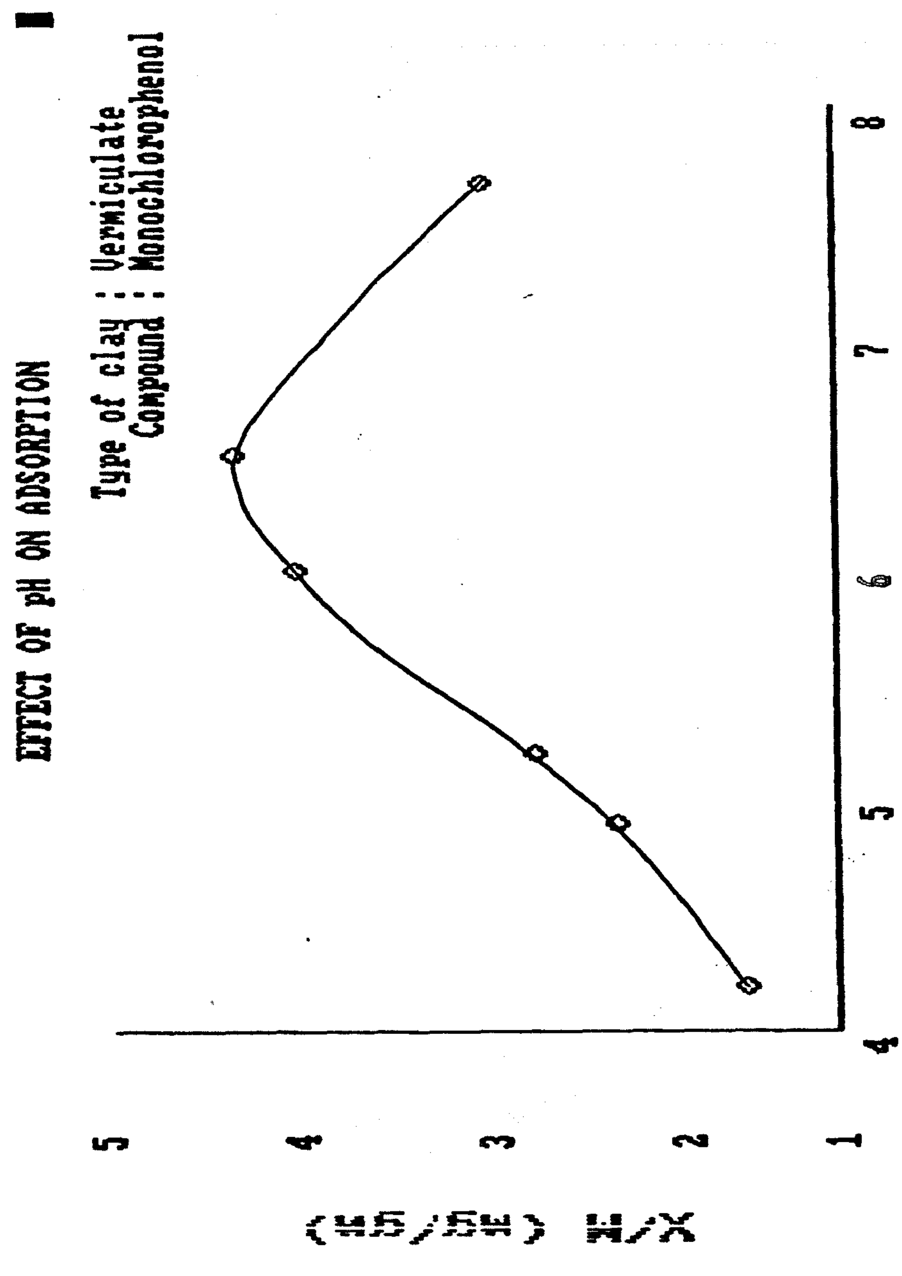

EFFECT OF pH ON ADSORPTION
Type of clay : Vermiculate
Compound : Cyclohexanol
X/M (MG/GM)
2.1
1.8
1.5
1.2
.9
3.8
4.8
5.8
6.8
7.8
pH



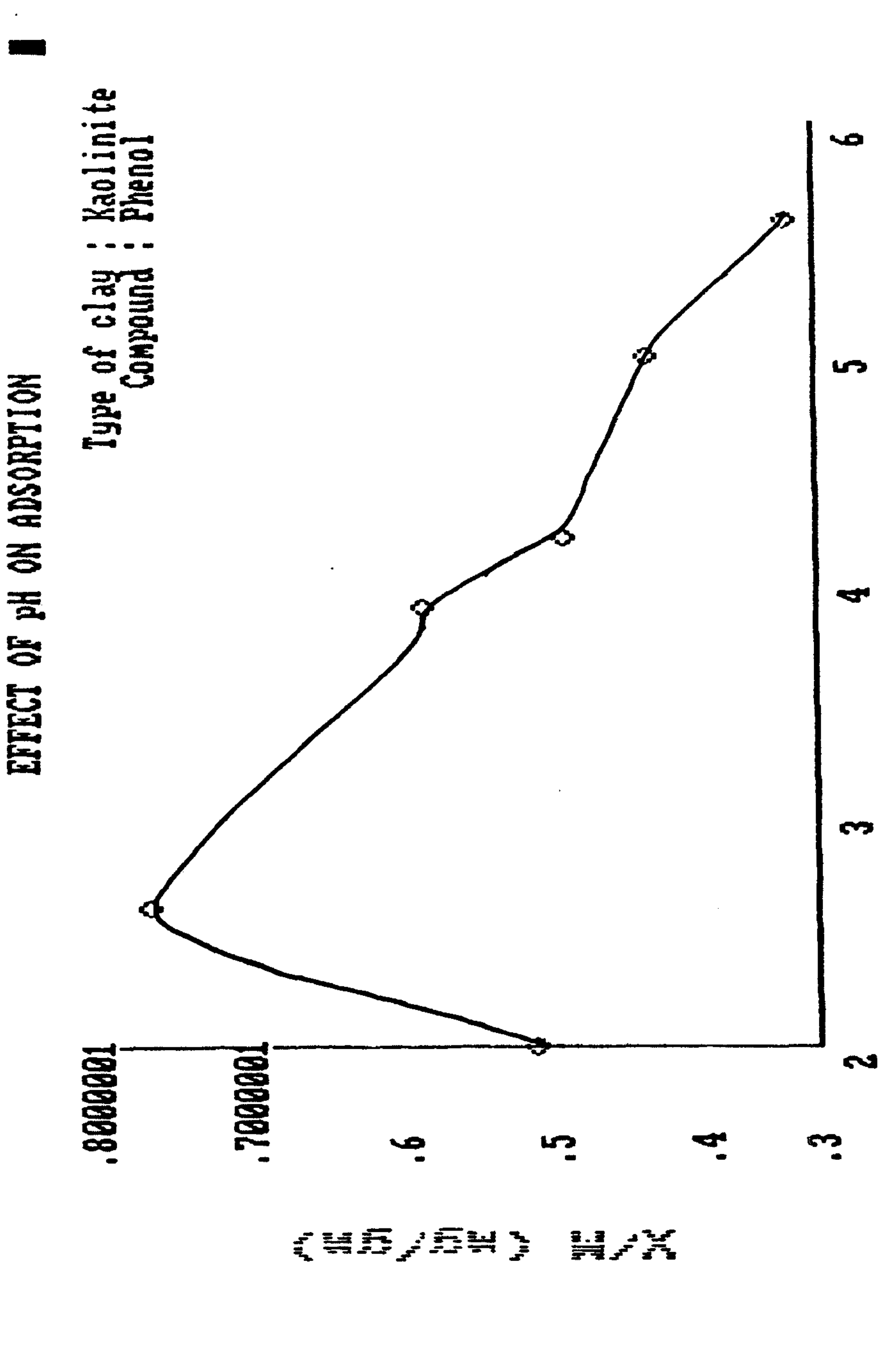
EFFECT OF pH ON ADSORPTION
Type of clay : Vermiculate
Compound : Cresol
5.55
4.65
3.75
2.85
1.95
4.5
5.5
6.5
7.5
8.5
pH

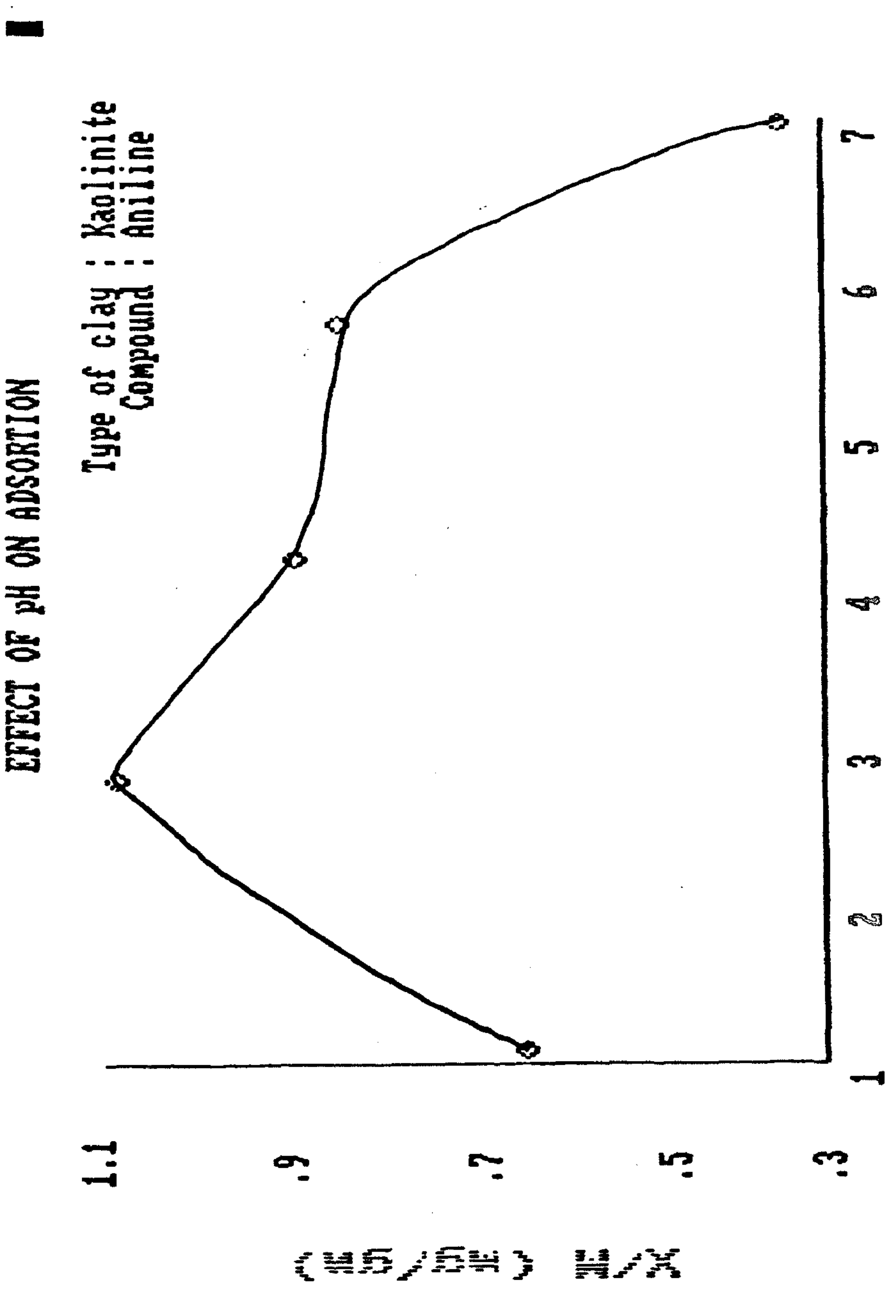
EFFECT OF pH ON ADSORPTION

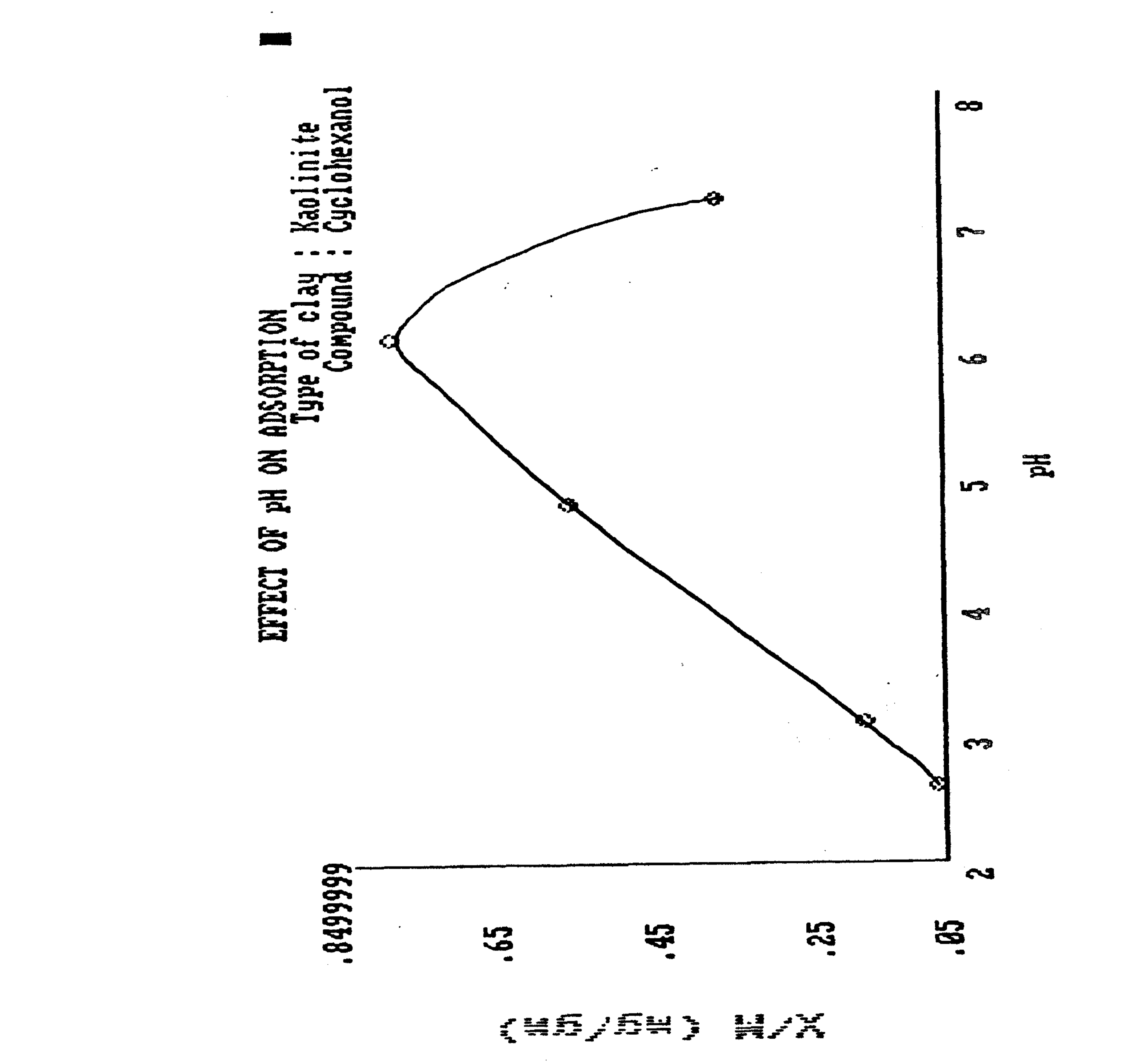


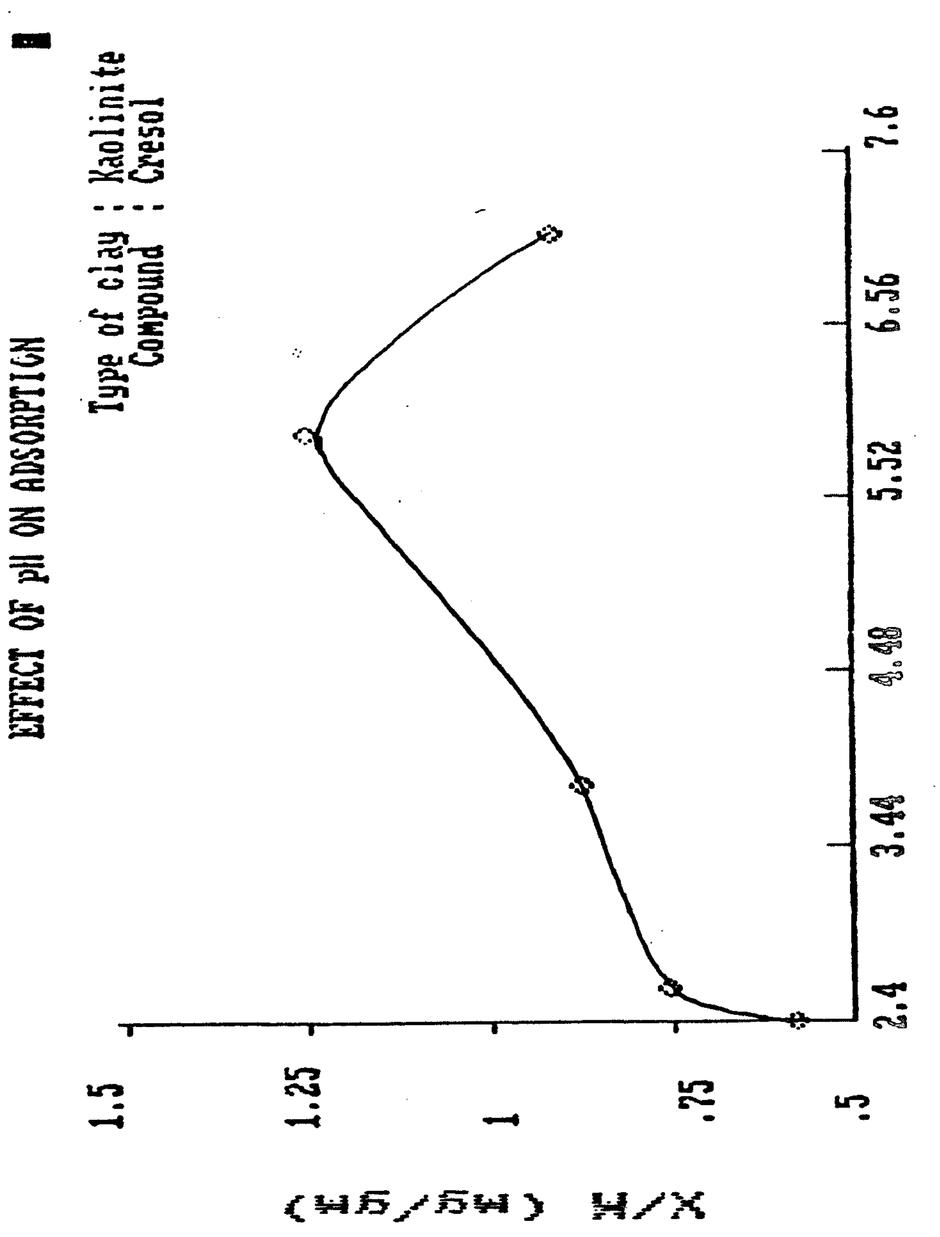


EFFECT OF pH ON ADSORPTION
Type of clay : Vermiculate
Compound : Monochlorophenol
X/M (mg/gm)
5
4
3
2
1
4
5
6
7
8
pH

