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Removal of Acidic Pollutants from Water Using Activated Charcoal Obtained From Mango Flowers

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Abstract: *Huge amount of water pollutants are being released from the industries which is largely affecting the quality of water. Acids are found to be one of the most common water pollutants causing an adverse impact on the aquatic ecosystem and in turn bringing a negative impact on the health of human population. Hence there is a need to overcome the harmful effects by their removal from our water bodies. As these acids are water soluble and colorless we used a simple cost effective technique to separate these pollutants from water and at the same time to determine their concentration. The present analysis is aimed at the removal of acidic pollutants using the activated charcoal prepared from Mango Flowers. The method of determination of concentration of these acids is through simple volumetric analysis. The activated charcoal obtained from the Mango flowers is found to be a low-cost and effective biosorbent. The adsorption isotherms were verified by the experimental data at 25^{0}C.*

Keywords: *Adsorption, Adsorption isotherms, Biosorption, Volumetric analysis, Biosorbents, Mango Flowers.*

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I. Introduction

Industries of the various fields are releasing acids as their waste products into the water bodies which are causing the pollution of various water bodies [1]. Among the acidic pollutants the main concern is towards Acetic, Oxalic and Phosphoric acids, as these acids are emitted out as waste in large quantities inturn affecting the quality of water [2]. It is difficult to remove these acids as they are easily soluble in water.

The Acetic Acid is generated as the waste product of the pharma industry and is emitted out in the water bodies thereby disturbing the aquatic life by causing some alterations in the aquatic organism which in turn depletes the aquatic species [3]. Similarly Oxalic Acid is a waste product of the Agriculture industry where it is used in excess in the man-made fertilizers. These reaches the water bodies through soil erosion and forms various compounds with water which causes a health hazard to both aquatic and human life[4]. Phosphoric Acid is more commonly released in high concentration by chemical industry and refineries. When this acid dissolves in water, it increases its contamination potential[5].

There is a growing threat for human life by these acidic pollutants and hence there is a need to remove these pollutants from water. As these pollutants are miscible in water and colorless in nature, the method of separation of these pollutants is through the Biosorption technique and the Bioadsorbent i.e. activated carbon of mango flowers used here is naturally available. These days the Biosorbents are making an attractive mark as they are easily available and are of less cost when compared to the synthetic adsorbents. Biosorbents are the waste products of materials which are abundant in nature [6].

We have identified mango flowers as biosorbent in the present analysis for the removal of acidic pollutants like Acetic, Oxalic and Phosphoric Acids from water [7]. The experimental data is verified by the Freundlich and Langmuir adsorption isotherms and the studies were carried out at room temperature using the activated charcoal collected from mango flowers.

II. Material and Methods

Acetic, Oxalic and Phosphoric Acids were taken in 0.5M aqueous solution and is prepared as the stock solution. These stock solutions were made into different dilutions and were taken up for the adsorption studies [8].

Mango flowers were collected from the domestic mango gardens. These mango flowers were washed separately and were burnt in the muffle furnace at 300^{0}C and were sieved for uniformity and stored in air tight containers [9]. The adsorption is carried out on acids which are water soluble and colorless; the determination of the concentration of the acid is done through the mechanism of simple acid-base titration. Phenolphthalein is used as an indicator in this titration [10].

III. Experiments

The mango flowers stored were taken in separate china dishes and were heated up in a muffle furnace at 200^0C and the residue obtained from this process is the activated carbon of the mango flower. This is used up in the adsorption studies of Acetic, Oxalic and Phosphoric Acids [11]. The activated carbon were prepared from mango flowers were taken in 0.2gm /100ml. After a time period of 24 hours these respective dilutions were taken up for the adsorption studies which were carried out through acid-base titration. In this 0.1M sodium hydroxide is taken in a burette and 10 ml of the filtered dilution are taken in a conical flask. 2-3 drops of Phenolpthalein indicator was added [12]. Now the sodium hydroxide is allowed to enter the conical flask drop wise and the burette readings were noted for each dilution as the base neutralizes the acid present in the conical flask this is noted by the appearance of pink color in the conical flask marking the completion of the neutralization reaction [13].

IV. Results and Discussions

The study of the adsorption by the activated carbon of mango flower against the Acetic, Oxalic and Phosphoric acids have been studied by using the Freundlich and Langmuir adsorption isotherms [14]. The Freundlich and Langmuir plots for these acids are shown in fig 1, fig 2 and fig 3 respectively.

