BioGecko Vol 12 Issue 01 2023

ISSN NO: 2230-5807

Back to nature to design solid adsorption phases to remove some pollutants from aqueous solutions

Shahad Mohammad Esmail , M. M. Sirhan , Hamid Khaled Ali

Researcher, Department of Chemistry, College of Education for Pure Sciences, University of Anbar, Ramadi, Iraq1
Assistant Professor, Department of Chemistry, College of Education for Pure Sciences, University of Anbar, Ramadi, Iraq2

Abstract:
usedthe asphalt with sulfuric acid as adsorbents to remove chromium ions (Cd+2), lead ions (Cu+2) and para-phenylenediamine (PPD) dye. Determining the effective functional groups using infrared spectroscopy (FT-IR), which can contribute to adsorption. Scanning electron microscopy (SEM) was also used to diagnose the surface morphology, and it showed that the surface is rough and contains many pores and gaps. Moisture and ash content was measured, and the inner and outer surface area was determined using the iodine index and methylene blue index. It showed that the surfaces have an excellent surface area for the adsorption of small and large particles. Determination of the pH at the zero charge point (pH pzc) and it was shown that all the prepared activated charcoal samples were acidic. Studying the effect of adsorbent dose, contact time, acidity function, temperature, and initial concentration of the adsorbents on the percentage of adsorption. The temperature and the increase in the initial concentration of the adsorbents that the percentage of adsorption decreases with the increase in the initial concentration and that the adsorption capacity (Qe) increases. The application of adsorption isotherms (Freindlich and Lankemeier) and it was found that the adsorption process is fully compatible with Freindlich's equation and Lankmeier equation.

1- Introduction

It is a liquid substance that has a black color, as it is affected by time and temperature, where the high temperatures are liquid, either at low temperatures solidly and at moderate viscous and flexible temperatures (1)Gear is characterized by its high molecular weight because it contains hydrocarbon compounds (paraffinic, naphthenic and aromatic) and contains in its composition oxygen, nitrogen and sulfur, which have an impact on the physical properties of tartar due to its polarity (2)Bimer does not have solubility in water but dissolves in organic solvents such as carbon tetrachloride and some other organic solvents (3) Qiir is found in nature in several forms, such as the Qire lakes that are on the surface of the earth (4), the Qire springs, the Qire rocks, or freely in nature (5) The city of Hit, located 60 km from the city of Ramadi, is characterized by containing natural eyes from which natural tar mixed with water comes out and hydrogen sulfide gas comes out, which has a smell similar to the smell of rotten eggs (6) Gear is a rheological substance because it is affected by temperatures (7), so at high temperatures it is a liquid substance and at low temperatures it is a solid and at normal degrees it is viscous (8), The development of studies found that there is a colloidal system, that physical measurements of viscosity, elongation and ductility proved that tartar is a colloidal material (9) Gear consists of carbon, hydrogen and a little nitrogen, oxygen and sulfur, when dissolving the tar in a specific solvent such as hexane or heptane, the tar separates into two molecules, namely maltines and asphaltins responsible for the hardness and color of the tar, the proportion of both asphaltins and maltinins in the tar varies due to several factors such as high temperatures and exposure to oxygen and light, and these changes usually occur due to oxidation or evaporation of volatile compounds or chemical reactions that affect the properties of binder, and this leads to an increase in viscosity Gear(10)

2- Charcoal preparation

200g of tar (asphalt) was brought from the asphalt springs located in the city of Hit - Anbar and placed in a large baker and added to the mechanism of concentrated sulfuric acid H2SO4 in the form of 4-5 batches in the presence of heat and left for 24 hours to complete the reaction and turn it into charcoal, the coal formed was washed with distilled water as in the figure until the pH reached its 6.4 pH, then filtered and dried at a temperature of 100C for two hours, then ground it into fine powder and sifted with a sieve µm 53 and denoted by ACS

3- Results and discussion

Infrared spectroscopy (FT-IR) was used to determine effective aggregates and scanning electron microscopy (SEM) to determine surface functions.

