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Study of Adsorption Isotherms of Acetamide and Propionamide on Carbon Nanotube

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ABSTRACT

In this research adsorption isotherm of acetamide and propionamide on multi-wall carbon nanotube has been studied. The results of experiment with models Freundlich, Langmuir, and Temkin were conducted and various parameters of this model for adsorbing carbon nanotubes obtained. According to the error calculated for each model, good match between the data obtained with the models seen. With the help of spectrophotometre machin (UV / VIS) adsorption chart base on the wavelength of acetamide and propionamide has been obtained, and also effect change concentration on value adsorption. In this study, four different concentrations of acetamide and propionamide in the range of (3, 4, 6,8) ppm were used. The results of experiments acetamide and propionamide show Increasing concentration increases adsorption.

Key words: Adsorption, Carbon nanotube, Acetamide, Propionamide.

INTRODUCTION

Carbon nanotubes (CNT (discovery by Iijima in 1991 [1].Carbon nanotubes (CNTs) are hollow cylinders of graphite carbon atoms. These tubes are on the nanoscale (10^{-9} m), which is so small that 10,000 of them could fit within the diameter of one human hair. Carbon nanotubes are a new form of carbon with unique electrical and mechanical properties. They can be considered as the result of folding graphite layers into carbon cylinders. These cylinders may be composed of a single shell single wall carbon nanotubes (SWCNTs), or of several shells multi-wall carbon nanotubes (MWCNTs). CNTs can be thought of as a rolled-up sheet of hexagonal ordered graphite formed to give a seamless cylinder. Due to the variety of extraordinary properties exhibited by CNTs, a large number of possible applications have been proposed [2]. Recent discoveries of various forms of CNTs have stimulated research on their applications in diverse fields[3]. The nature of bonding in carbon nanotubes (CNTs) is described by applied quantum chemistry, specifically, orbital hybridization. This chemical bonding is composed entirely of sp2 bonds, similar to those of graphite. This bonding structure, which is stronger than the sp3 bonds found in diamond, provides the molecules with their

unique strength. CNTs are the strongest and stiffest materials on earth, in terms of tensile strength and elastic modulus respectively. This strength results from the covalent sp^2 bonds formed between the individual carbon atoms. As for thermal Carbon nano conduction, the CNT surpasses even that of diamond, reaching almost double the value diamond[4]. Carbon nanotubes (CNT) possess many unique characteristics that promise to revolutionize the world of structural materials resulting in significant impact on our capability to build lighter, smaller and higher performance structures for aerospace and many other industrial applications. Based on its unique properties, many applications of CNT have been proposed including quantum wires, tiny electronic devices[5,6].

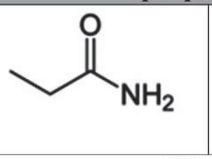
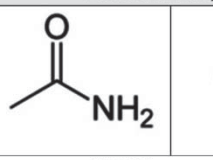
MATERIAL AND METHODS

Substances

Distilled water as solvent, acetamide and propionamide as adsorbent and multi-wall carbon nanotube as absorber.

Devices used

Spectrophotometer (Uv-Vis) model Genesys 5

porpoionamide		Acetamide,	
			
IUPAC name Propanamide		**IUPAC name** Acetamide Ethanamide	
Other names n-propylamide		**Other names** acetic acid amide	
Properties		**Properties**	
Molecular formula	C_3H_7NO	Molecular formula	C_2H_5NO
Molar mass	73.10 g/mol	Molar mass	59.07 g mol^{-1}
Density	1.042g/cm^3	Density	1.16 g/cm^3
Melting point	80 ºC	Melting point	79-81°C
Boiling point	213 ºC	Boiling point	222°C

Methods

At first, stock solution of amides was prepared in water (100mg/l). Then, from stock solution of amides, four standard solutions in concentration of (3,4,6,8ppm) were prepared. Absorbance of four standard solutions was measured by spectrophotometer Uv/Vis and calibration curve was plotted. 10 ml of four standard solutions were added separately to Hundredth milligrams of carbon nanotube as adsorbent and after 10 minutes mixing by magnetic mixer solutions were filtered by filter papers. Absorbance of filtered solutions was measured by spectrophotometer.

