Studying the Temperature Effect and Orang Asid 2 Adsorption Isotherms on Banana Skin

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Abstract: In this work removal of Acid orange 2 from aqueous solution onto banana skin Substrates was studied. The effect of operational parameters including pH, temperature, agitation speed, contact time, adsorbent dose and initial dye concentration were evaluated in a batch mode reactor. The optimum results were obtained at pH 2 and banana skin dose of 0.1g. According to the analysis of different kinetic models for adsorption of Acid orange 2 onto banana skin obeys pseudo- second order kinetic. Gibbs free enthalpy, and entropy as thermodynamic parameters were calculated and it was found that the process is exothermic.

Keywords: banana skin, Acid orange 2, Adsorption, Langmuir Isotherms, Thermodynamic Study

1. Introduction

the orange acid 2 is a mixture of D Azo with the molecular formula of C16H2NaO4S (sodium salt). This odorless orange powder possesses a molecular body of 350.32 g/m and unmixed percentage of 99. This matter can absorb the light and in length of wave 484nm indicates the highest absorption, that it is used for determining the amount of the orange acid (II). [1].Sublime absorption, the process of sublime absorption is also used for the elimination of color vastly and its application is extensive in refining the weakest water. The phenomenon of sublime absorption, the absorption of absorptive molecules is (a part of gas or liquid) on the absorbent surface. The interval solids are with a very high surfaces and tiny volumes that cause to increase in absorption. The phenomenon of sublime absorption was observed by Shell in 1773 for the gases imposed in Carbon. These observations were accomplished by Lovitz in 1785 through revocable elimination in color and scent of the components in the water by the charcoal. [2]. The bananas in which are black-colored in the refrigerator after one day, have a property of discovering cancer cells and the more they are black-colored, the more they have this kind of property. According to the Japanese scientist's investigations, among those fruits that have a property of anti-cancer such as grape, apple, water melon, pineapple, pear, and persimmon, banana has the most property to increase the amount of white blood cells and making strong the immune system of the body and defeating the cancer cells because the amount of T-N-F matters in the banana is more than the other fruits. Mel and his colleagues in 2006, the elimination of OG & MV colors through the sublime absorption on the megass ashes. These researchers studied the synthetic models, like the first grade, second grade and intra absorption and concluded that in each of the two colors case the second one is true. Also, the obtained data in OG color absorption process had more accordance with the Frondlichisotrom model and in MV color case the most accordance was agreeable with Redlich-Peterson isotrom model. [3]. Wang and his co-workers, studied on the cooling and they concluded that regarding the essence of involved forces in the absorption process, the absorbent materials used in this process can be divided into two physical and chemical categories. Addition to this, they presented some methods for equipment in absorptive matters in sublime model [4]. Ozjan and his co-workers in 2005 studied the absorption of color AR57 from water solutions on adjusted Sepiolites. The synthetic studies showed that the process of absorption followed from the second grade model; also experimental data have more accordance with Frondlichisotrom model. The positive amount of

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DG states that the process of absorption is not by itself [5]. Aton and his co-workers in 2003, studied the sublime absorption of acid Carminic on the glass powder and concluded that Frondlich and Longmir model are in accordance with the experimental data and thermodynamic parameters according to Anthrophy and enthalpy amounts, are spontaneously and warming and the speed of absorption increases with the increase in temperature and the concentration of color [6].

Materials and Methods

At first the skin of the banana that is dried before in a well-washed mortar and it is distilled in the water properly and then we shape it like the powder and to remove the probable impurity we wash it with water.

An amount of 0/01 gram of orange acid powder2 weight by a digital scale and then spill 100 cc into the balloon and it should be bulked with distilled water. The concentrate of the solutions is 100 ppm. By using the relation of $c_1v_1 = c_2v_2$, we can prepare some kind of needed concentrations and it can be used.

To determine the amount of elimination of orange acid 2 it is needed that in different levels and certain times, the concentration of this matter should be determined. Since the orange acid 2 is a colorful material, we can use the property of light absorption to determine its concentration. To do this we use from the solvent 100ppm of orange acid 2 (major solvent) by Pipit Jose, we take 5 Ml liters and reach it to 25 Ml with distilled water and prepare 20ppm of the solvent. The needed amount of this solvent is entered into the celli in 1 centimeter and by spectrophotometer in the area of (200-800) nano. Through the landau graph the maximum of this composition is reached. According to spectrum, the amount is $\lambda_{max= 484.}$