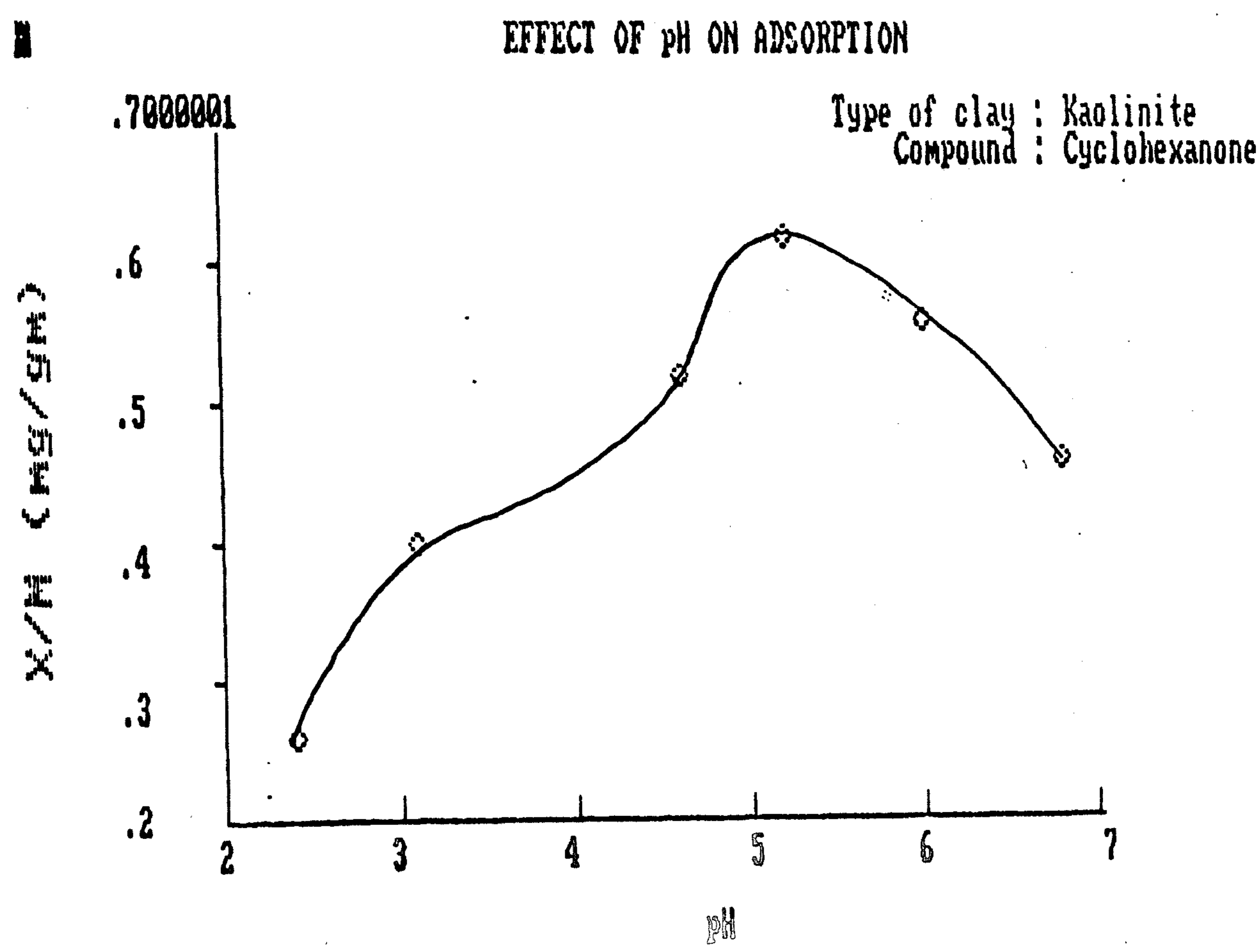

EFFECT OF pH ON ADSORPTION
Type of clay : Kaolinite
Compound : Phenol
X/M (MG/GM)
.8000001
.7000001
.6
.5
.4
.3
2
3
4
5
6
pH


EFFECT OF pH ON ADSORTION
Type of clay : Kaolinite
Compound : Aniline
X/M (mg/gm)
1.1
.9
.7
.5
.3
1
2
3
4
5
6
7
pH

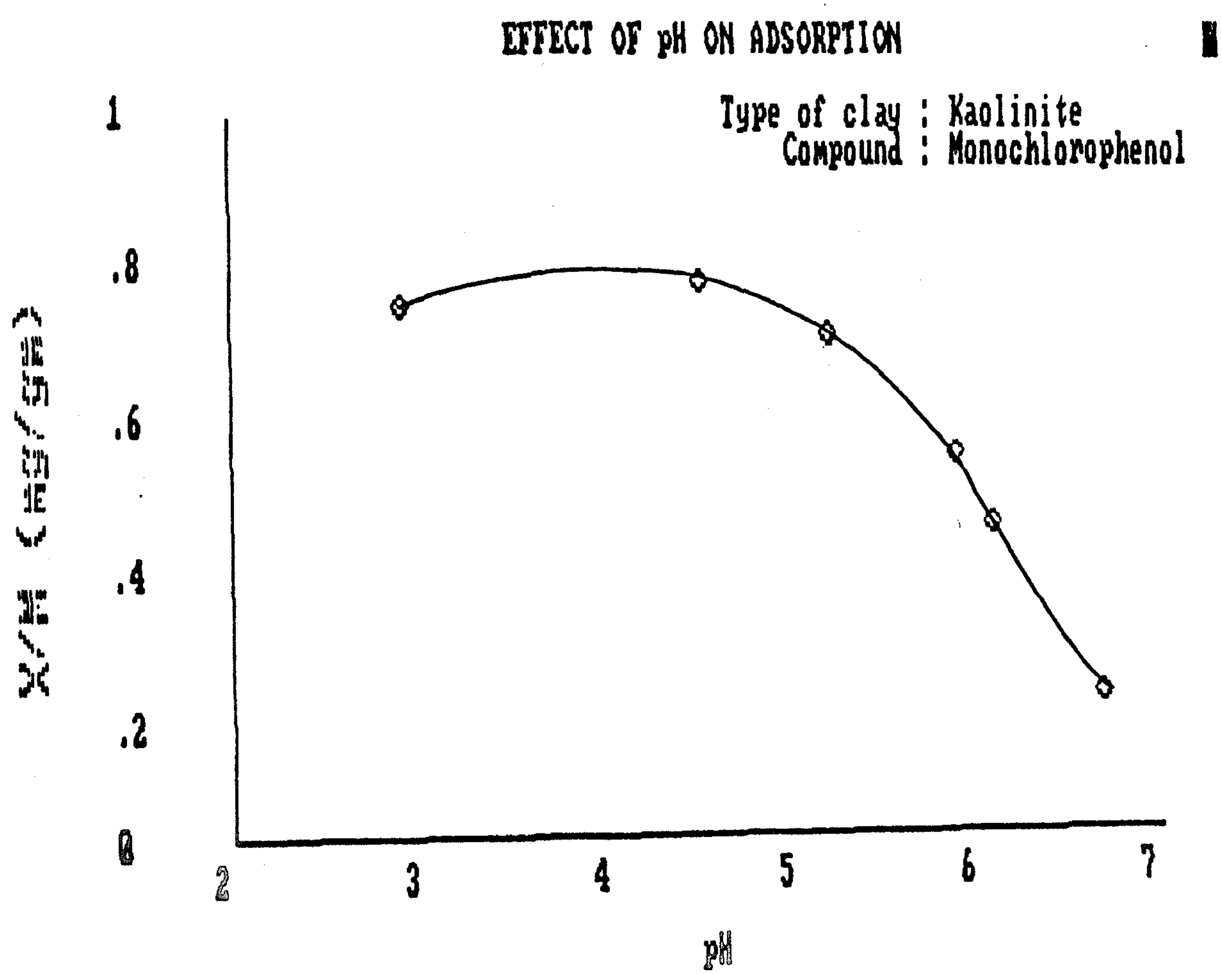

EFFECT OF pH ON ADSORPTION
Type of clay : Kaolinite
Compound : Cyclohexanol
X/M (mg/gm)
.8499999
.65
.45
.25
.05
2
3
4
5
6
7
8
pH



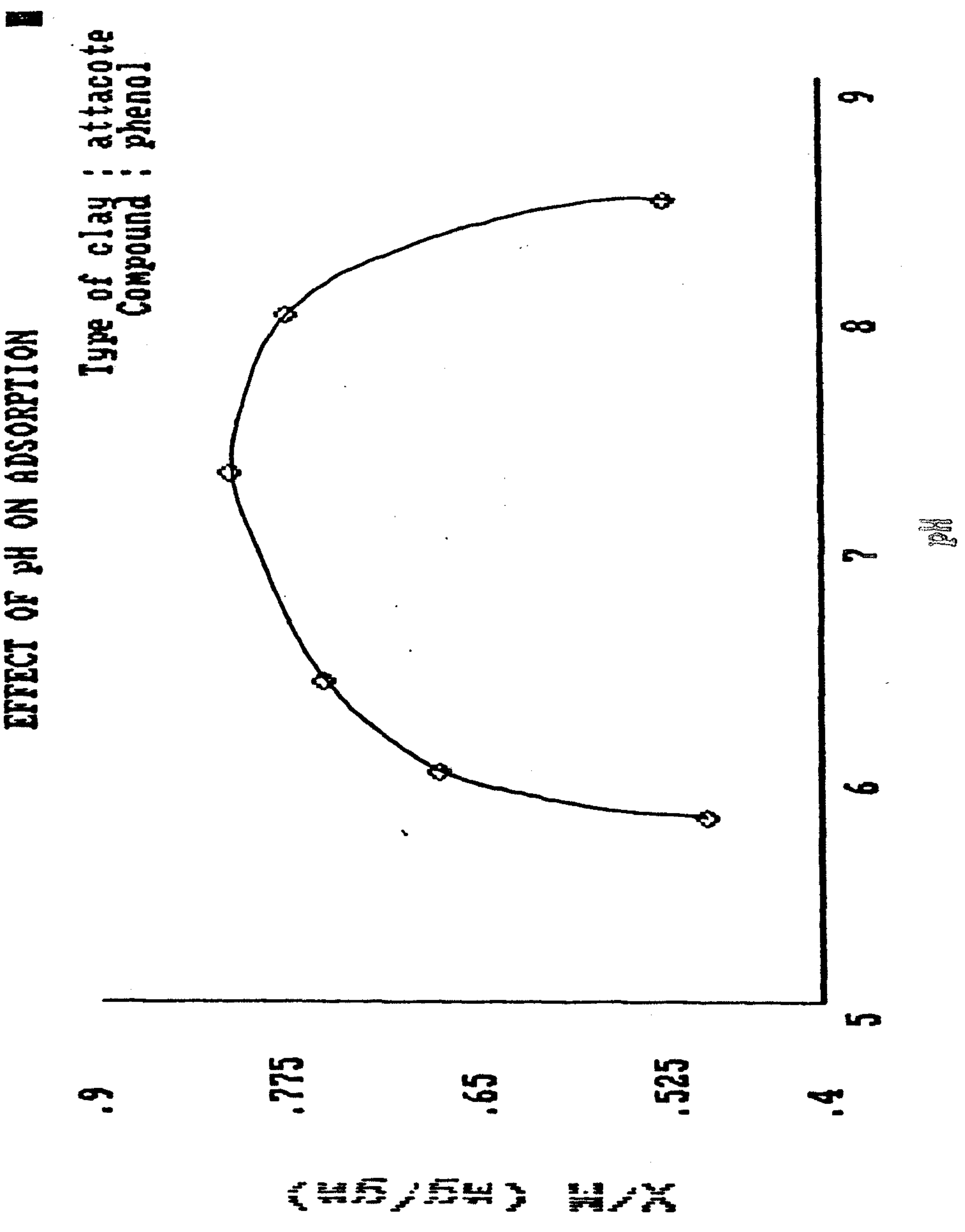
EFFECT OF pH ON ADSORPTION
Type of clay : Kaolinite
Compound : Cresol
X/M (mg/gm)
1.5
1.25
1
.75
.5
2.4
3.44
4.48
5.52
6.56
7.6
pH



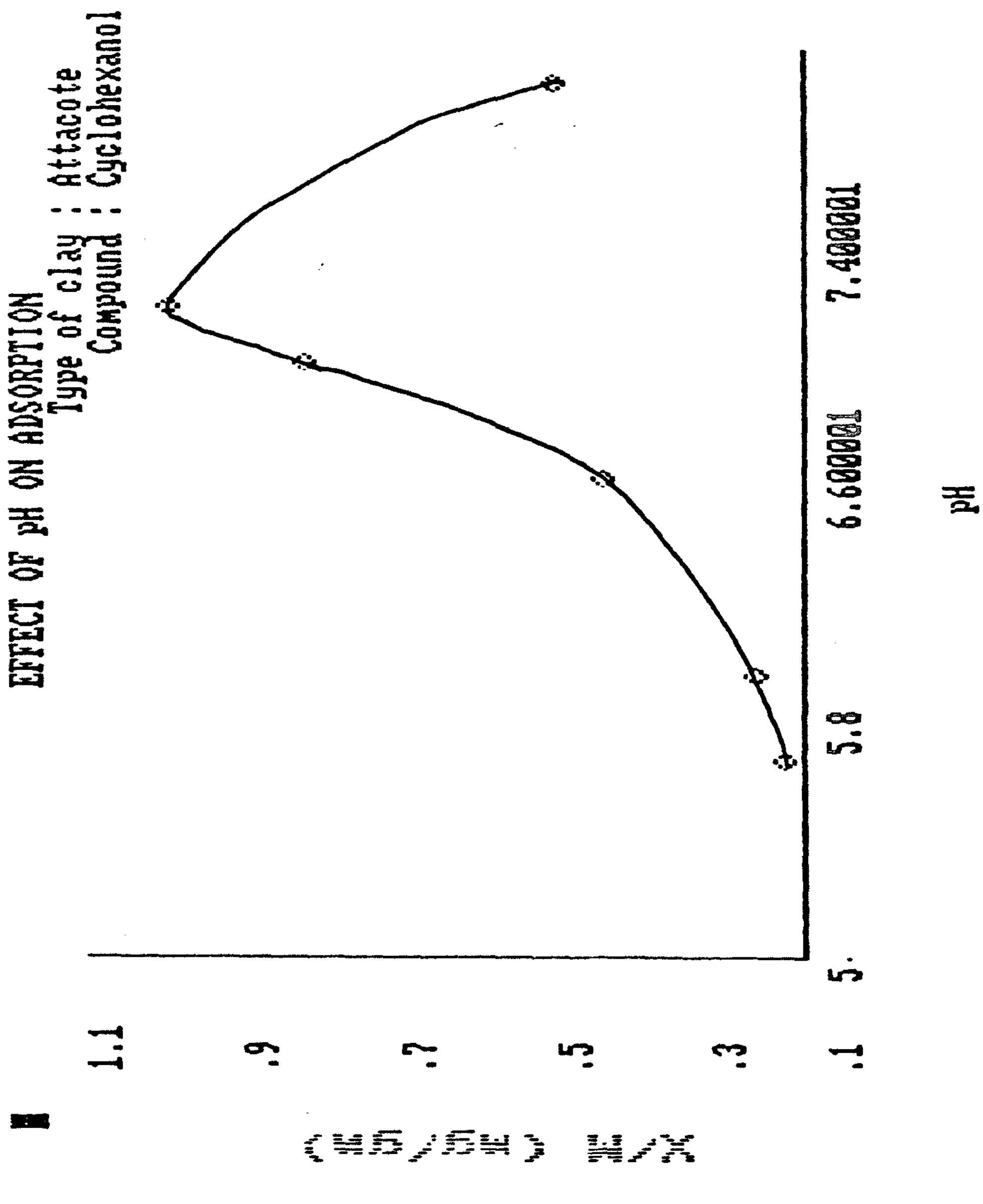
EFFECT OF pH ON ADSORPTION
Type of clay : Kaolinite
Compound : Cyclohexanone
X/M (mg/gm)
.7000001
.6
.5
.4
.3
.2
2
3
4
5
6
7
pH

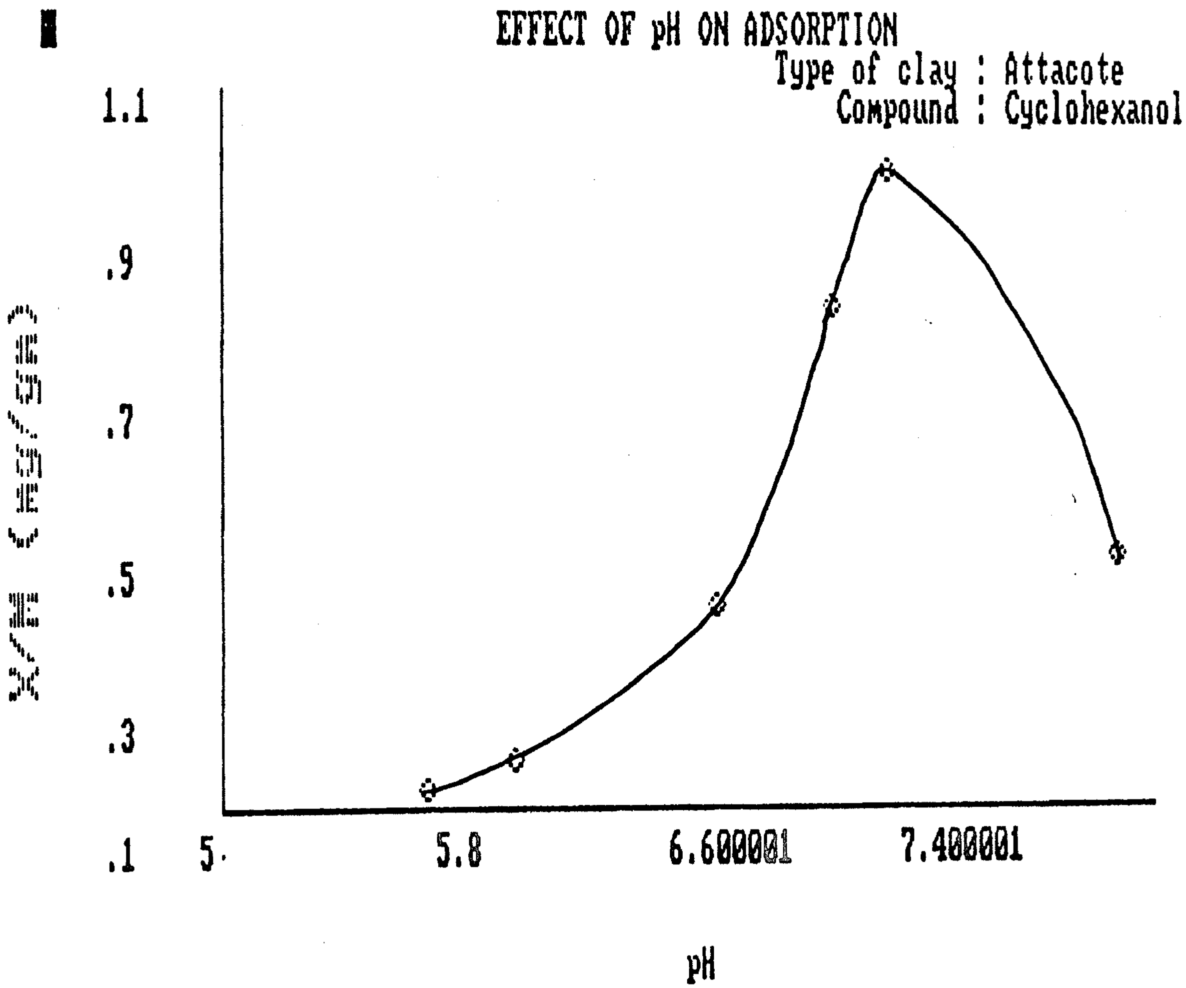


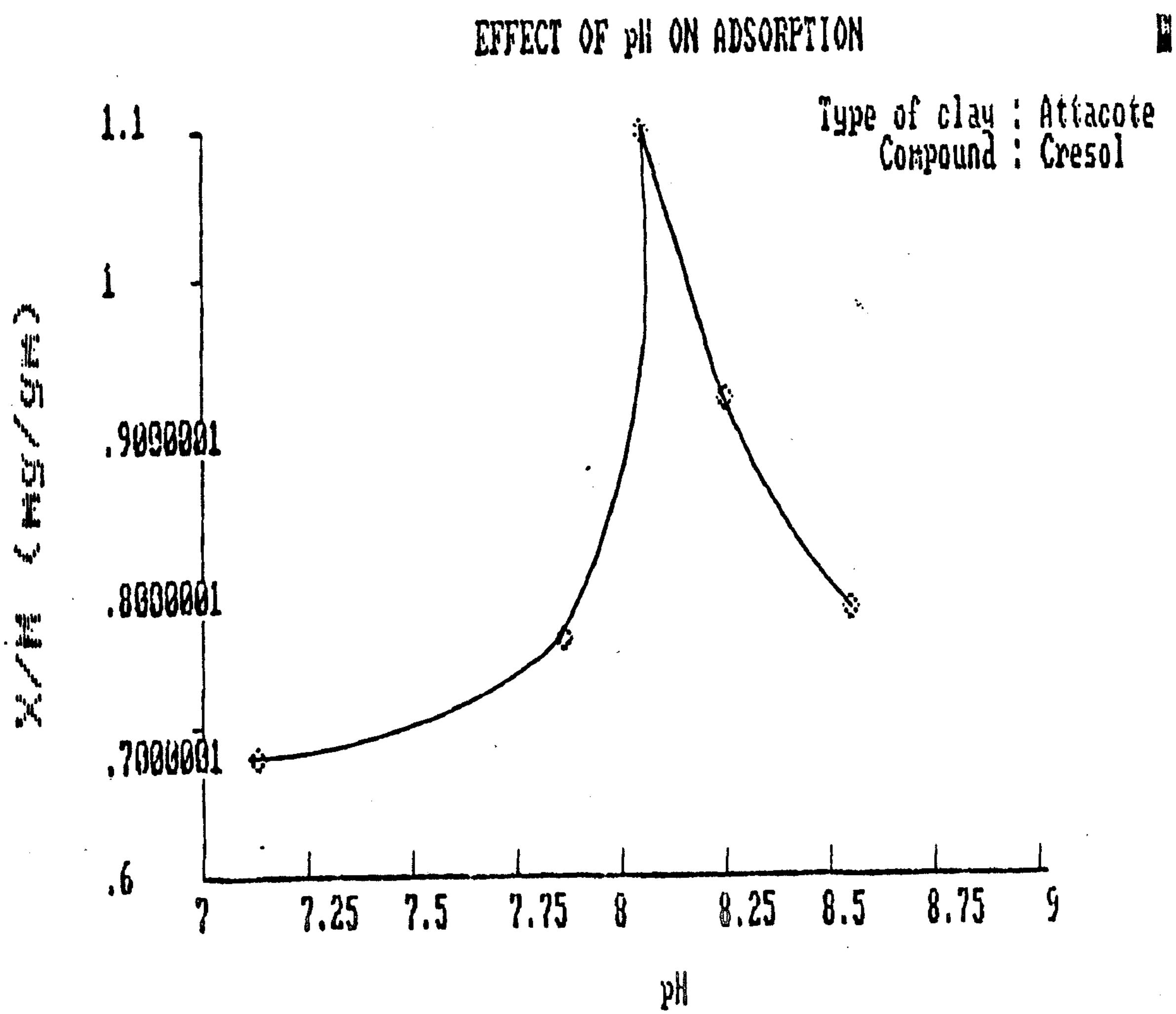
EFFECT OF pH ON ADSORPTION
Type of clay : Kaolinite
Compound : Monochlorophenol
X/M (mg/gm)
1
.8
.6
.4
.2
0
2
3
4
5
6
7
pH