RESULTS

Table 1 shown the absorbance of acetamide and propionamide in the absent of carbon nanotub(CNT). As seen, figure and table 1 shown amount of absorbance is increased when concentrations are increased. . Table 2 also shown the increasing absorbance of a cetamide and propionamide against the concentrations in the presence of carbon nanotube.

Study of adsorption isotherms

Calculated parameters based on

Table 1: Absorbance of acetamide and propionamide in the absent of CNT

Concentrations (ppm)	Acetamide	Propionamide
3	0.18 9	0.258
4	0.222	0.305
6	0.269	0.387
8	0.329	0.437

Table 2: Absorbance of acetamide and propionamide in the present of CNT

Concentrations (ppm)	Acetamide	Propionamide
3	0.134	0.210
4	0.157	0.250
6	0.209	0.329
8	0.268	0.410

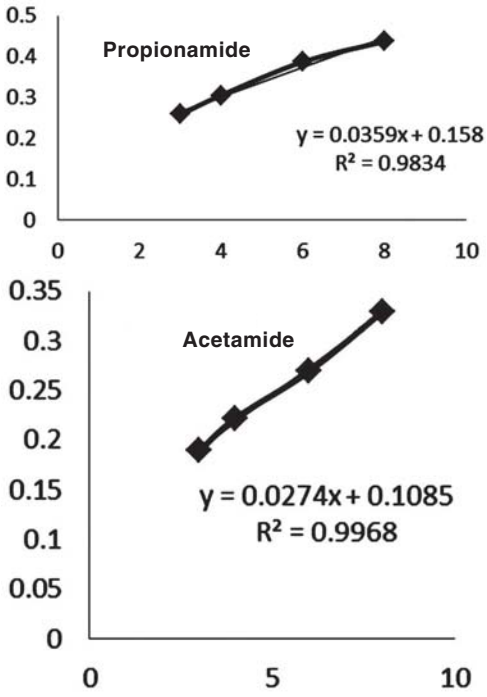


Fig. 1: Absorbance of acetamide and propionamide in the absent of CNT

isothermic equations are shown in table 3. As seen, the values of correlation coefficient (R^2) for the absorbance of acetamide and propionamide with the use of carbon nanotube for Temkin, Freundlich and Langmuir models respectively. The results showed that the absorbance of, acetamide and propionamide on absorbent is in conformance with Langmuir isotherm. Calculating different parameters of these models showed propionamide has the most sorption on adsorber.

Table 3: Isotherm parameters calculated for models

Isotherm	Temkin			Freundich			Langmuir		
Absorbent	R^2	A	B	R^2	n	K_F	R^2	qm	b
Acetamide	0.9117	36.76	0.258	0.9352	4.8	0.96	0.9853	1.65	0.95
Propionamide	0.9802	55.13	0.2498	0.9866	5.4	1.04	0.9976	1.66	1.15