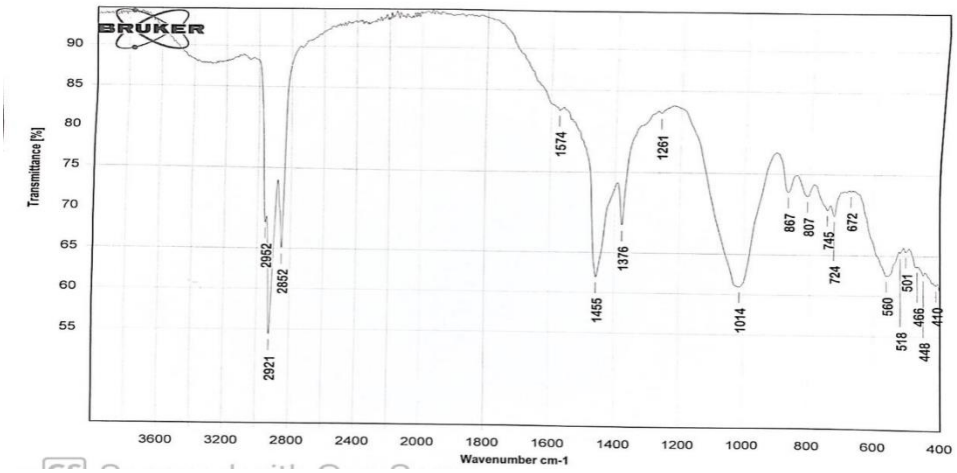

Figure (1) Asphalt FTIR spectrum before transaction

Table (1) FTIR Packs for asphalt before treatment

(cm-^{1})Frequency	Tip
2952	Vibration (C-H)
2852 ,2921	The Levate (C-H)
1574	Extension (c = c)
1376	Crown (CH3)
1014	Met (C-K)
867	curvature(C-H)

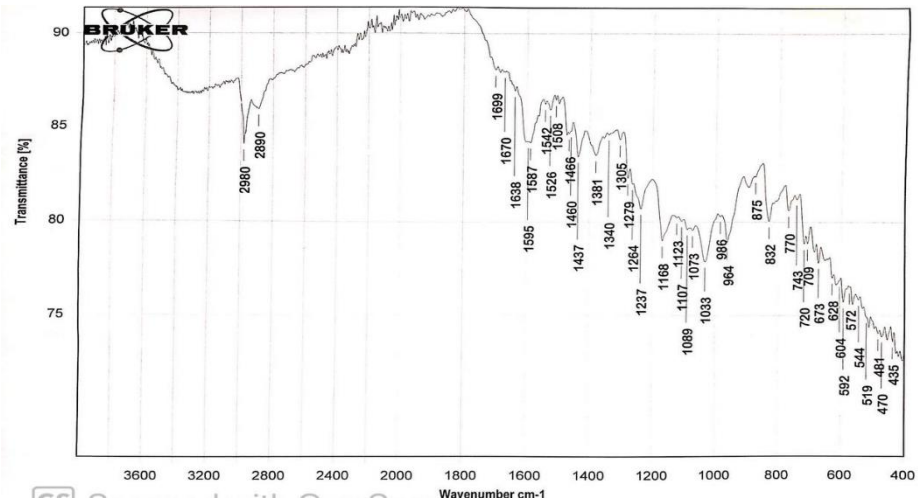

Figure (2) Spectrum (FTIR) for asphalt after treatment

Schedule (2) FTIR Packs after treatment

Frequency(cm^{-1})	TIP
2952	Raising (C-H)
2852 ,2921	Murder (C-H)
1574	expansion(C=C)
1376	curvature(CH_3)
1014	Murder(C-N)
867	curvature(C-H)