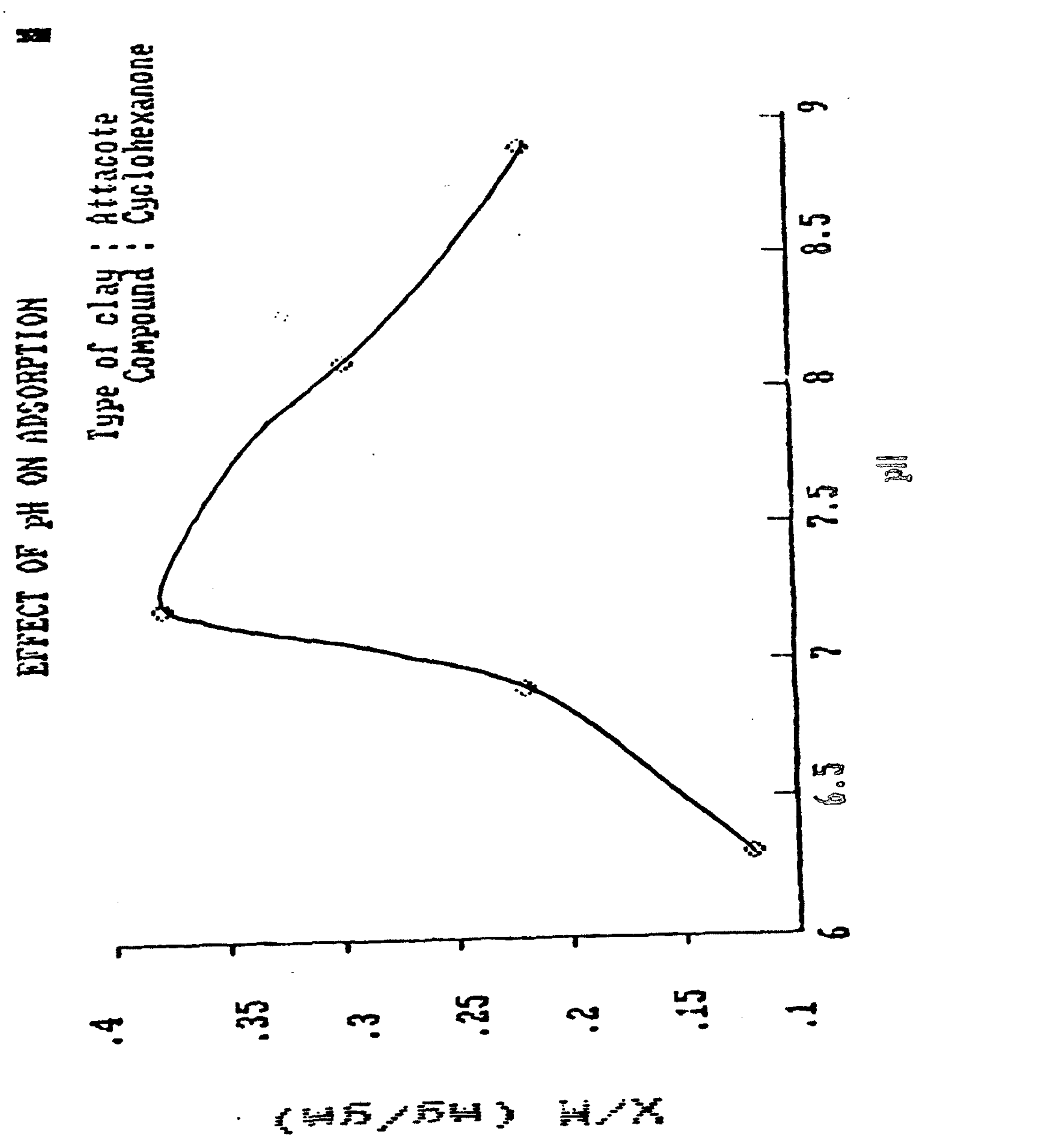


EFFECT OF pH ON ADSORPTION
Type of clay : attacote
Compound : phenol
X/M (mg/gm)
.9
.775
.65
.525
.4
5
6
7
8
9
pH

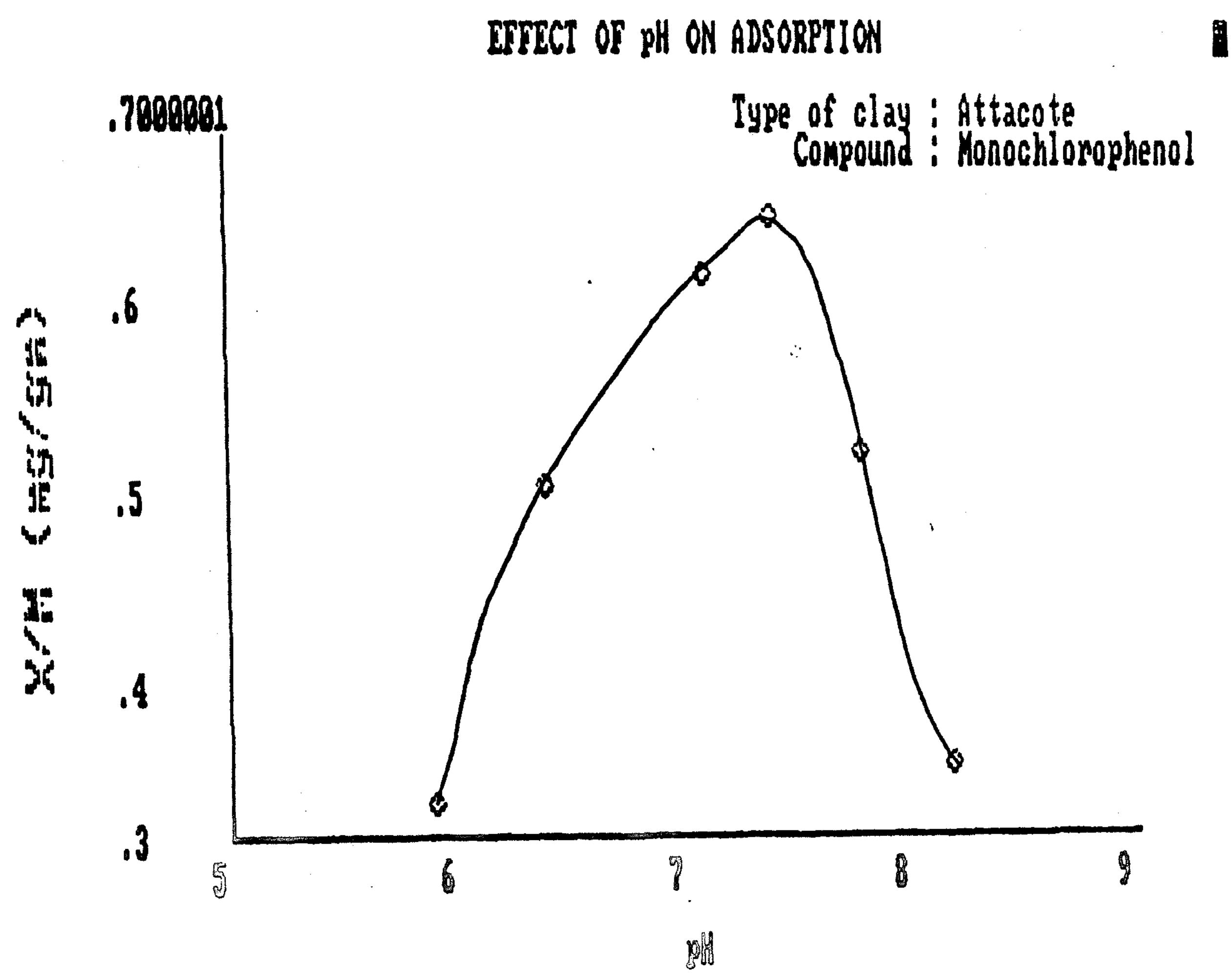

EFFECT OF pH ON ADSORPTION
Type of clay : Attacote
Compound : Cyclohexanol
X/M (mg/gm)
1.1
.9
.7
.5
.3
.1
5.
5.8
6.600001
7.400001
pH

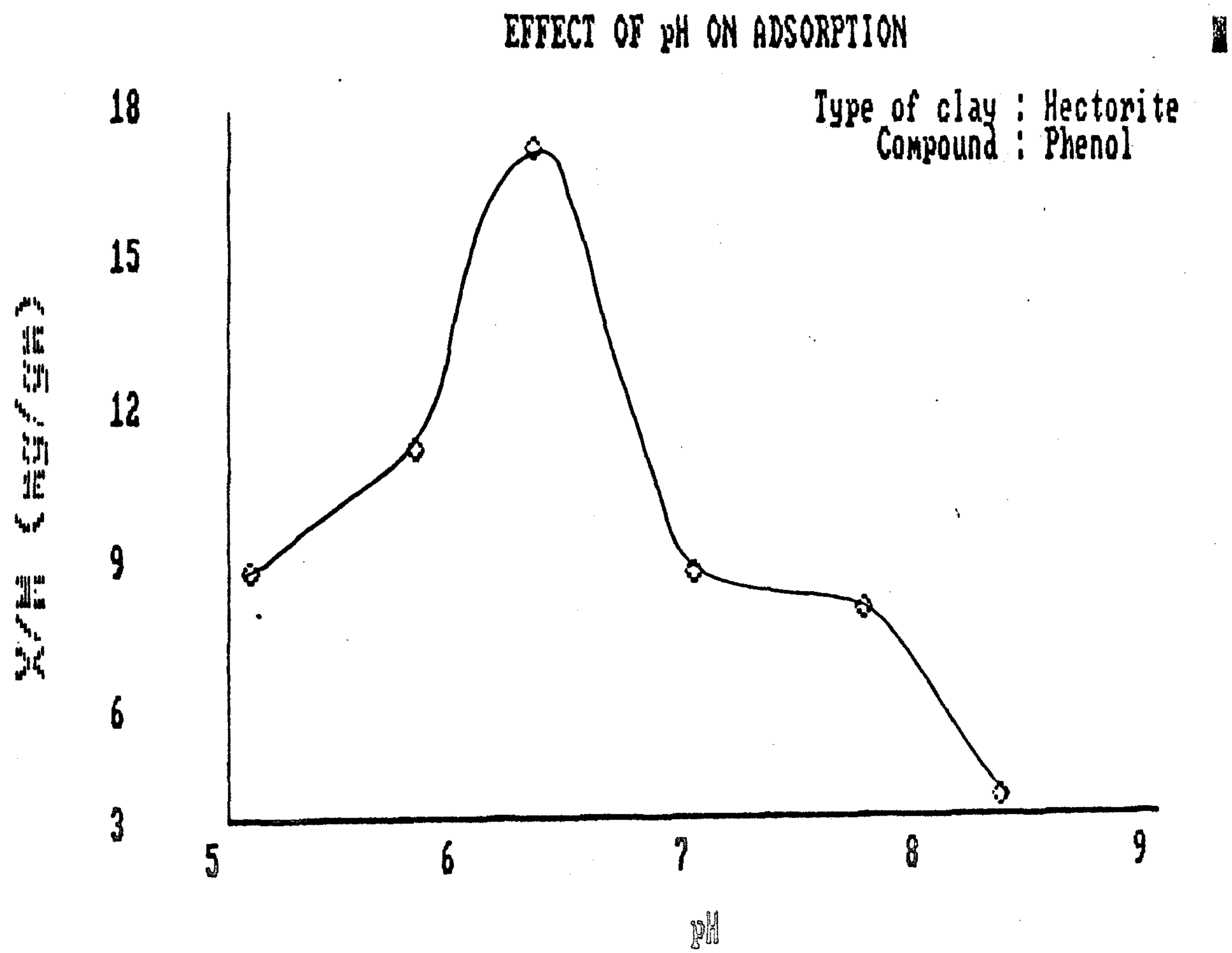

EFFECT OF pH ON ADSORPTION
Type of clay : Attacote
Compound : Cyclohexanol
X/M (mg/gm)
1.1
.9
.7
.5
.3
.1
5.
5.8
6.600001
7.400001
pH


EFFECT OF pH ON ADSORPTION
Type of clay : Attacote
Compound : Cresol
X/M (mg/gm)
1.1
1
.9000001
.8000001
.7000001
.6
7
7.25
7.5
7.75
8
8.25
8.5
8.75
9
pH

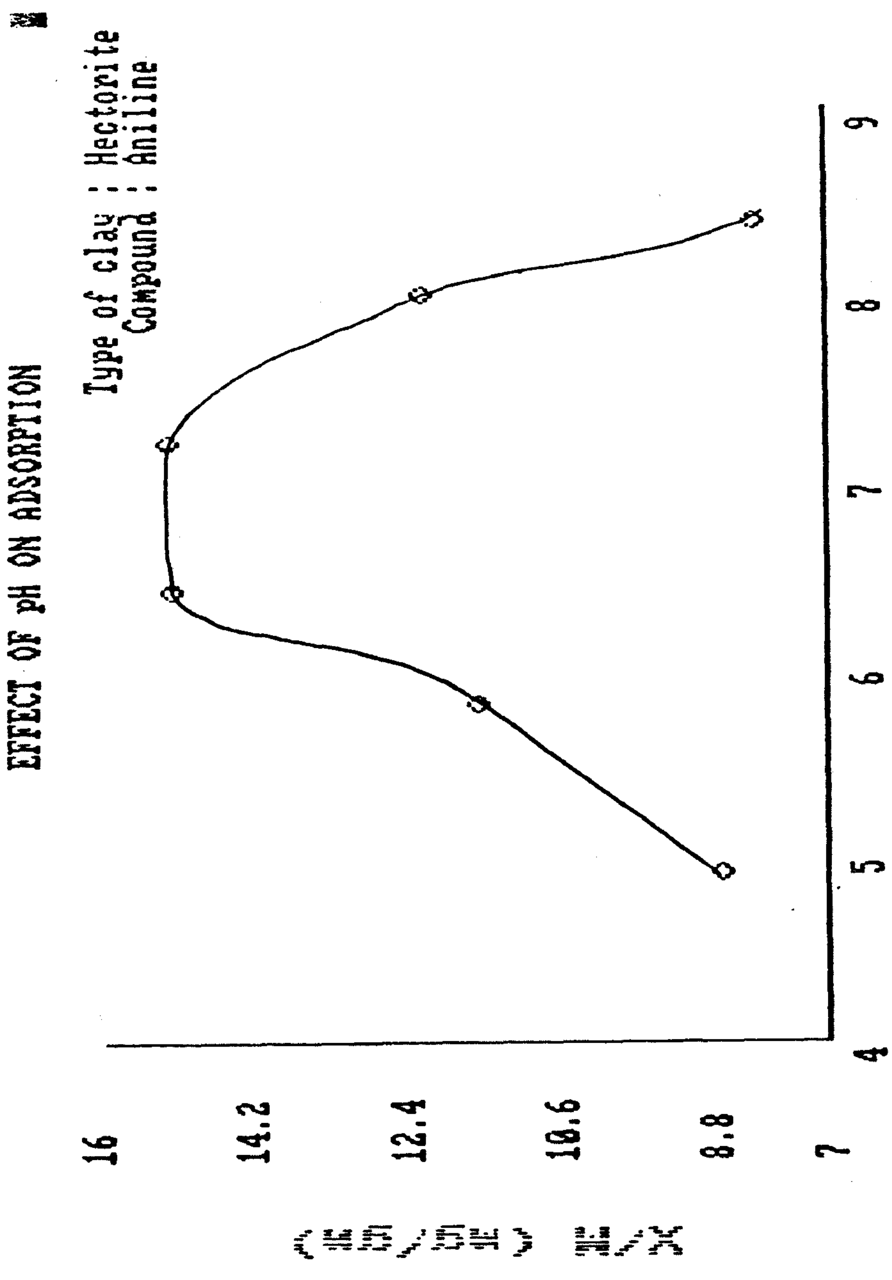


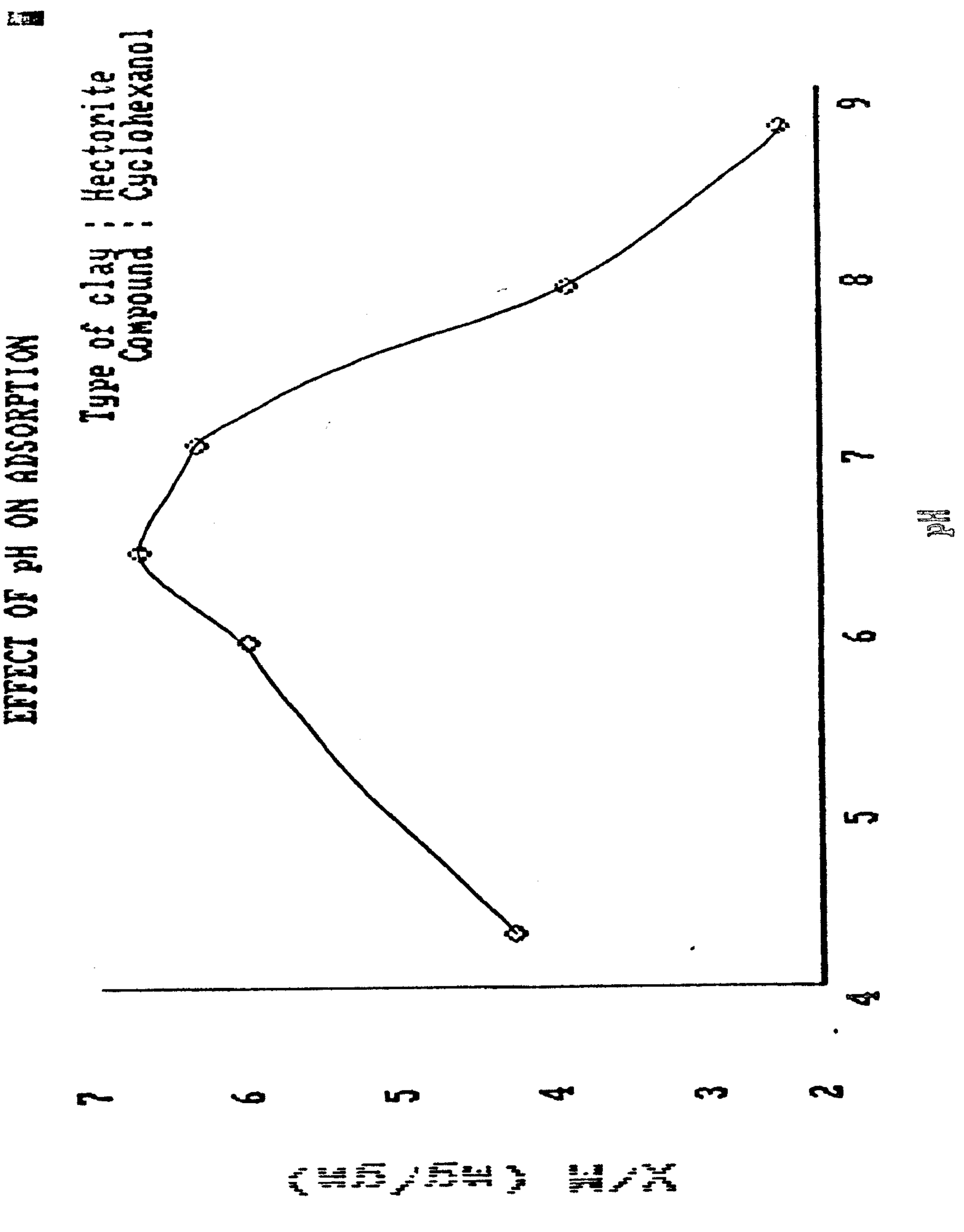
EFFECT OF pH ON ADSORPTION
Type of clay : Attacote
Compound : Cyclohexanone
X/M (mg/gm)
.4
.35
.3
.25
.2
.15
.1
6
6.5
7
7.5
8
8.5
9
pH