The Freundlich adsorption isotherm equation is $\mathbf{\log \frac{x}{m} = \log k + \frac{1}{n} x \log C_e}$. [15]

The Langmuir adsorption isotherm is valid for the adsorption of mono layered nature onto a surface with a finite number of identical sites. The Langmuir adsorption equation is

$$\frac{C_e}{\frac{x}{m}} = \frac{1}{k_1 \times k_2} + \frac{C_e}{k_2} \quad [15]$$

Where k_1, k_2 are Langmuir constants. The Freundlich adsorption isotherm using the activated carbon of mango flowers for the removal of Acetic, Oxalic and Phosphoric acids yielded a straight line with an intercept. The graphs are represented in the respected figures as discussed earlier. The 'log k' and 'n' value are noted in table 1. The Langmuir adsorption isotherm which in the graph between $\frac{C_e}{\frac{x}{m}}$

Which is on the y-axis and C_e which is on x-axis yielded a straight line with an intercept which is in accordance to the Langmuir adsorption isotherm? The Langmuir constants k_1, k_2 of Acetic, Oxalic and Phosphoric acids were calculated and are listed in table 2.

Table 1: log k and n value obtained from the Freundlich plot of different acids

Acid	log k	n
Acetic acid	-2.1	0.8
Oxalic acid	-2.1	0.91
Phosphoric acid	-2.01	0.81

Table 2: k_1 and k_2 value obtained from the Langmuir plot different acids

Acid	k_1	k_2
Acetic Acid	0.43	0.21
Oxalic Acid	12.5	0.16
Phosphoric Acid	71.4	0.074

References

[1]. Verla AW, Horsfall M, Verla EN, Spiff AI, Ekpete OA (2012) Preparation and characterization of activated carbon from fluted pumpkin (*Telfairia occidentalis* Hook.F) seed shell. Asian J Nat Appl Sci 1(3):39–50

[2]. Syeda Sameena *Aziz.et.al.* Adsorption Studies of Acetic Acid Removal from Waste Water Using Seeds of Brassica Nigra *Int. Journal of Engineering* Research and Application ISSN: 2248-9622, Vol. 7, Issue 8, (Part -2) August 2017, pp.01-03

[3]. Syeda Sameena Aziz*.et.al.* Custard apple leaf powder as an Efficient Biosorbent for the removal of Acidic Pollutants from Water, IJCRT | Volume 6, Issue 1 January 2018 | ISSN: 2320-2882

[4]. Syeda Sameena Aziz and Abdul Razzak Removal of Acetic, Oxalic and Phosphoric Acids from Water Using Sawdust as Biosorbent

[5]. Syeda Sameena Aziz, Qamar and Abdul Razzak. Mango Leaves- An Effective and Low Cost Biosorbent for Acids Journal of Chemistry and Chemical Sciences, *Vol.8(4), 751-755, April 2018* (An International Research Journal), *www.chemistry-journal.org*

[6]. Dr. Syeda Sameena Aziz *.et.al.* Timber waste as a low cost and effective biosorbent for the removal of congo red dye Int. Journal of Engineering Research and Application, ISSN: 2248-9622, Vol.7, Issue 10, (Part-7) October 2017, pp.04-06.

[7]. Ansari R, Mosayebzadeh Z (2010) Removal of basic dye methylene blue from aqueous solutions using sawdust and sawdust coated with polypyrrole. J Iran Chem Soc 7:339–350

[8]. Kannan N, Xavier A (2001) New comparative mixed adsorbents for the removal of acetic acid by adsorption form aqueous solutions. A Comp Study Toxical Env Chem 79(1):95–100

[9]. Nwabanne JT, Igbokwe PK (2012) Mechanism of copper (II) removal from aqueous solution using activated carbon prepared from different agricultural materials. Int J Multidiscip Sci Eng 3(7):46–52 [ISSN:2045-7057]

[10]. Mrunami Joshi, Nikita More, Deepa Gaikwad, Sunil Kulkarni.(2014) Removal of Acetic acid from waste water by Low Cost Materials-a Review. International Journal of science,Engineering and technologyResearch(IJSETR) VOL 3,Issue 10

[11]. Poonam Gehlot, Kailash Daga, Rishika Mehta.(2011).Adsorption study of dye water using poly vinyl alcohol coated black carbon as an effective and low cost adsorbent.International journal of chemistry, vol 3.
[12]. Sivarajasekar N, Baskar R, Balakrishnan V. Biosorption of an Azo dye from aqueous solutions onto Spirogyra. Journal of the University of Chemical Technology and Metallurgy 2009; 44(2): 157-64.
[13]. Sreeramanan S, Lim HY, Xavier R, Marimuthu K, Sreeramanan S, Mas Rosemal HMH, et al. Removal of methyl orange from solutions using yam leaf fibers. J ChemTech Research 2010; 2(4): 1892-900
[14]. Naiya, T.K., Chowdhury, P., Bhattacharya, A.K., Das, S.K. Sawdust and neem bark as low-cost natural biosorbent for adsorptive removal of Zn(II) and Cd(II) ions from aqueous solutions. Chemical Engineering Journal **148** 68–79. (2009).
[15]. Advanced Physical Chemistry byGurtu, Snehi; Reprint of 7th Edition (2005) pg no, 492-496.