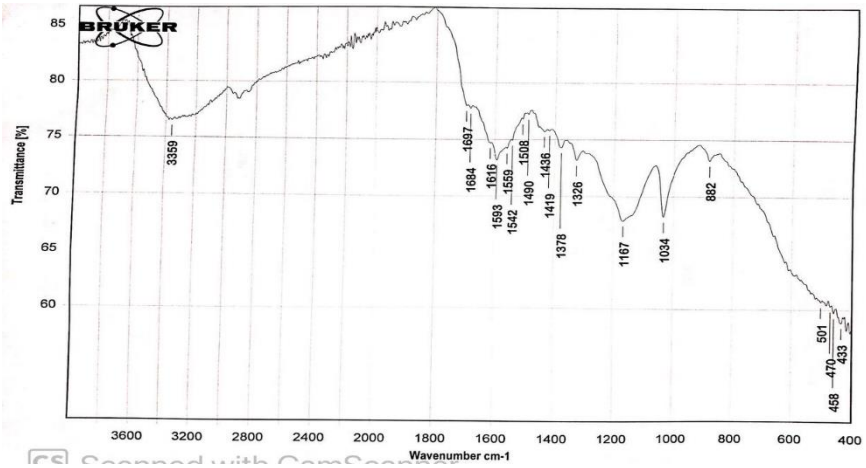

Figure (3) Spectrum (FTIR) for asphalt after treatment with the blue counterparts

Table (3) Ftir Packs for asphalt after treatment with the blue counterparts

Frequency(cm^{-1})	TIP
3359	OHelongation
1697	Murder (C-N)
1490	Murder(C-C)
1378	curvature(CH_3)
1034	Murder(C-N)
882	curvature(C-H)