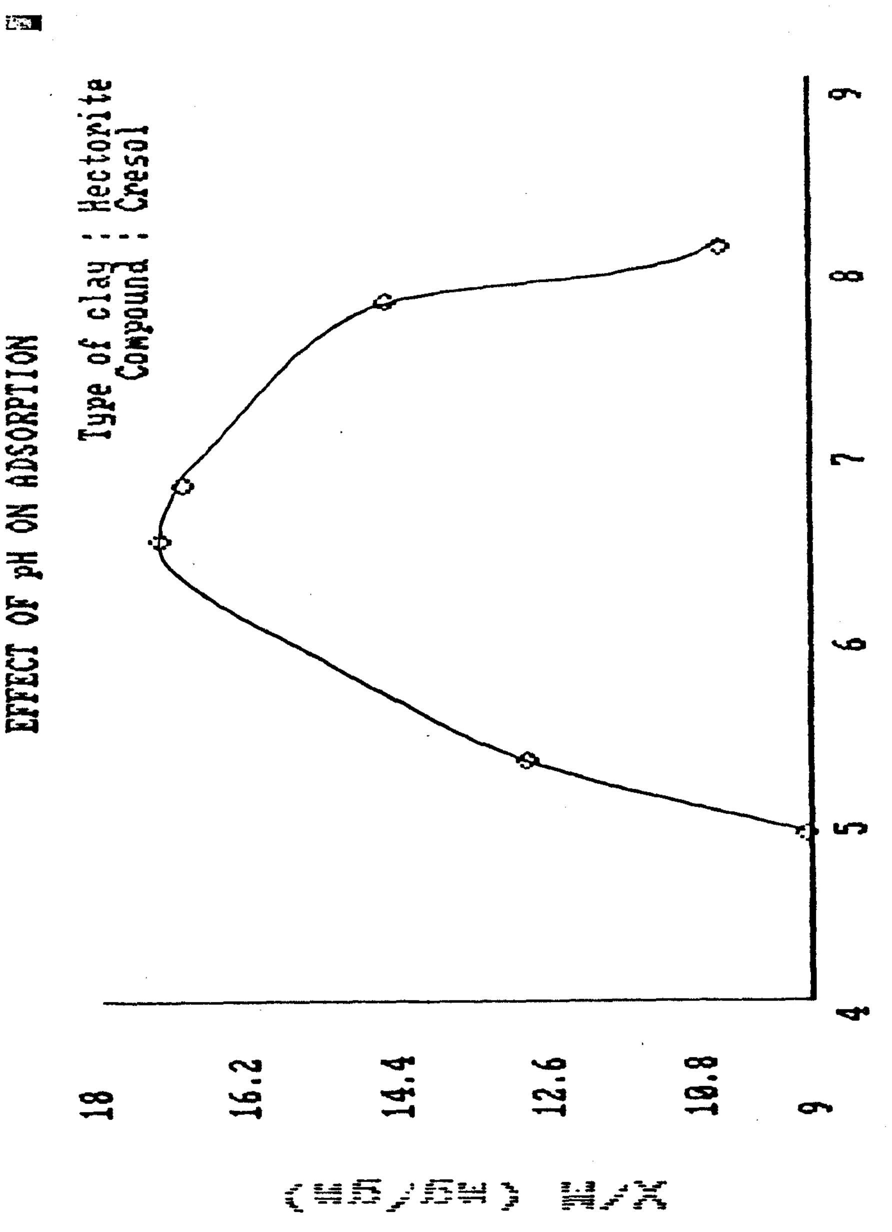

EFFECT OF pH ON ADSORPTION
Type of clay : Attacote
Compound : Monochlorophenol
X/M (mg/gm)
.7000001
.6
.5
.4
.3
5
6
7
8
9
pH

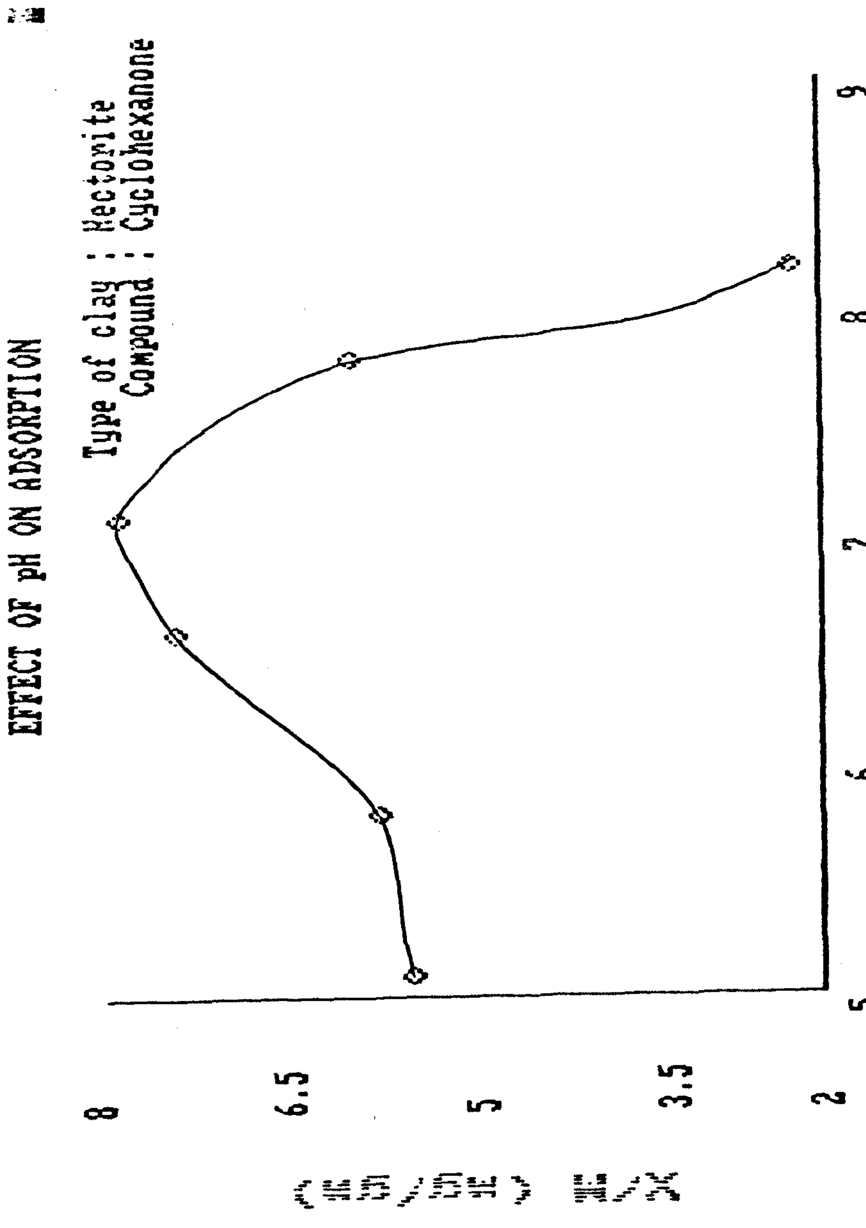


EFFECT OF pH ON ADSORPTION
Type of clay : Hectorite
Compound : Phenol
X/M (mg/gm)
18
15
12
9
6
3
5
6
7
8
9
pH

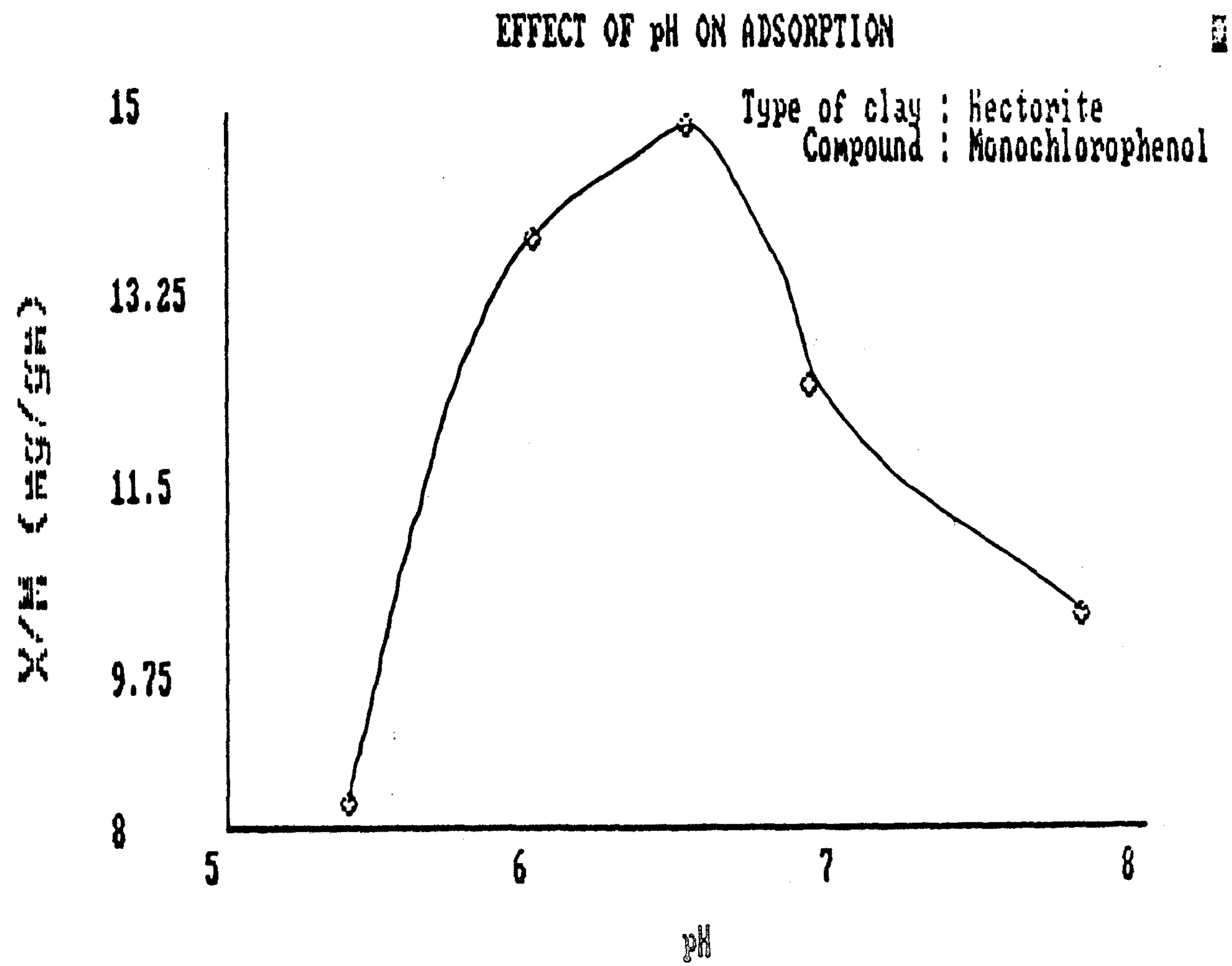

EFFECT OF pH ON ADSORPTION
Type of clay : Hectorite
Compound : Aniline
X/M (mg/gm)
16
14.2
12.4
10.6
8.8
7
4
5
6
7
8
9
pH

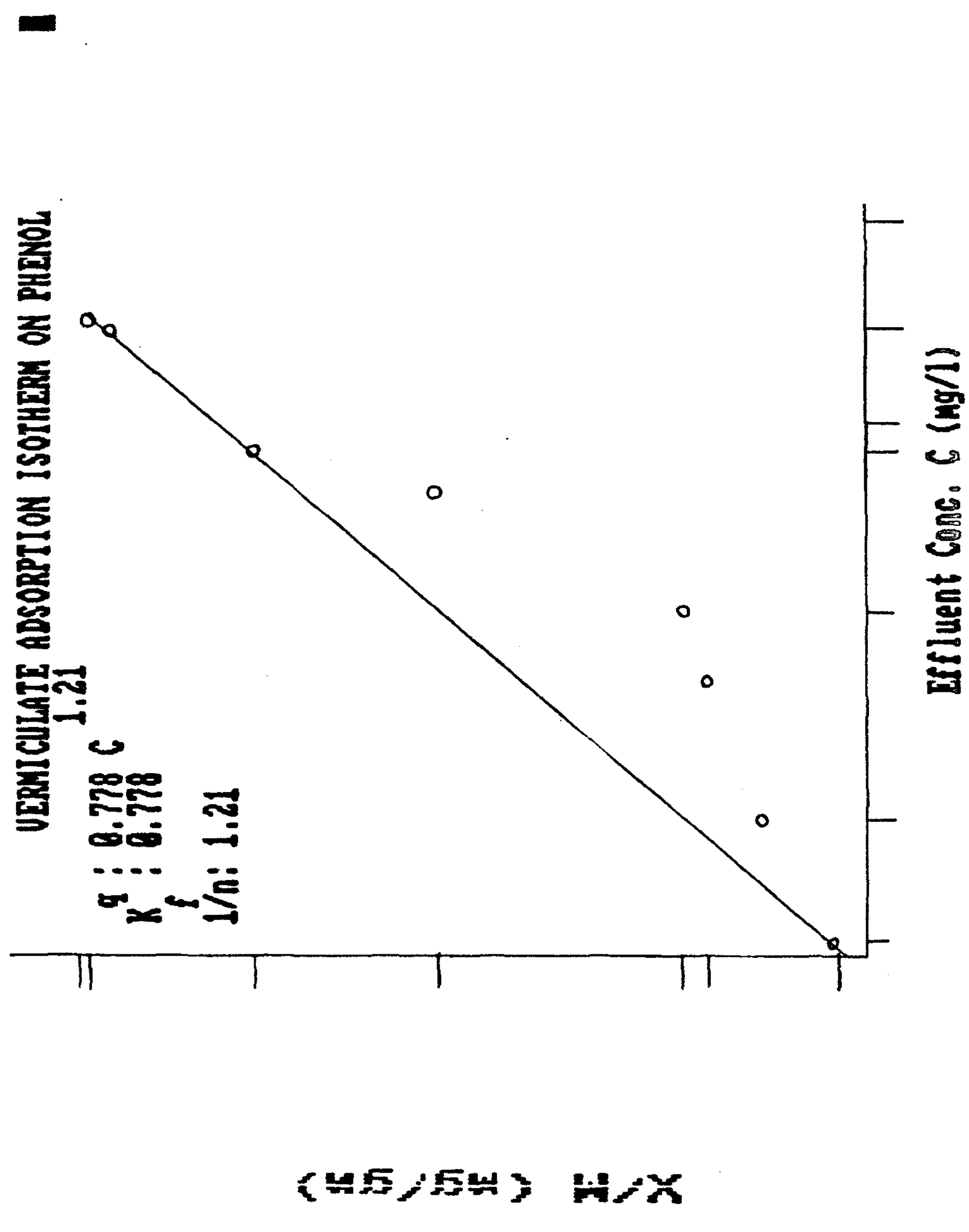

EFFECT OF pH ON ADSORPTION
Type of clay : Hectorite
Compound : Cyclohexanol
X/M (Mg/gm)
7
6
5
4
3
2
4
5
6
7
8
9
pH

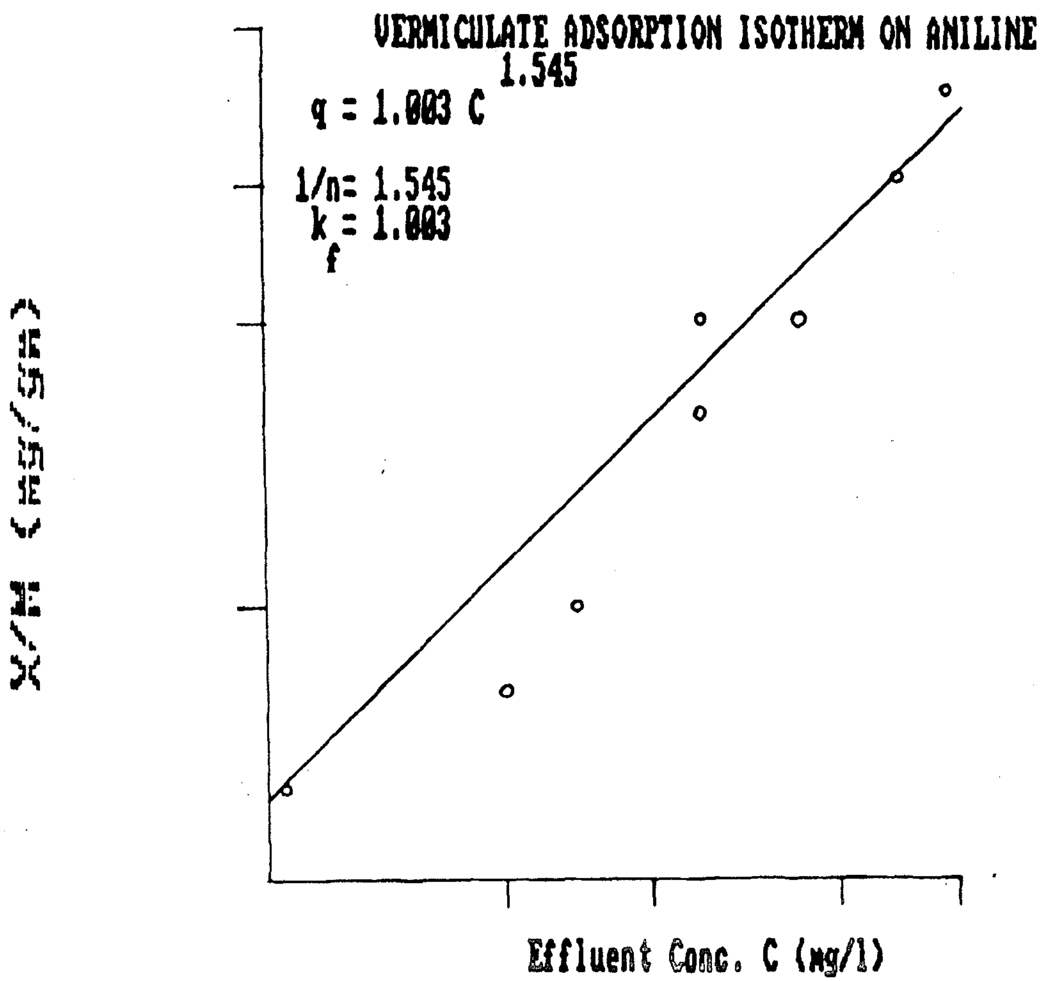

EFFECT OF pH ON ADSORPTION
Type of clay : Hectorite
Compound : Cresol
18
16.2
14.4
12.6
10.8
9
X/M (MG/GM)
4
5
6
7
8
9
pH