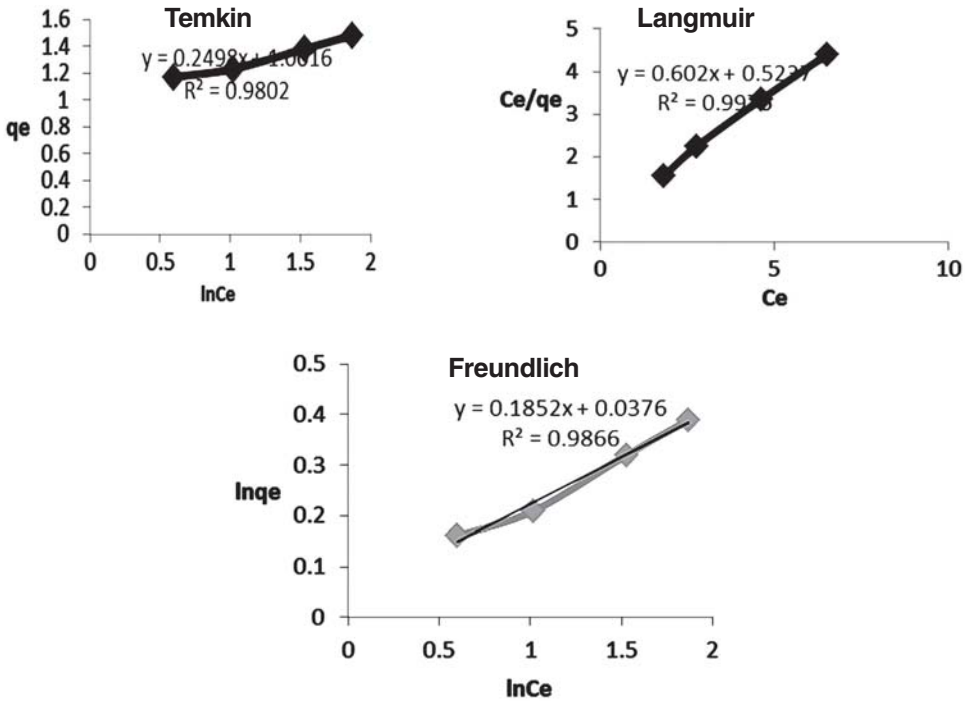


Fig. 2: Adsorption isotherms of propionamide with models: a) Temkin b) Langmuir c) Freundlich

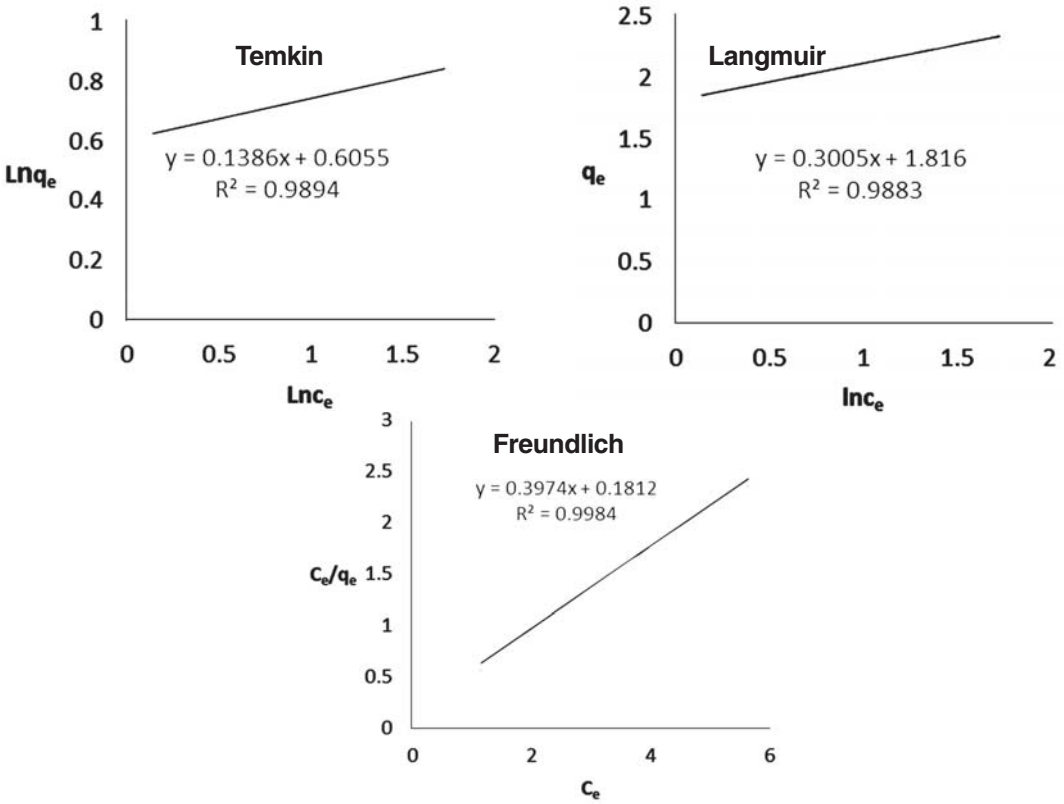


Fig. 3: Adsorption isotherms of acetamide with models: a) Freundlich b) Temkin c) Langmuir

CONCLUSION

In this research was determination adsorption isotherms rate acetamide and propionamide on multi-wall carbon nanotube that which performed by solution constraction changing technique in ppm unit .concludation of taken results implies to acceptable and logical relation ship between models and data also Langmuir possessed best sameness with data. Calculating different parameters of these models showed propionamide has the most sorption on absorber.

The reason is related to size and increases hydrocarbon chain length increases because CH_3 (electron releasing) increases adsorption .

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