We notice from SEM photos

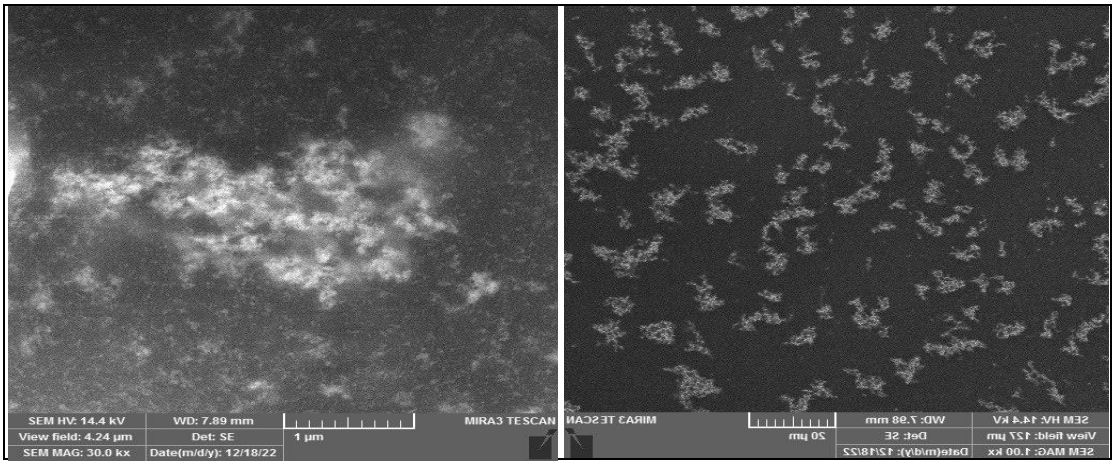

Figure (4) SEM images for asphalt before treatment

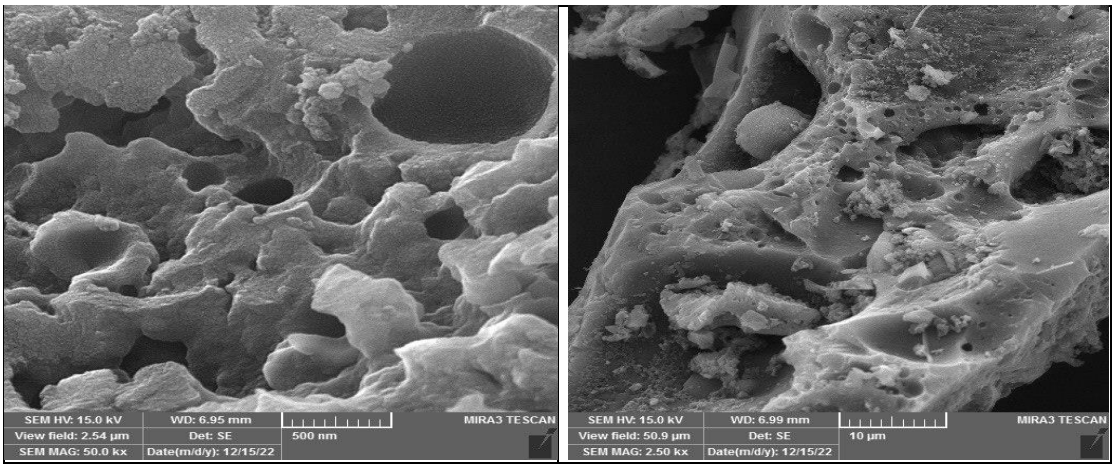

Figure (5) SEM images for asphalt after treatment

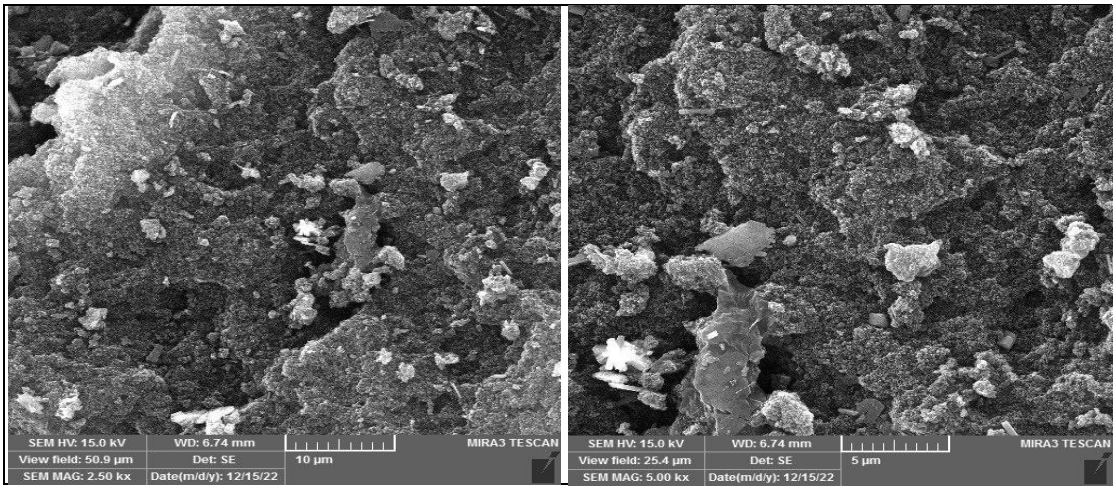

Figure (6) SEM images of asphalt after treatment with the blue counterparts

Factors affecting admission

1- Adsorbent mass effect

Various weights of activated charcoal are added (0.01, 0.02, 0.04, 0.08, 0.1, 0.2 G) to 50ml from (CU) (CD) (PPD) with a concentration of 1000PM to see the effect of the mass and from the results obtained in the table

	AC			ACS
	Adsorbent	PPD	Cu^{+2}	**Cd^{+3}**
% Removal	**min5**	68.9	70.0	**65.7**
	min10	75.4	77.5	**69.1**
	min15	78.5	81.6	**73.3**
	min30	83.7	85.2	**79.8**
	min45	97.1	97.7	**96.3**
	min60	97.1	97.7	**96.3**
	min90	97.1	97.7	**96.3**
	min120	97.1	97.7	**96.3**

2- Effect of contact time

The effect of time on the adsorption process was studied by preparing several solutions with a volume of 50 ml and a concentration of 1000 ppm for each of PPD, Cu, Cd to which 0.5g of activated charcoal was added and placed in a rocking bath at a temperature of 25C and at different times (5,10,15,30,45,60,90,120 min) and measured the remaining concentration after the end of the specified time, where the results shown in the table were obtained