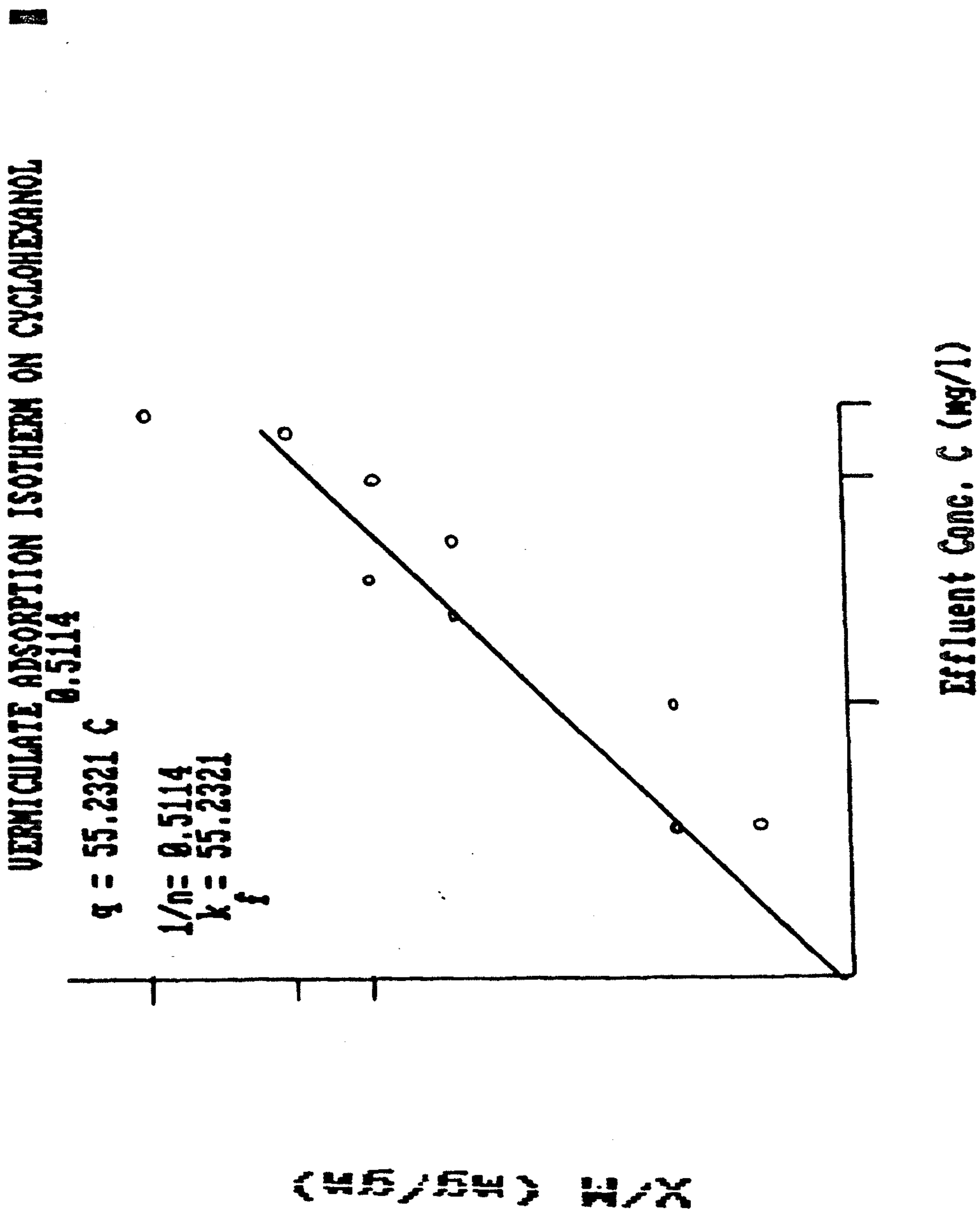
EFFECT OF pH ON ADSORPTION
Type of clay : Hectorite
Compound : Cyclohexanone
X/M (mg/gm)
8
6.5
5
3.5
2
5
6
7
8
9
pH

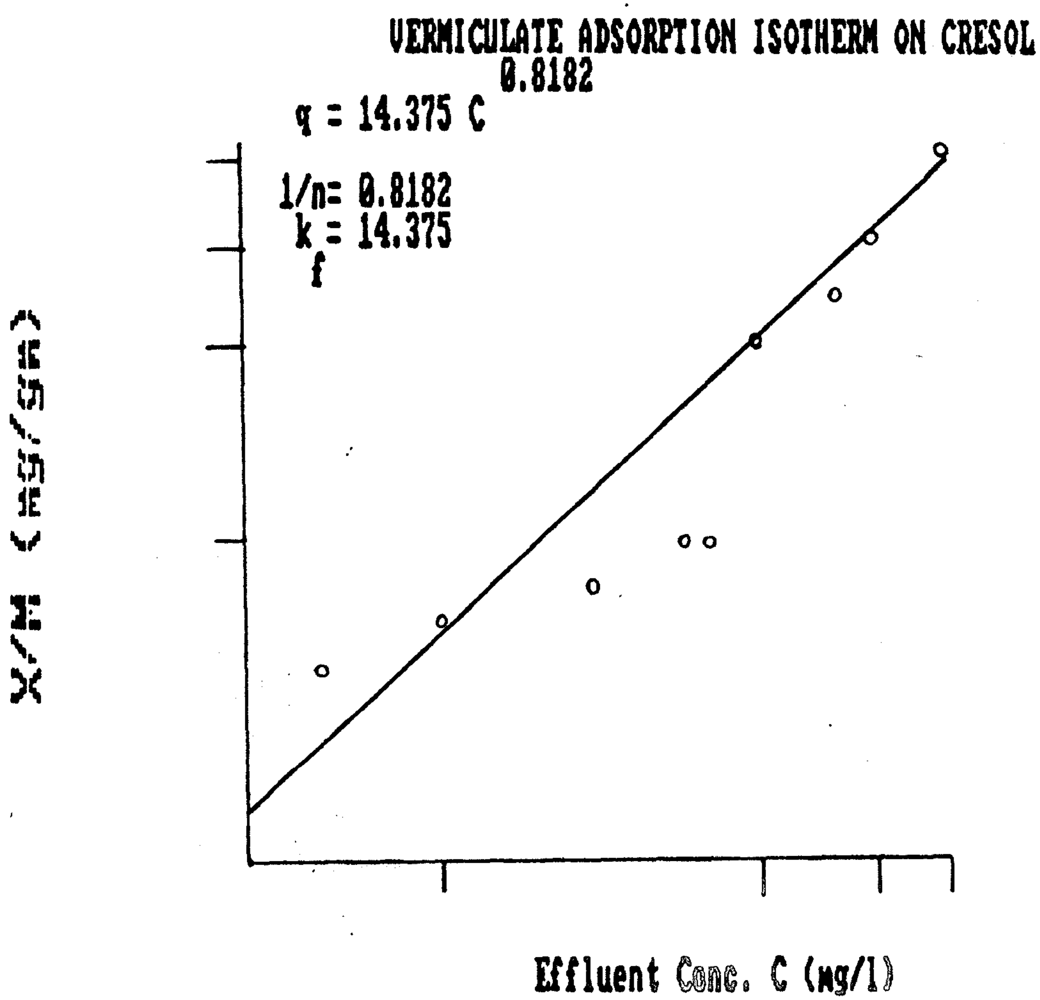

EFFECT OF pH ON ADSORPTION
Type of clay : Hectorite
Compound : Monochlorophenol
X/M (mg/gm)
15
13.25
11.5
9.75
8
5
6
7
8
pH

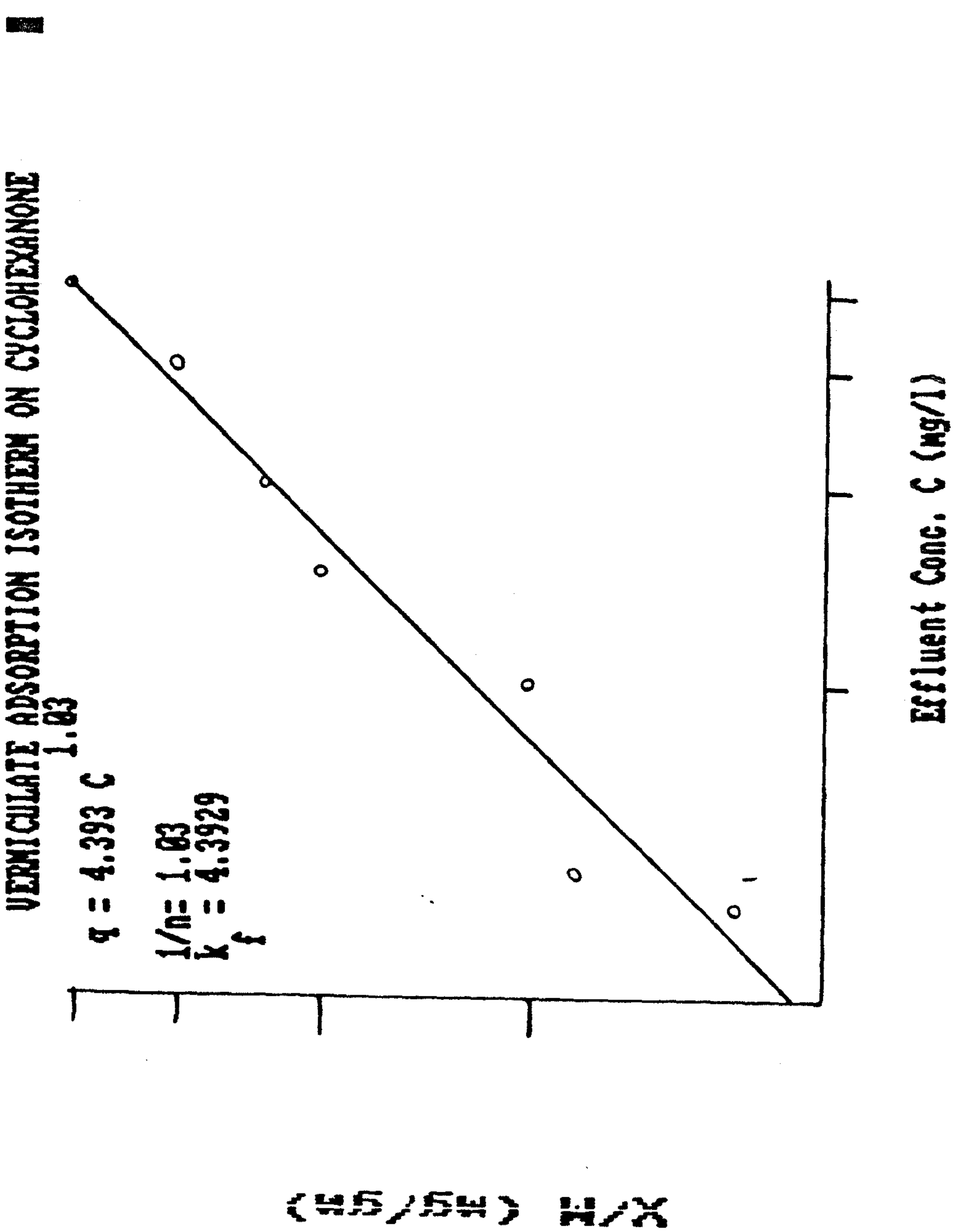

VERMICULATE ADSORPTION ISOTHERM ON PHENOL
q : 0.778 C 1.21
K : 0.778
f
1/n: 1.21
Effluent Conc. C (mg/l)

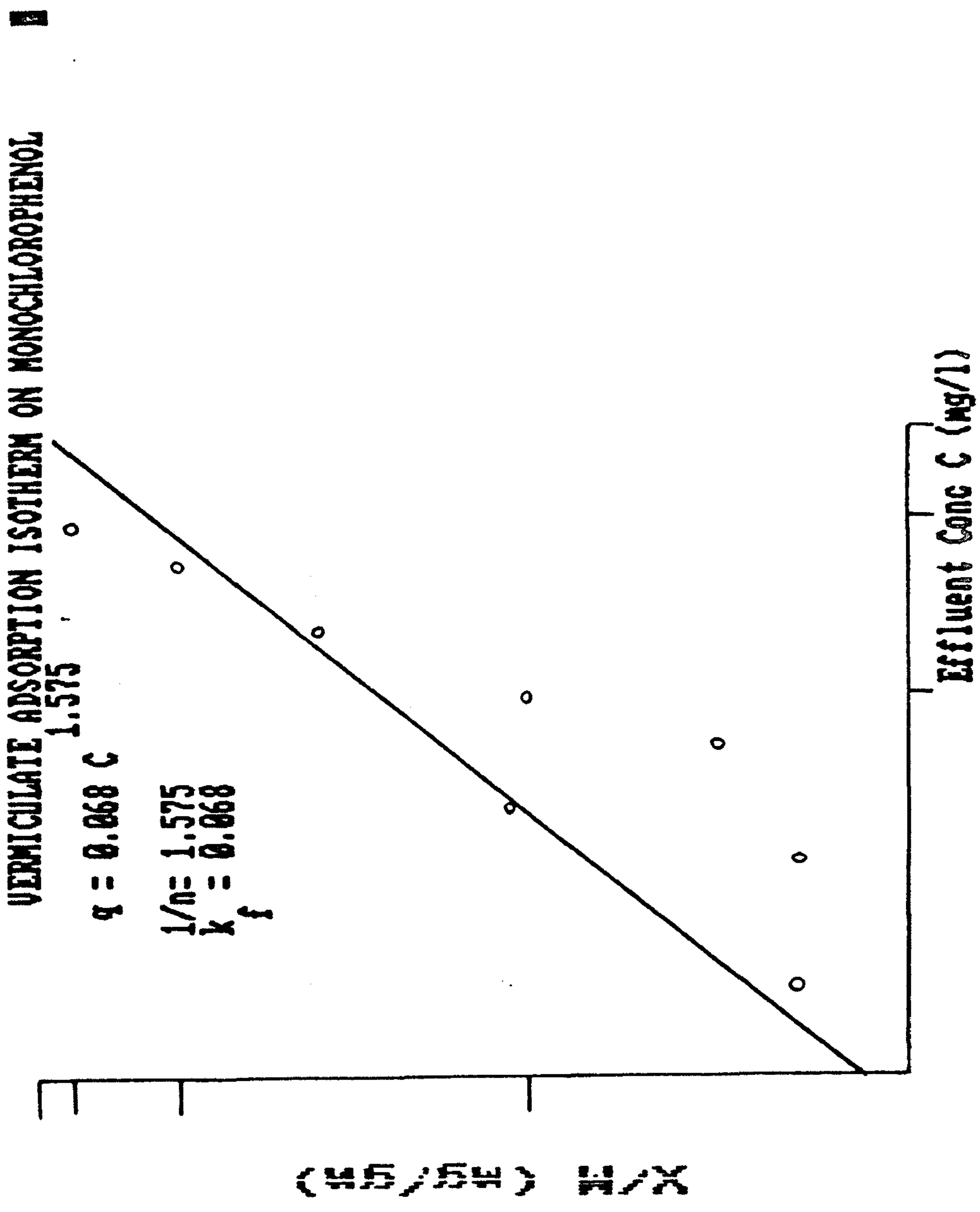


VERMICULATE ADSORPTION ISOTHERM ON ANILINE
q = 1.003 C^1.545
1/n= 1.545
k_f = 1.003
X/M (mg/gm)
Effluent Conc. C (mg/l)

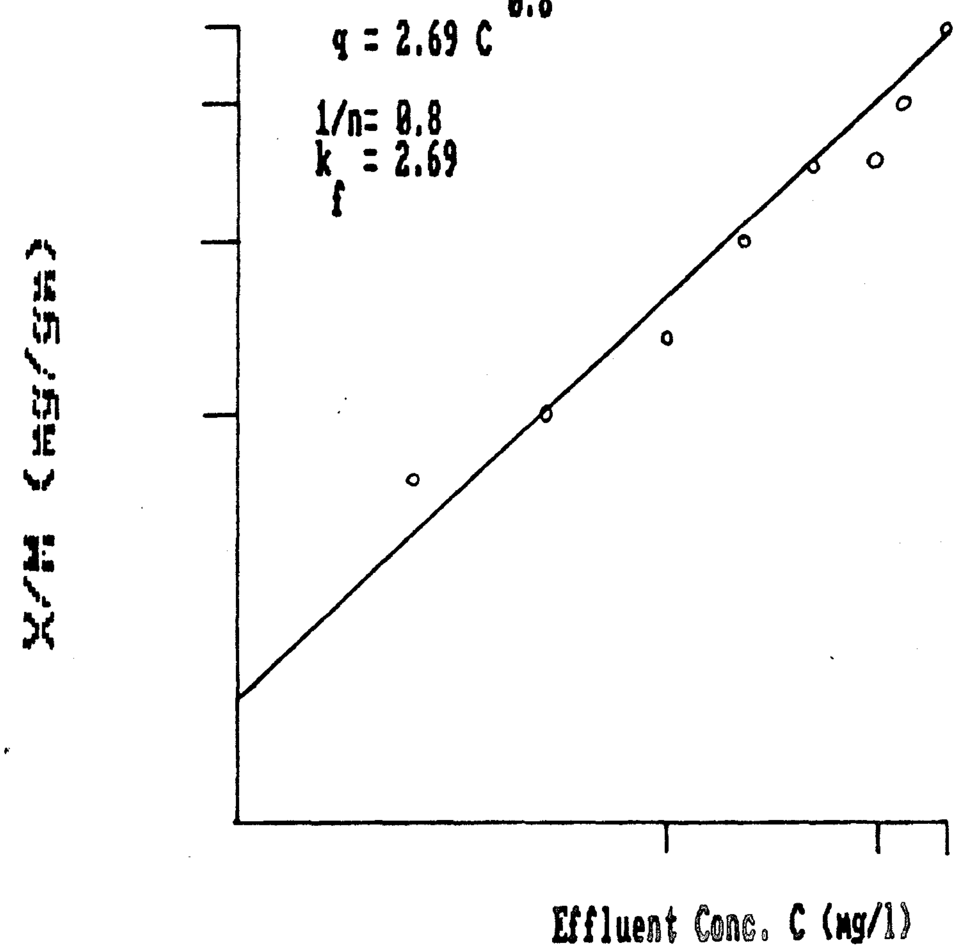

VERMICULATE ADSORPTION ISOTHERM ON CYCLOHEXANOL
q = 55.2321 C 0.5114
1/n= 0.5114
k = 55.2321
f
X/M (mg/gm)
Effluent Conc. C (mg/l)

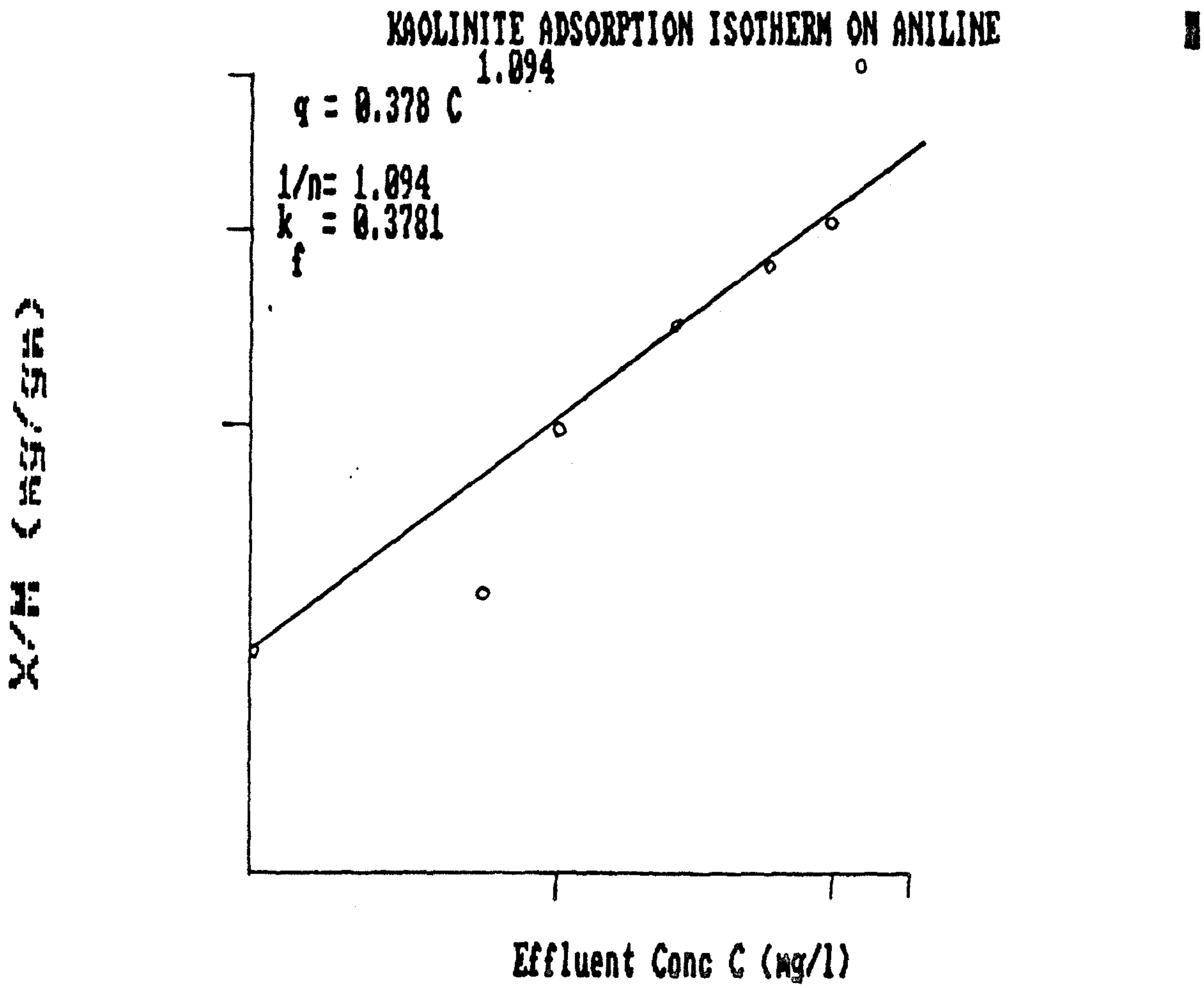

VERMICULATE ADSORPTION ISOTHERM ON CRESOL
q = 14.375 C 0.8182
1/n= 0.8182
k = 14.375
f
X/M (mg/gm)
Effluent Conc. C (mg/l)