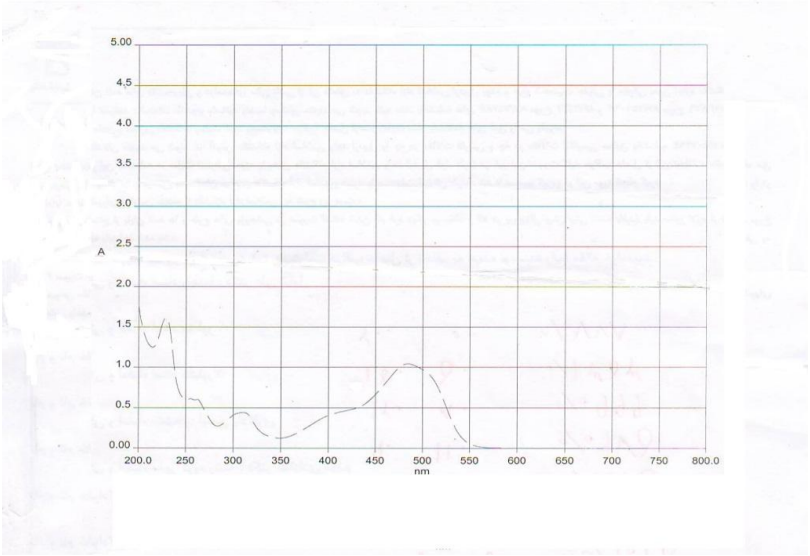

Figure 1: the amount of absorbent orange acid 2

To determine the relationship of orange acid 2 absorption to the concentration, it is used of the Calibration graph method. In this method by using of the major solutions of orange acid 2 into 100ppm of concentration, the relation of $c_1v_1 = c_2v_2$ in 9 container of 50 Ml we prepare solvents of different concentrations of orange acid 2 (2,4,6,8,10,13,15,18,20) ppm and after reaching it to pH=2 by using the spectrophotometer (UV-VIS) the amount of absorption of this solutions are scaled in 484nm wave meter.

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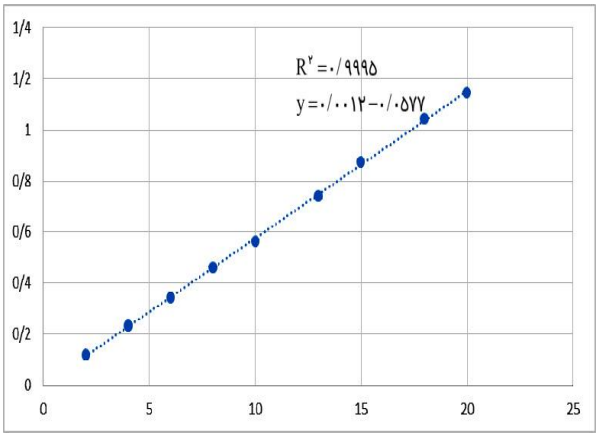

Figure 2: the graph of orange acid 2 solutions calibrations in 484nm

considering the calibration graph, the concentration of 20ppm of orange acid 2 was determined to accomplish the other levels of the experimentation. Because among the prepared samples, 20 ppm is an average concentration with the absorption of 1/1482 that is neither more that may exit from the spectrophotometer sensitivity nor less that the investigation of different parameters may cause errors on it.

Determining the proper amount of adsorbent: By using the major solution orange acid 2 it is made 10 solvents of 20ppm and then pill 50 Ml container and adding some drops of HCL of solvents in pH=2 is settled and later into each solutions we add (1, 0.9, 0.8, 0.7, 0.6, 0.5, 0.4, 0.3, 0.2 and 0.1) grams of banana's skin absorbent. By a magnetic mixer in 60 minutes with a cycle of 5 (250rpm) it is mixed. After smoothing the solutions the sampling process is done and the absorption of the samples was reported.

Determine the most appropriate: amount of 25 mililiter of asid orange 2 throw 4 beakers with density of 40ppm,PH regulate on 2 and then, add amount of 0.1gr of banana peel absorbent, so, incorporate the solution for 60 minutes in 4 different temperature with 250rpm the optimal distance and after that reject filter. Now, we can sampling and see 484nm wavelength by specturphotometer set absorption samples.

Method of analyzing the results: In all of the experiments for scaling the percentage of elimination the following equation is used.

$$R(\%) = \frac{C_0 - Ct}{C_0} \times 100 \quad \text{(Equation 1)}$$

Also for comparing the amounts of $q_t$and q_e the following equations were used:

$$q_e = \frac{(C_0 - Ce)V}{W} \quad \text{(Equation 2)}$$

$$q_t = \frac{(C_0 - Ct)V}{W} \quad \text{(Equation 3)}$$

Results and discussion

Determining the proper amount of absorbent: To determine the optimum amount of absorbent, different amounts of needed absorbent is mixed with 25 Ml of orange acid 2 solution in concentration of 20mgL1 and by adding some drops of HCL the solutions are settled in PH=2 and then by using the magnetic mixer in speed of 250 rpm in 60 minutes and absorption of the samples in 484 wave nanometer is read.

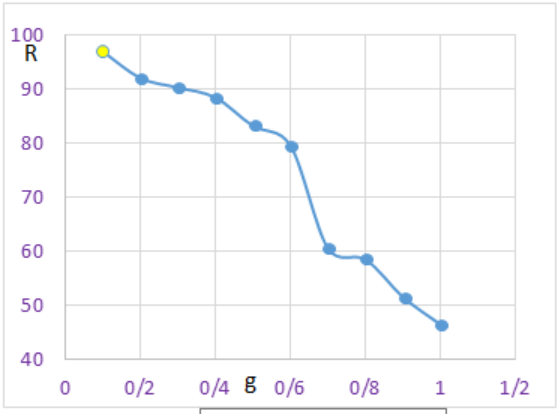

Figure3: the percentage of orange acid 2 elimination in terms of the absorbent grams

The results showed that the most random of elimination is while that the amount of banana's absorbent is 0/1 gram. Therefore, this amount is determined as the most suitable amount in elimination of orange acid2.