3- Temperature effect

Several solutions were prepared to study the effect of temperature on adsorption with a volume of (50 mL) at a concentration of (100 mg/L) for each of (PPD), (Cu +2), (Cd+3) and (0.1g) of activated charcoal was added to it and then placed in a rocking water bath at different temperatures,

namely (30,35,40,45,55 ° C) and for (2h) the solutions were leached and the residual concentration (CE) was measured at each temperature. As shown in the table

	AC			ACS
	Adsorbent	PPD	Cu^{+2}	**Cd^{+3}**
% Removal	**30 °C**	97.8	97.3	**95.5**
	35 °C	98.4	97.6	**95.7**
	40 °C	98.6	97.8	**96.0**
	45 °C	98.8	98.0	**96.4**
	55 °C	98.8	98.0	**96.4**

4- The effect of pH

Several solutions were prepared to study the effect of pH on adsorption with a volume of (50mL) and a concentration of (100mg/L) and the pH was adjusted using dilute solutions of hydrochloric acid and sodium hydroxide at (2,3,4,5,6,7,8,9,10) for each of (PPD), (Cu+2), (Cd+3) and (0.1g) of activated charcoal was added to it.

	AC			**ACS**
	Adsorbent	PPD	Cu^{+2}	**Cd^{+3}**
% Removal	**pH2**	65.2	64.8	**60.2**
	pH3	71.4	70.3	**66.9**
	pH4	82.8	84.2	**84.2**
	pH5	90.6	93.8	**90.1**
	pH6	97.3	96.6	**96.2**
	pH7	95.1	94.2	**92.7**
	pH8	83.7	80.2	**86.6**
	PH9	69.9	73.5	**76.8**
	PH10	62.5	68.3	**70.9**

AC		ACS		
Adsorbent		PPD	Cu^{+2}	**Cd^{+3}**
% Removal	**0.01g**	65.1	61.5	**55.9**
	0.02g	79.8	77.6	**72.4**
	0.04g	87.5	85.4	**83.0**
	0.08g	93.8	90.0	**87.5**
	0.1g	95.6	93.1	**91.6**
	0.2g	97.4	.379	**9.69**

References:

1. D.W.S. Ho "Civil Engineering Handbook " University of Singapore, CRC Press LLC, Part5, 4th ed. , Singapore,pag.15 – 54,104,130 (2003).
2. Dunn K., Chilingarian G. V. and Yen T. F. " Bitumens: Liquid Chromatography " University of Southern California, Los Angeles ,CA, USA , p. 2180,2181,2182. (2000)
3. A. R. SalaimanyNazar. L. Bayandory. Iranian Journal of chemical Engineering, Vol. 5. No. 7. Winter. IAHE (2008).
4. A. R. SalaimanyNazar. L. Bayandory. Iranian Journal of chemical Engineering, Vol. 5. No. 7. Winter. IAHE (2008).
5. Issa Suleiman Issa Al-Bayan, Master's Thesis, University of Mosul, College of Education, Department of Chemistry, pp. 1-6, 9-15, (2002).
6. Mohammed Abbas, KhaledSafa, OmranIssa, 'Study of the Physical Properties of Natural Limestone Depositions Khalaf, ArefSaleh, Environmental Management, Dar Al-Bazouri Scientific, Amman, Jordan, 1st edition, 2007.
7. Widespread in Iraq', University of Babylon, (2006). 26
8. Mateo-Sagasta, Javier, S. MarjaniZadeh, and Hugh Turral, eds. More people, more food, worse water?: a global review of water pollution from agriculture. (2018) . 27
9. Kefaya Hassan Maytham Al-Yasiri, Soil Pollution and Degradation in Hilla District (An Analytical Study in Environmental Geography), Unpublished Master's Thesis, College of Education for Human Sciences, University of Babylon, p. 14. 2013 28
10. Ahmad, NamikHawiz, Muhammad Hussein Rasul, 'Asphalt Tiling Engineering', Part I, Second Edition, Increased and Revised, pp. 44, 47, 51, (1990).