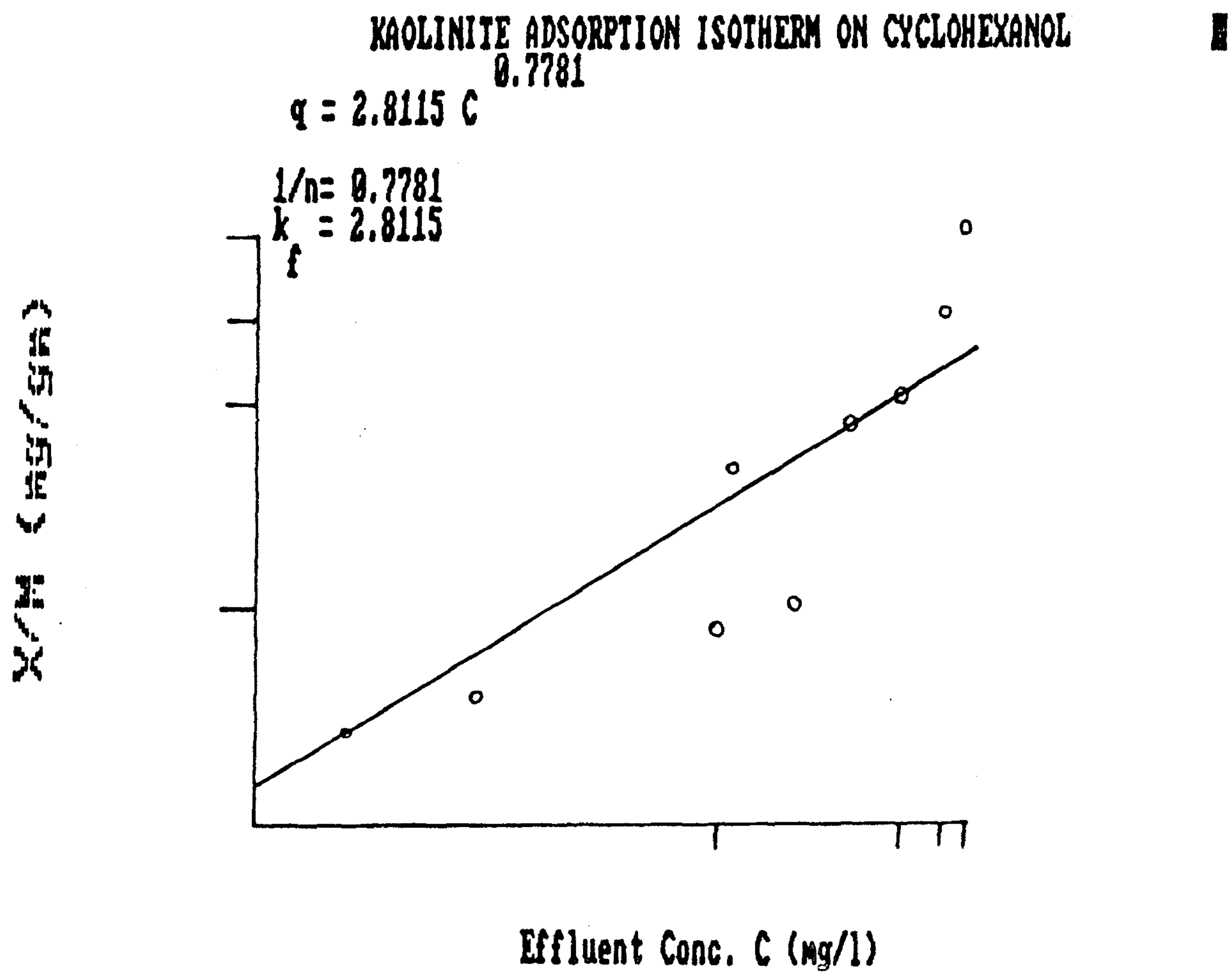

VERMICULATE ADSORPTION ISOTHERM ON CYCLOHEXANONE
q = 4.393 C 1.03
1/n= 1.03
k f = 4.3929
Effluent Conc. C (mg/l)
X/M (mg/gm)

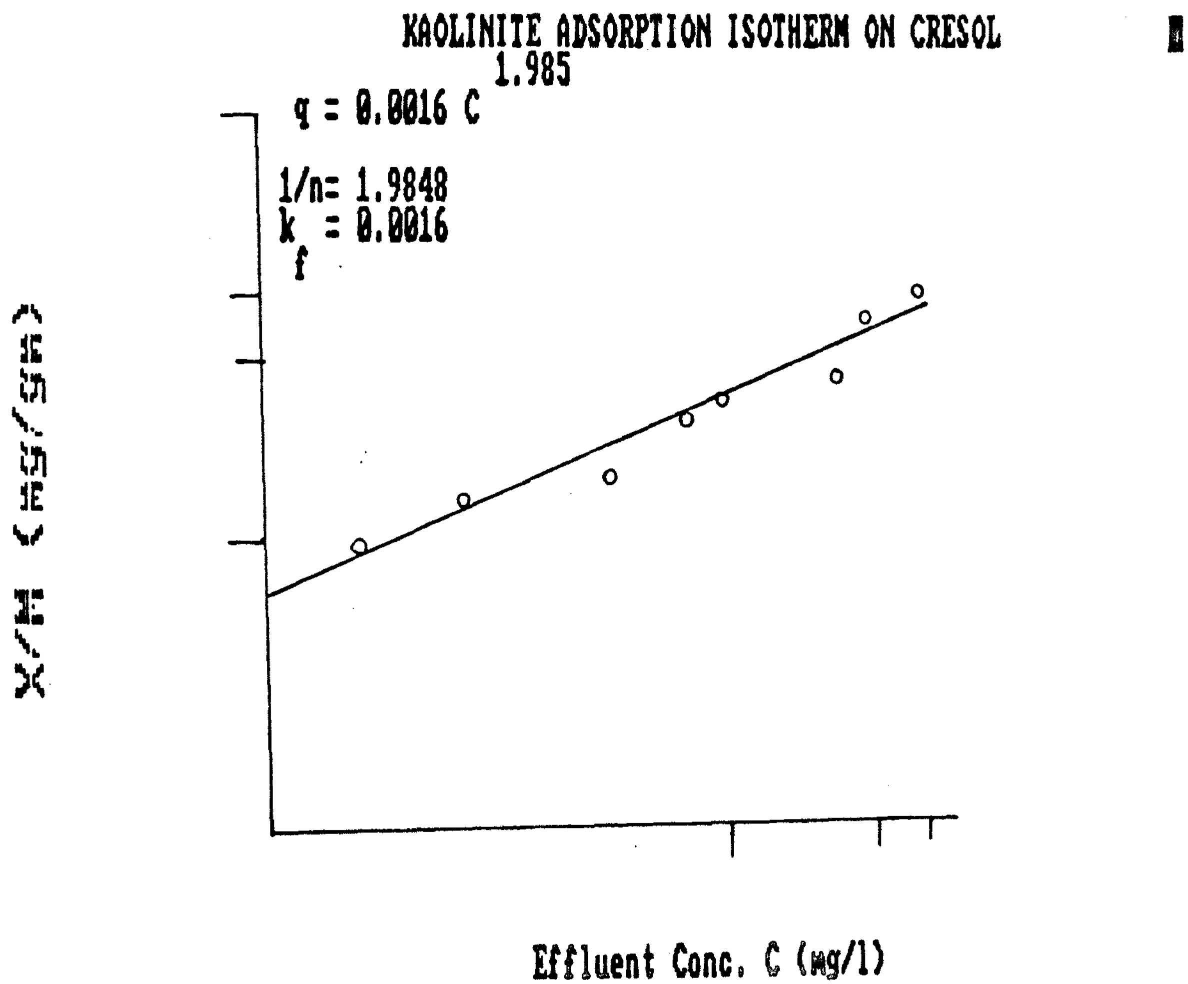

VERMICULATE ADSORPTION ISOTHERM ON MONOCHLOROPHENOL
q = 0.068 C^1.575
1/n= 1.575
k_f = 0.068
Effluent Conc C (mg/l)
X/M (mg/gm)

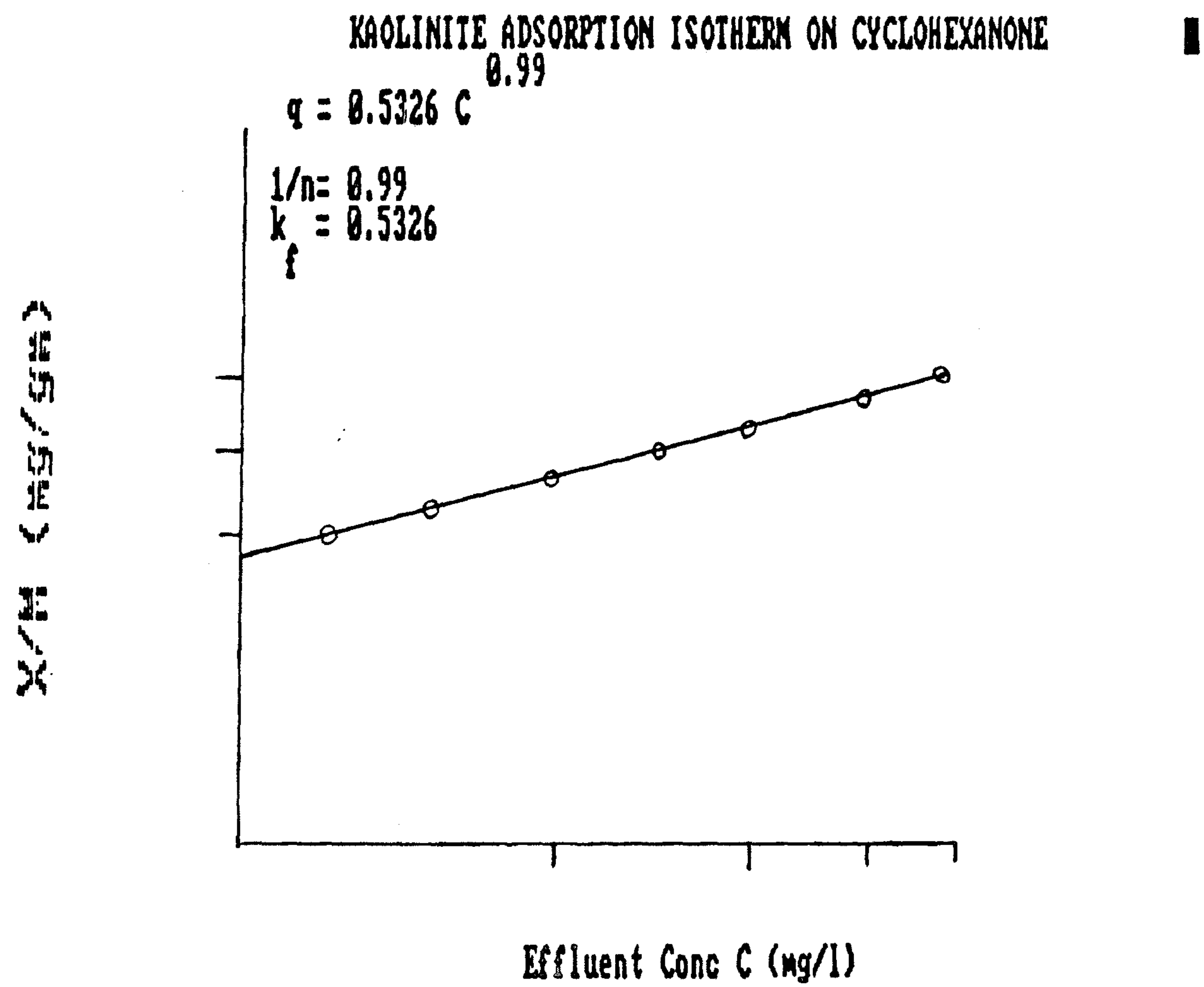
KAOLINITE ADSORPTION ISOTHERM ON PHENOL




KAOLINITE ADSORPTION ISOTHERM ON ANILINE
q = 0.378 C 1.094
1/n= 1.094
k f = 0.3781
X/M (mg/gm)
Effluent Conc C (mg/l)

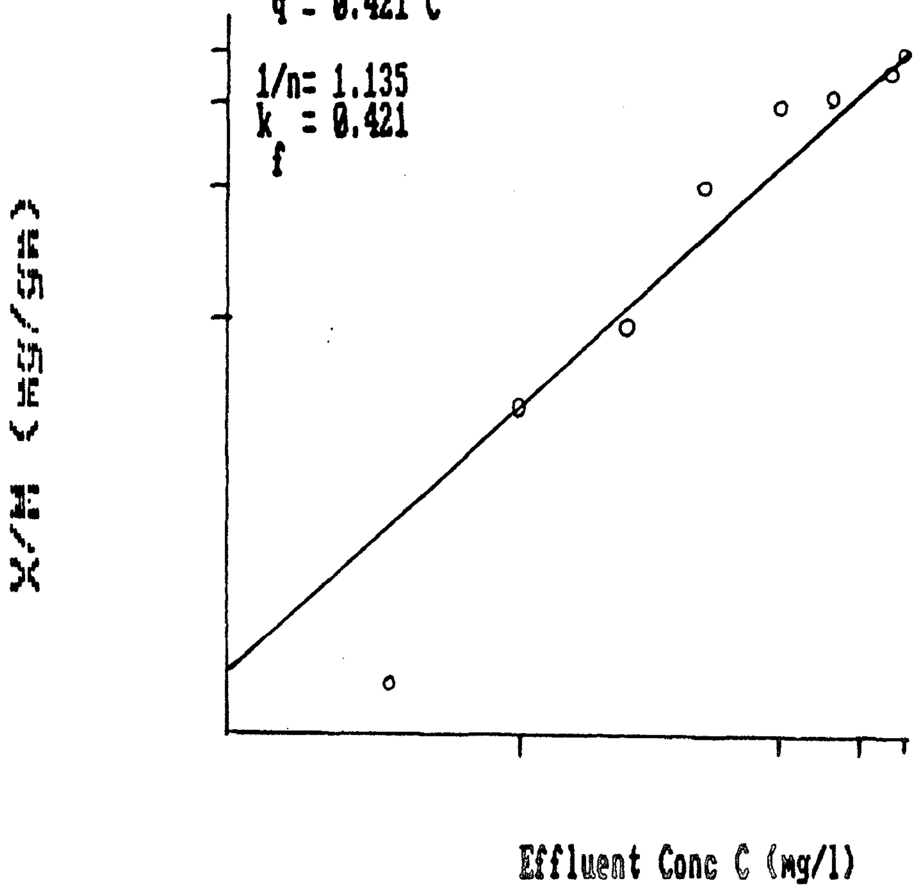

KAOLINITE ADSORPTION ISOTHERM ON CYCLOHEXANOL
q = 2.8115 C^0.7781
1/n= 0.7781
k_f = 2.8115
X/M (mg/gm)
Effluent Conc. C (mg/l)

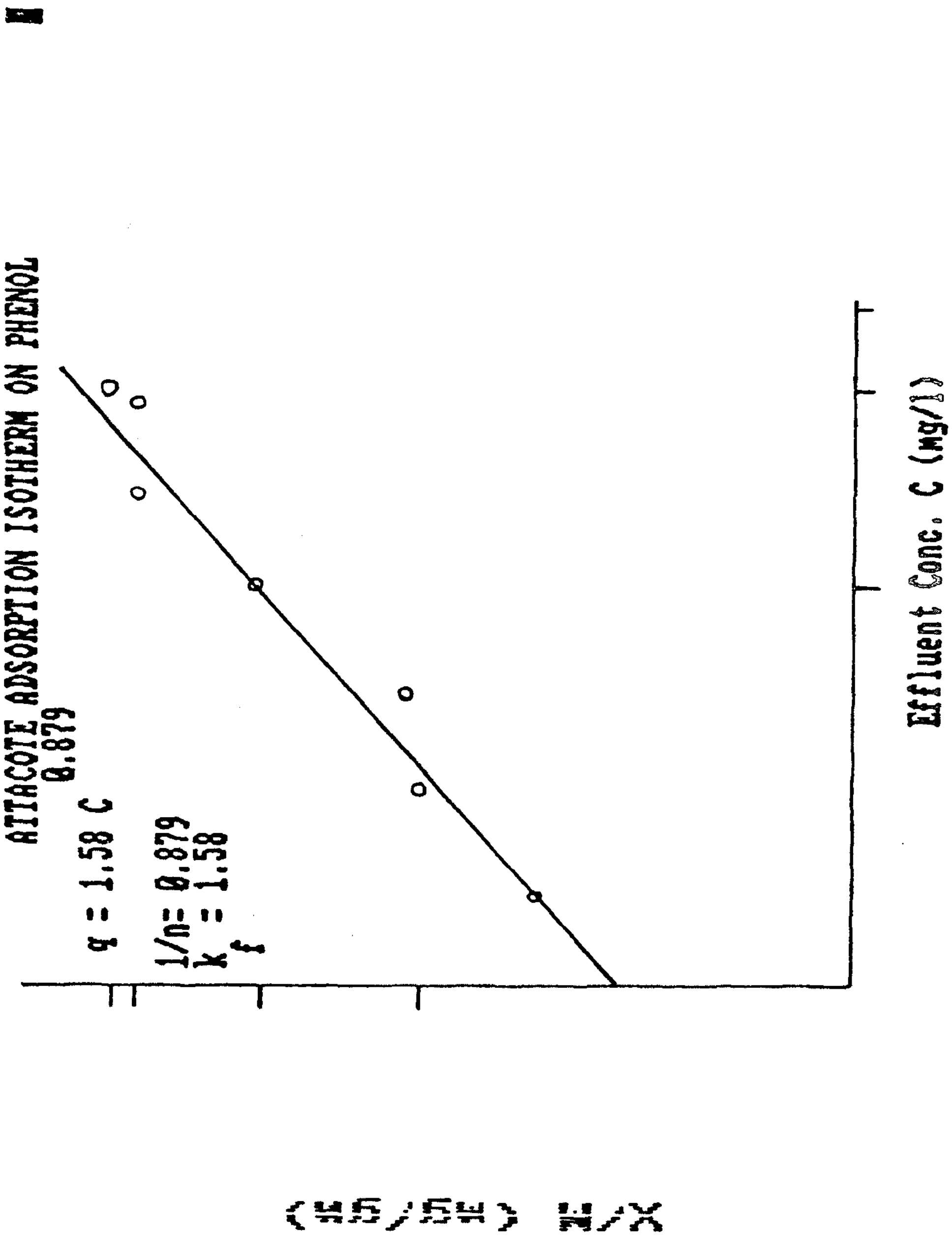

KAOLINITE ADSORPTION ISOTHERM ON CRESOL
q = 0.0016 C^1.985
1/n= 1.9848
k_f = 0.0016
X/M (mg/gm)
Effluent Conc. C (mg/l)