Temporatue effect: you must select 4 beakers and throw that 25 mililiter asid orange 2 with 40 mgl^{-1} density for determine the most appropriate in ph=2, then add 0.1gr banana peel absorbent with (15,25,35,45) degree temperature, respectively. After that the optimal distance 250rpm for 60 minutes , It was measured by a spectrophotometer the absorption of samples.

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The balance time, C_e amount of density was calculate by the balance time determine and folloed by the thermodynamic parameters such as Gibbs enovy (ΔG^0), enthalpy (ΔH^0), and entropy (ΔS^0), using equations (4), (5) and (6) were calculated.

$$K_c = \frac{C_s}{C_e} \quad \text{(Equation 4)}$$

$$\Delta G^o = -RT \ln K_c \quad \text{(Equation 5)}$$

$$\ln K_c = \frac{\Delta S^o}{R} - \frac{\Delta H^o}{RT} \quad \text{(Equation 6)}$$

The values of ΔH^0 and ΔS^0 obtained the slope and intercept of the graph Vant Hoff, it is drowing as $(\log K)$ and $\left(1/T\right)$.

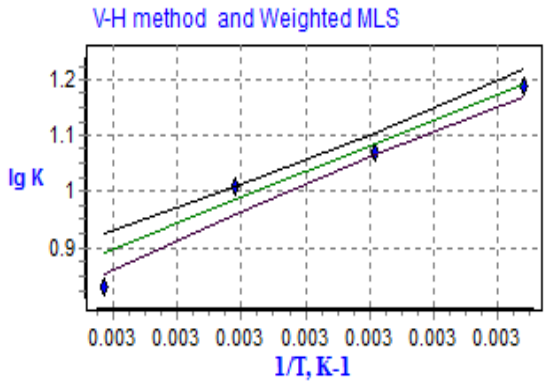

Figure 4: Vant Hoff graph (temperature effect on the rate of removal of asid orange 2 with density of 40mgl^{-1})

according to results from the absorption of asid orange 2 banana skin, the mentioned process is exothermic and on their own and due to amount of the nature of the adsorption enthalpy is the physical type.

studing the asid orange 2 absorption isotherms on banana peel:

for this subject that we did above in different densitys (10, 20, 25,30, 40, 50) and different times (10, 20, 30, 45, 60, 75, 90, 120, 150), then ph regulated in 2 and added banana peel absorbent 0.1 g and after optimal distance in mentioned terms and sampling, absorbtion measured by specturphotometer set.

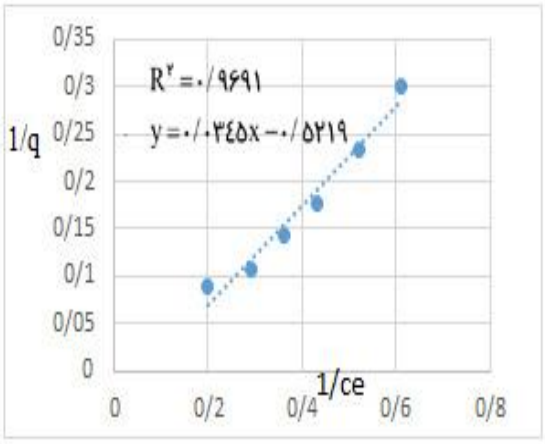

Figure 5: Langmuir isotherm diagram

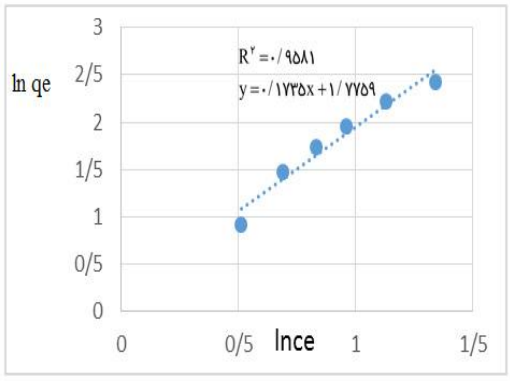

Figure 6: Freundlich isotherm diagram

wath the charts (5) and (6) are observed is due to the linearity of the Langmuir plot correlation coefficient one nearly, the absorption of asid orange 2 on banana peel has better compatibility with the Langmuir model.

Conclusion

In this study the elimination of colored material orange acid 2 is done by sublime absorption through the banana's skin absorbent. The obtained conditions are as follows: 0/1 gram of banana's skin absorbent, the time of contact in 60 minutes, the magnetic mixer 250 rpm and pH=2.

According to the obtained results in demanded conditions, different synthetic models are used and the second grade synthetic model was the most suitable respond for absorbing the orange acid 2 on banana's skin that its fixed speed is -0/1 g/mg min.

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