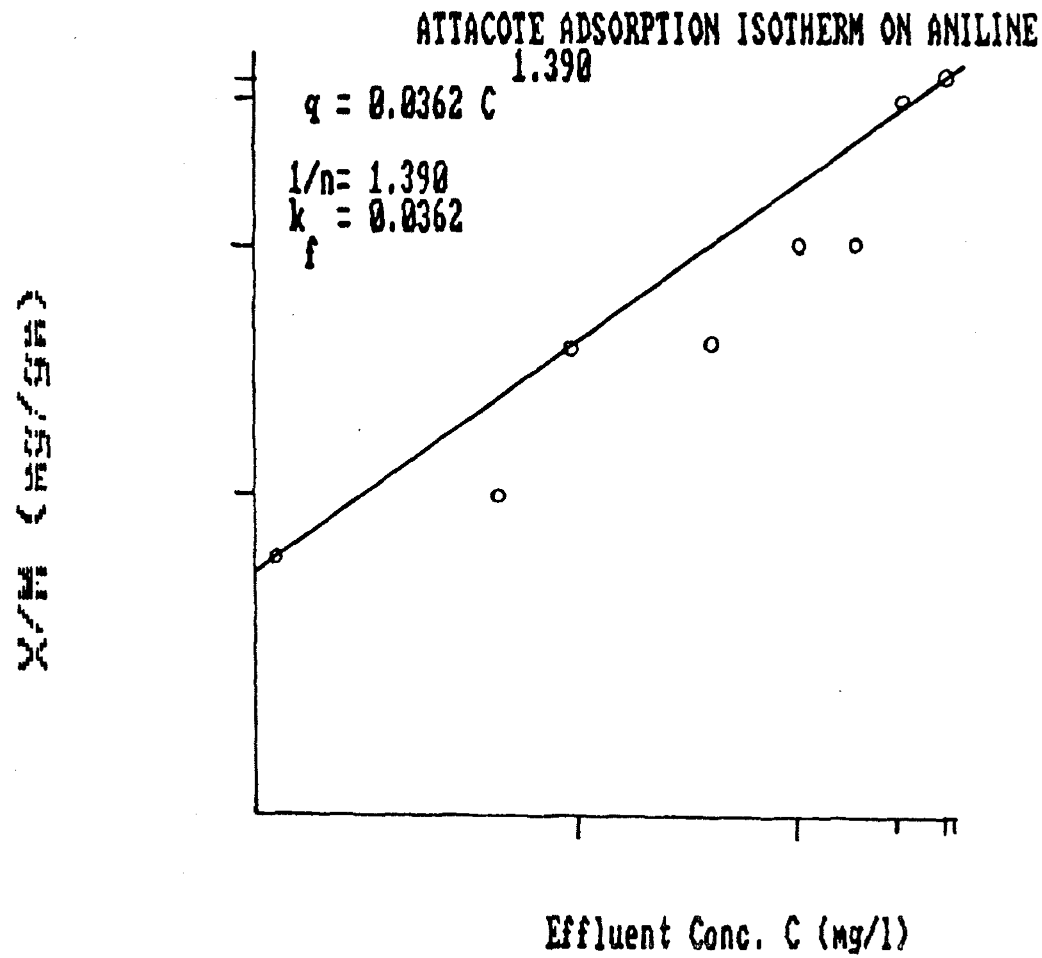

KAOLINITE ADSORPTION ISOTHERM ON CYCLOHEXANONE
q = 0.5326 C^0.99
1/n= 0.99
k_f = 0.5326
X/M (mg/gm)
Effluent Conc C (mg/l)

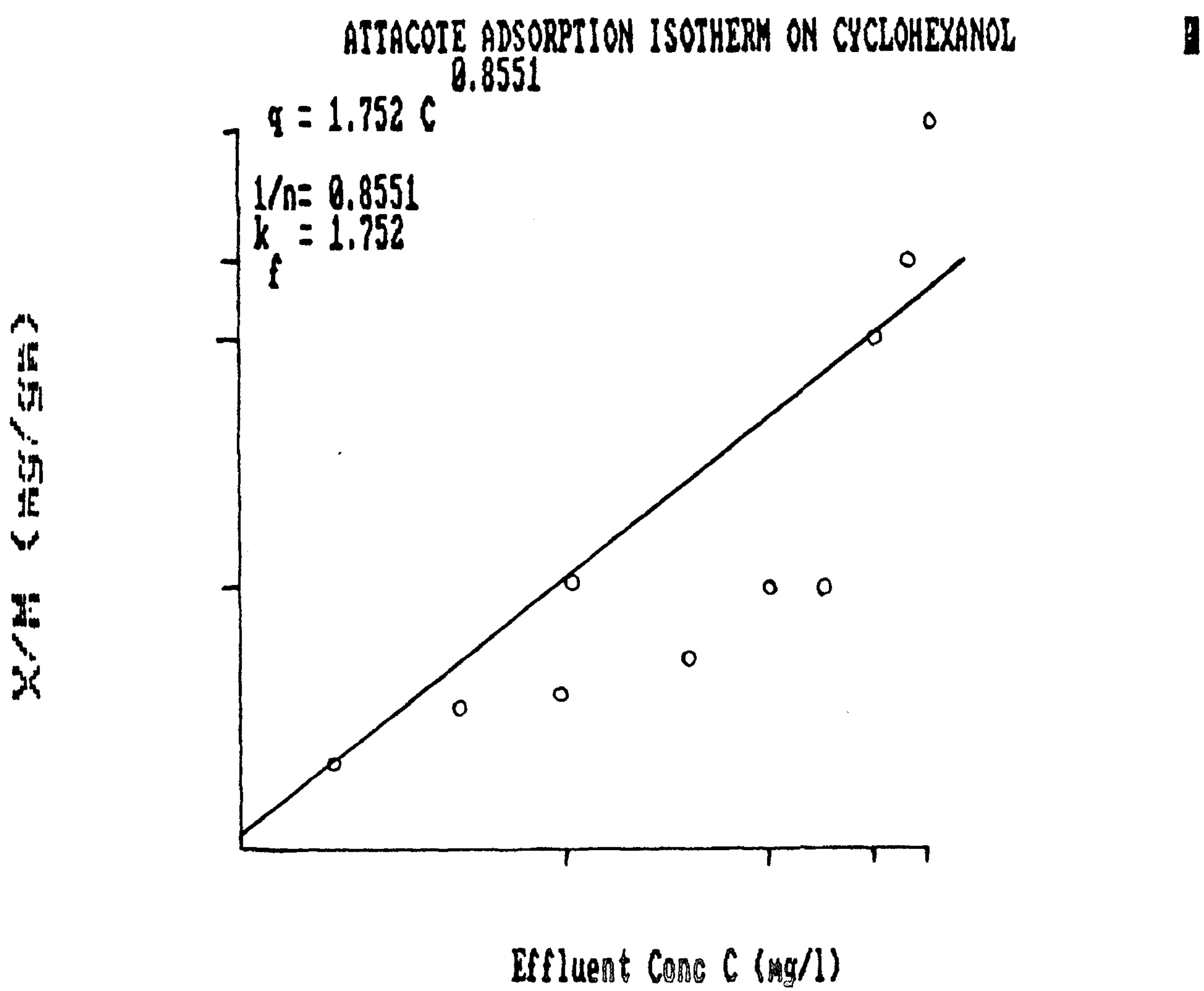
KAOLINITE ADSORPTION ISOTHERM ON MONOCHLOROPHENOL

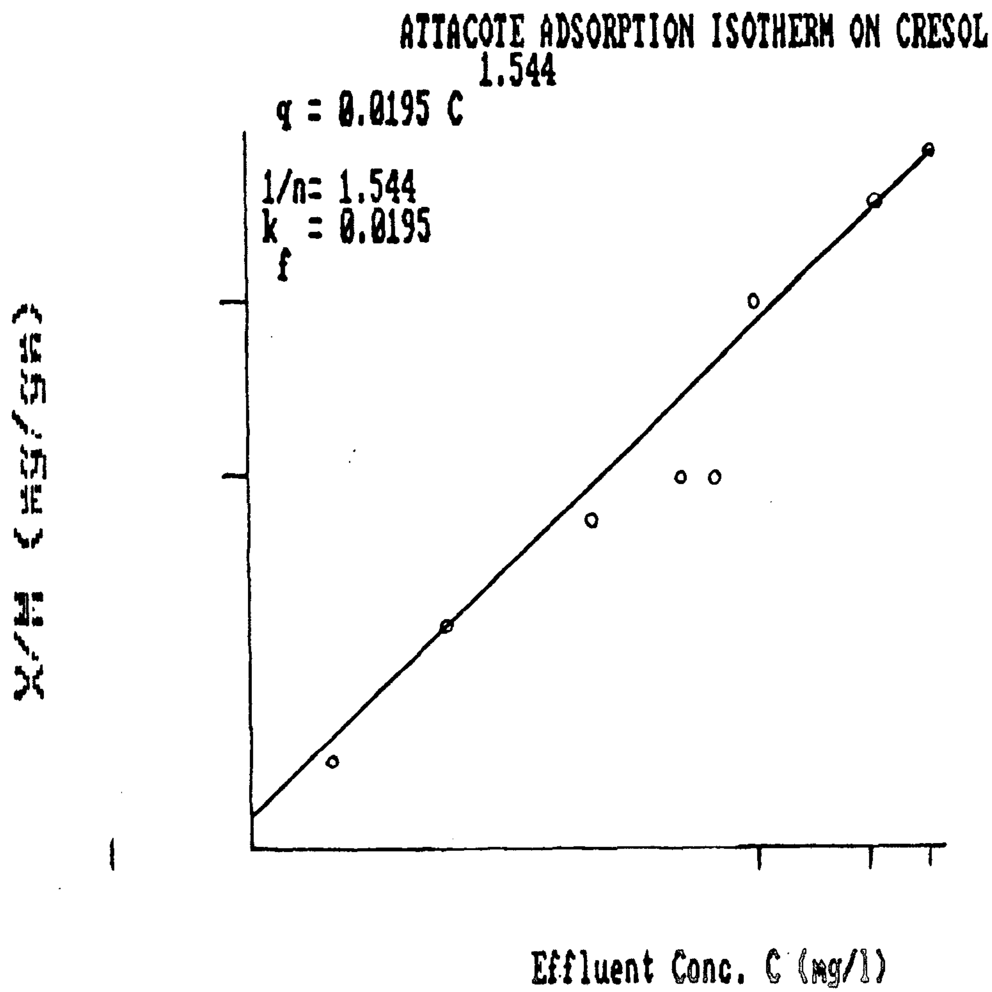
$q = 0.421\ C^{1.135}$

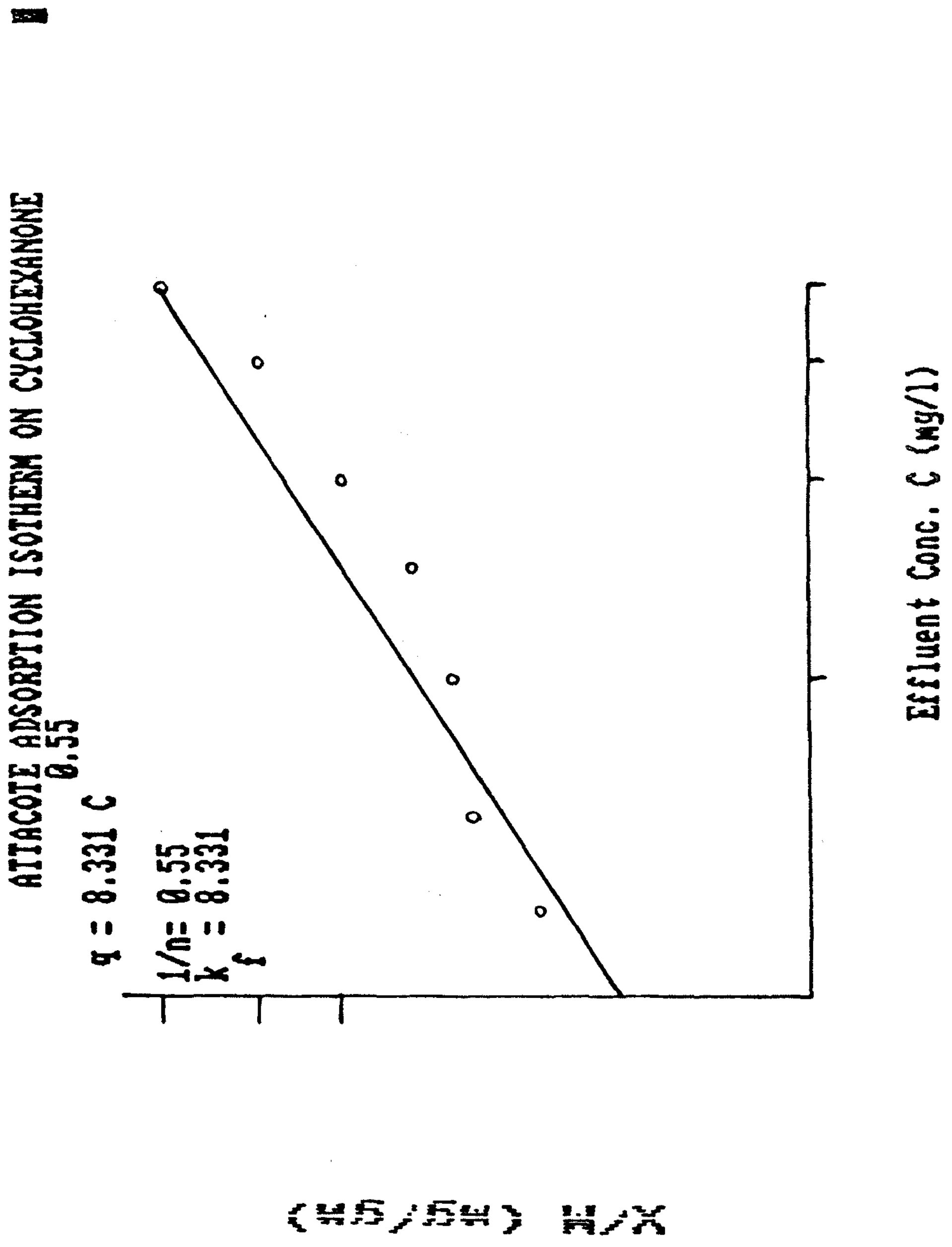


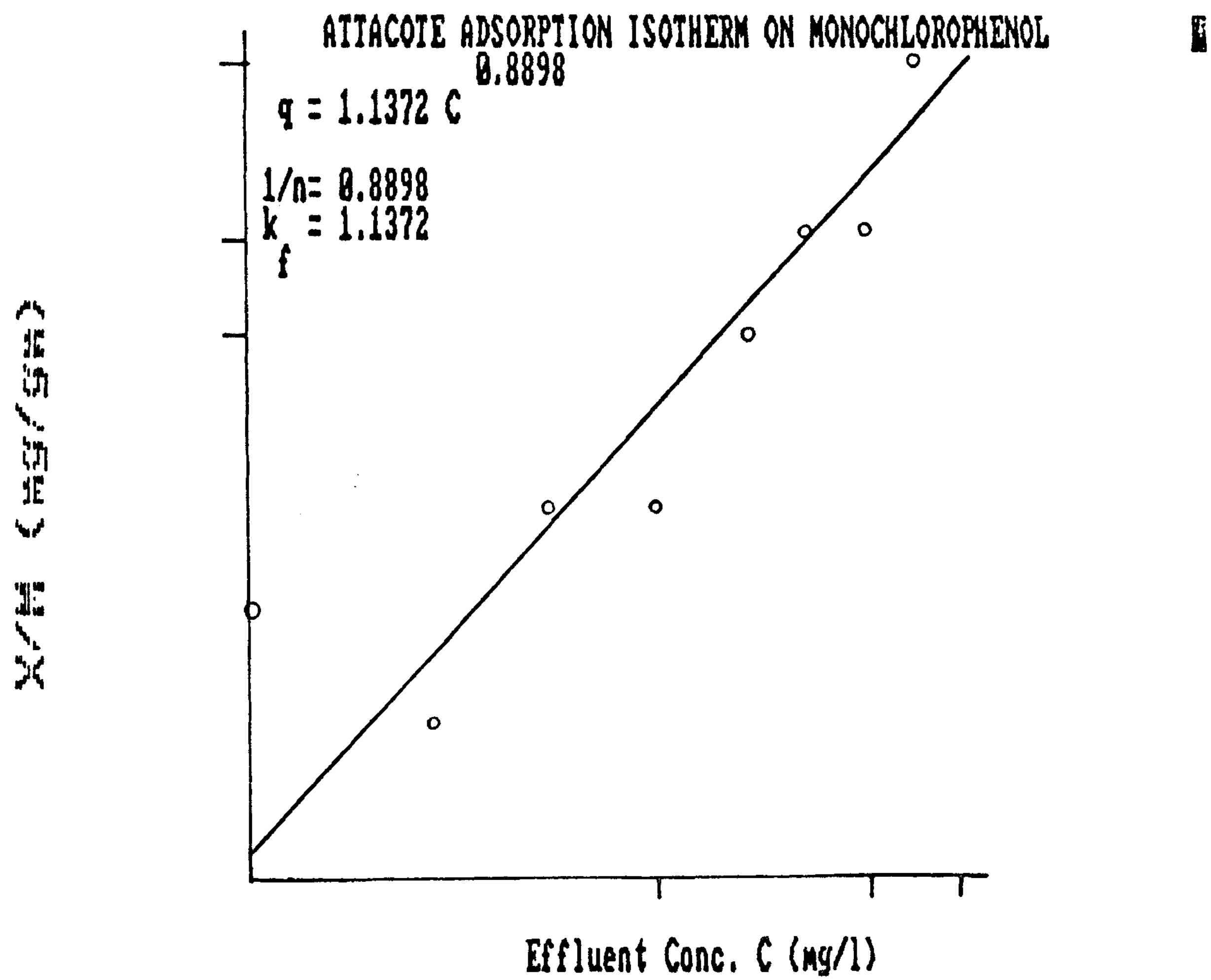

ATTACOTE ADSORPTION ISOTHERM ON PHENOL
q = 1.58 C 0.879
1/n= 0.879
k f = 1.58
Effluent Conc. C (mg/l)
X/M (mg/gm)

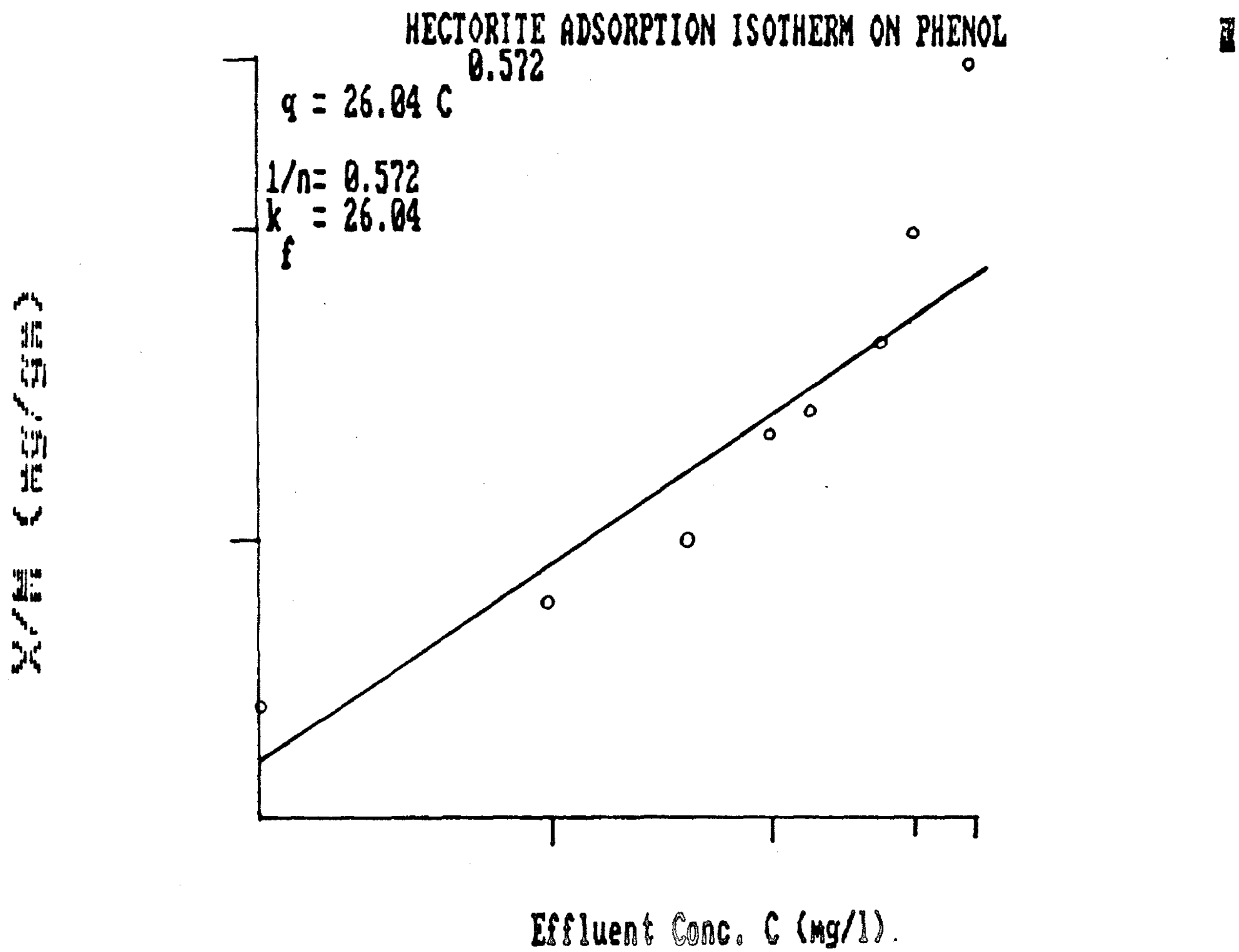

ATTACOTE ADSORPTION ISOTHERM ON ANILINE
q = 0.0362 C 1.390
1/n= 1.390
k f = 0.0362
X/M (mg/gm)
Effluent Conc. C (mg/l)

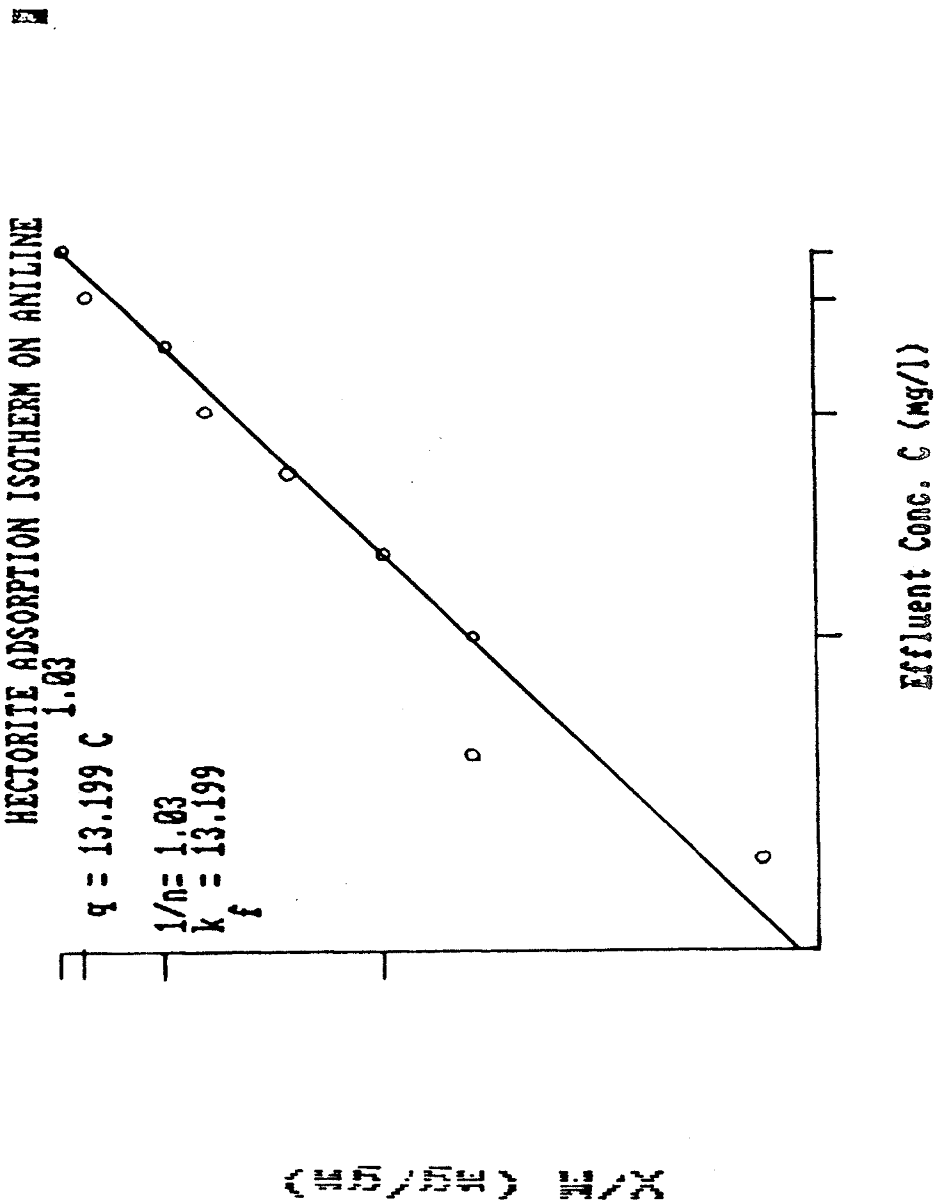

ATTACOTE ADSORPTION ISOTHERM ON CYCLOHEXANOL
0.8551
q = 1.752 C
1/n= 0.8551
k = 1.752
f
X/M (mg/gm)
Effluent Conc C (mg/l)

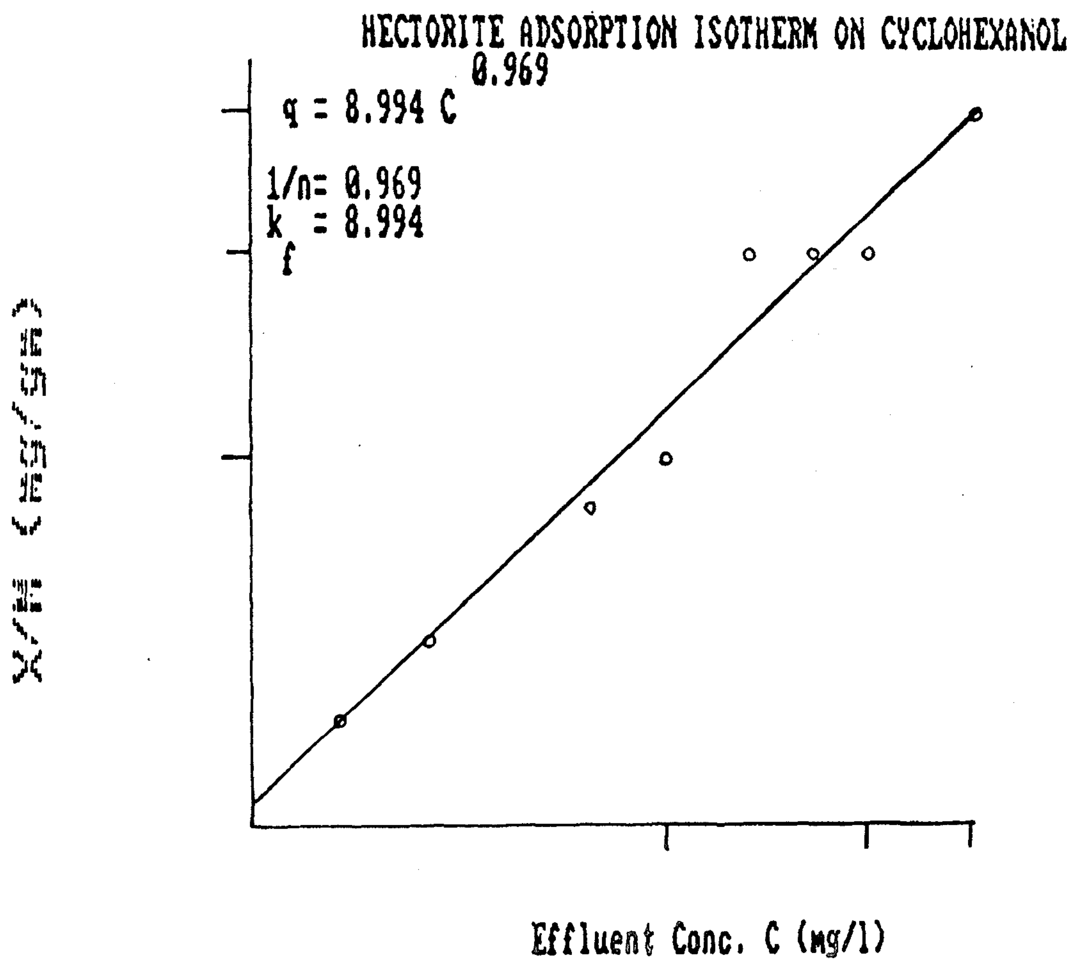

ATTACOTE ADSORPTION ISOTHERM ON CRESOL
q = 0.0195 C^1.544
1/n= 1.544
k_f = 0.0195
X/M (mg/gm)
Effluent Conc. C (mg/l)

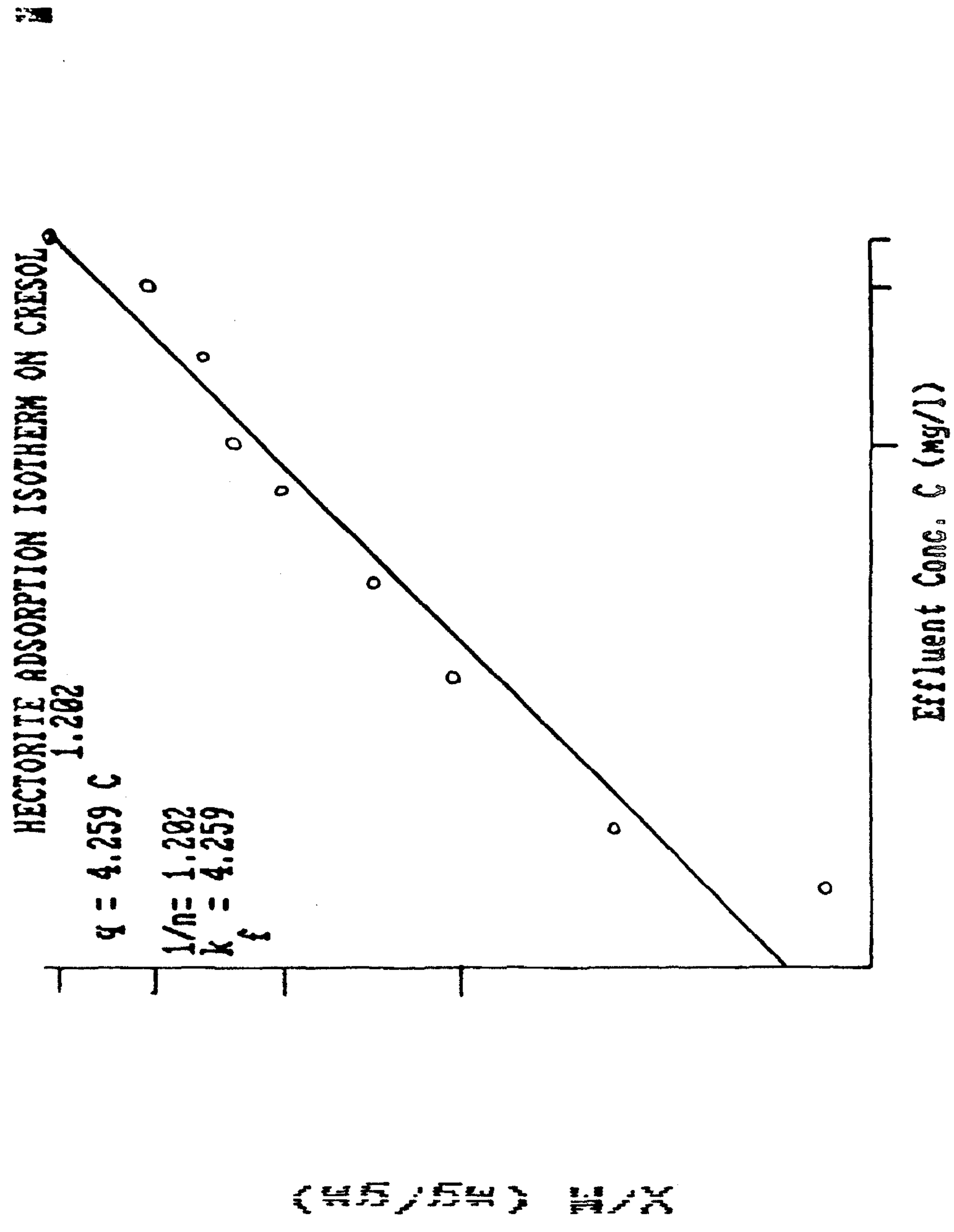

ATTACOTE ADSORPTION ISOTHERM ON CYCLOHEXANONE
q = 8.331 C 0.55
1/n= 0.55
k = 8.331
X/M (mg/gm)
Effluent Conc. C (mg/l)

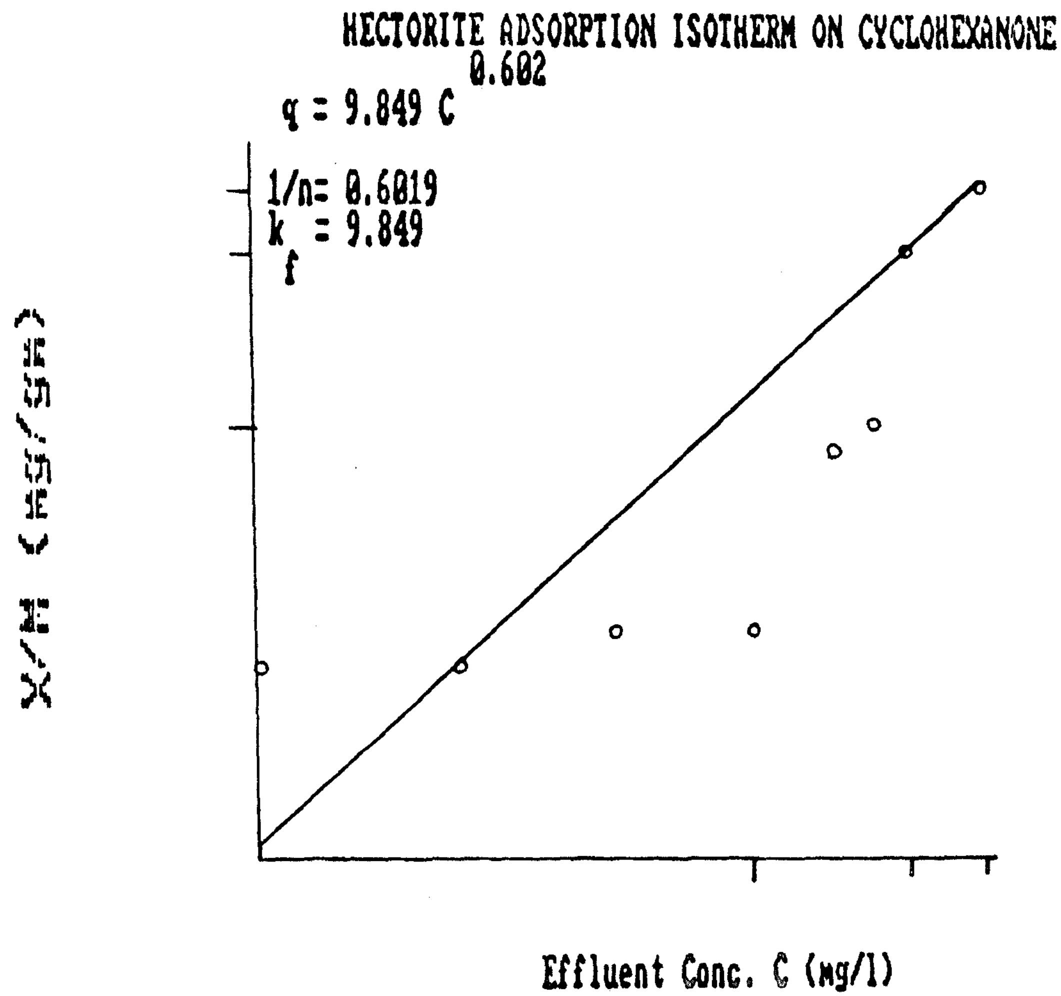

ATTACOTE ADSORPTION ISOTHERM ON MONOCHLOROPHENOL
q = 1.1372 C^0.8898
1/n= 0.8898
k_f = 1.1372
X/M (mg/gm)
Effluent Conc. C (mg/l)

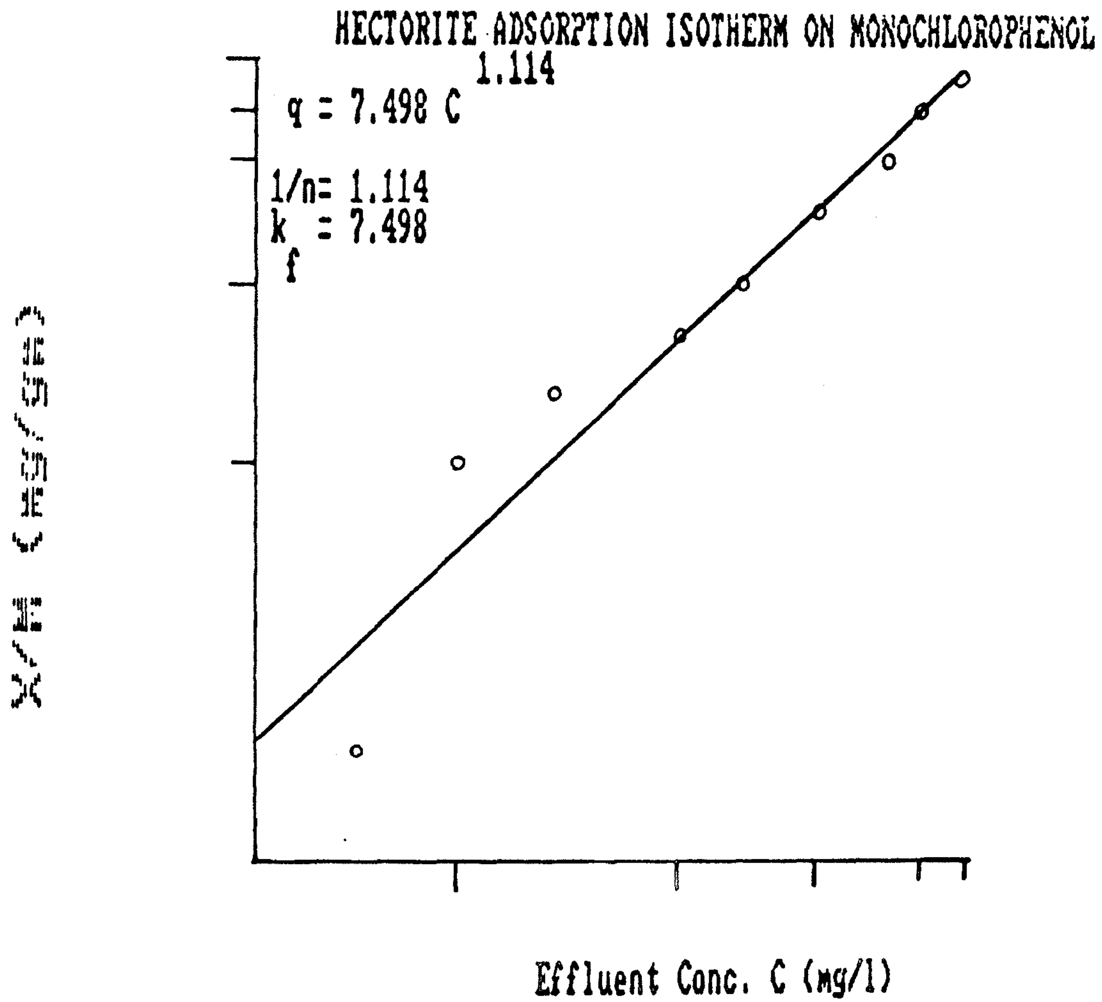

HECTORITE ADSORPTION ISOTHERM ON PHENOL
q = 26.04 C 0.572
1/n= 0.572
k = 26.04
f
X/M (mg/gm)
Effluent Conc. C (mg/l).


HECTORITE ADSORPTION ISOTHERM ON ANILINE
q = 13.199 C^1.03
1/n= 1.03
k = 13.199
f
Effluent Conc. C (mg/l)
X/M (mg/gm)


HECTORITE ADSORPTION ISOTHERM ON CYCLOHEXANOL
q = 8.994 C 0.969
1/n= 0.969
k f = 8.994
X/M (mg/gm)
Effluent Conc. C (mg/l)


HECTORITE ADSORPTION ISOTHERM ON CRESOL
q = 4.259 C 1.202
1/n= 1.202
k f = 4.259
Effluent Conc. C (mg/l)
X/M (mg/gm)


HECTORITE ADSORPTION ISOTHERM ON CYCLOHEXANONE
q = 9.849 C^0.602
1/n= 0.6019
k_f = 9.849
X/M (mg/gm)
Effluent Conc. C (mg/l)


HECTORITE ADSORPTION ISOTHERM ON MONOCHLOROPHENOL
q = 7.498 C 1.114
1/n= 1.114
k f = 7.498
X/M (mg/gm)
Effluent Conc. C (mg/l)

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