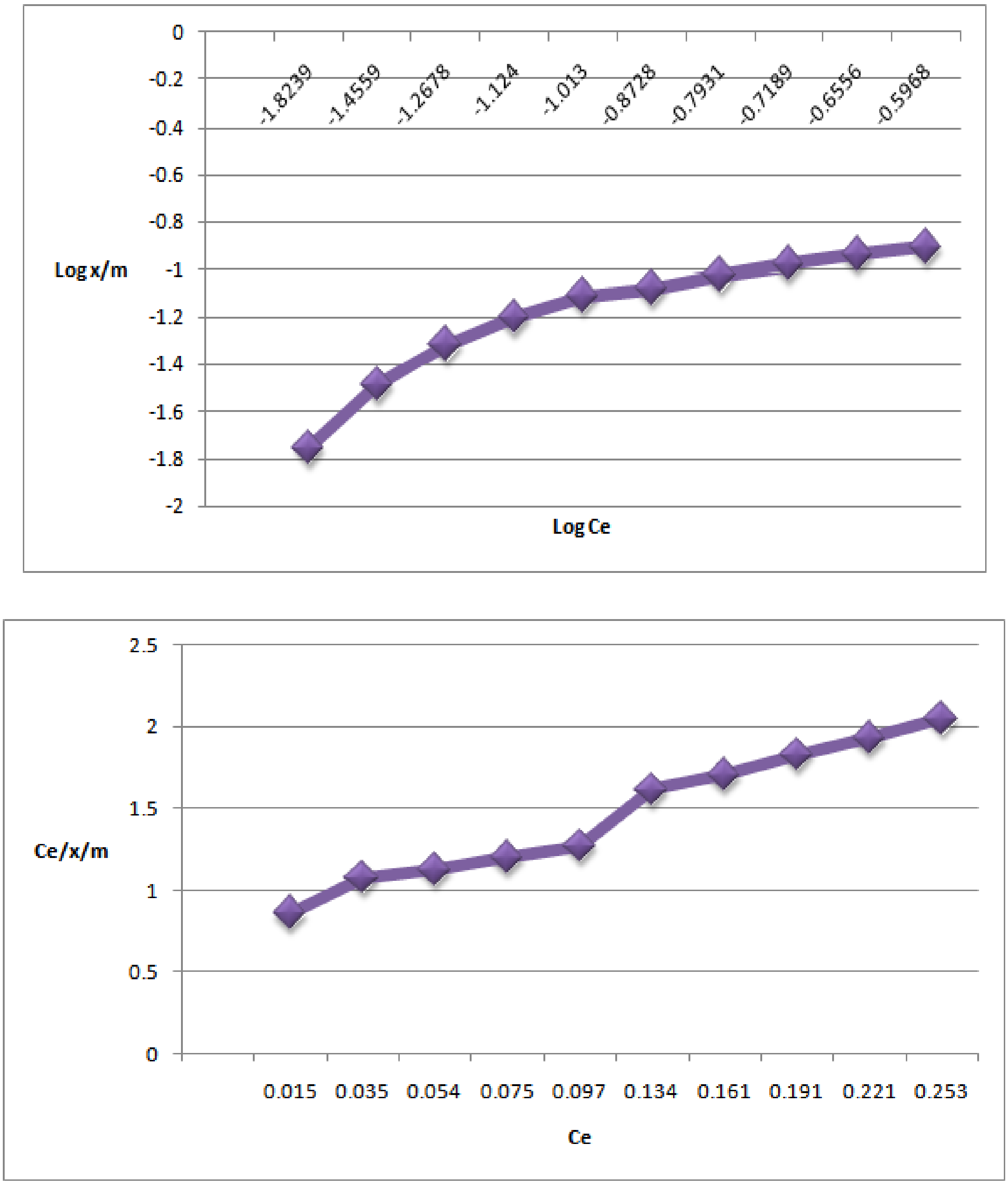
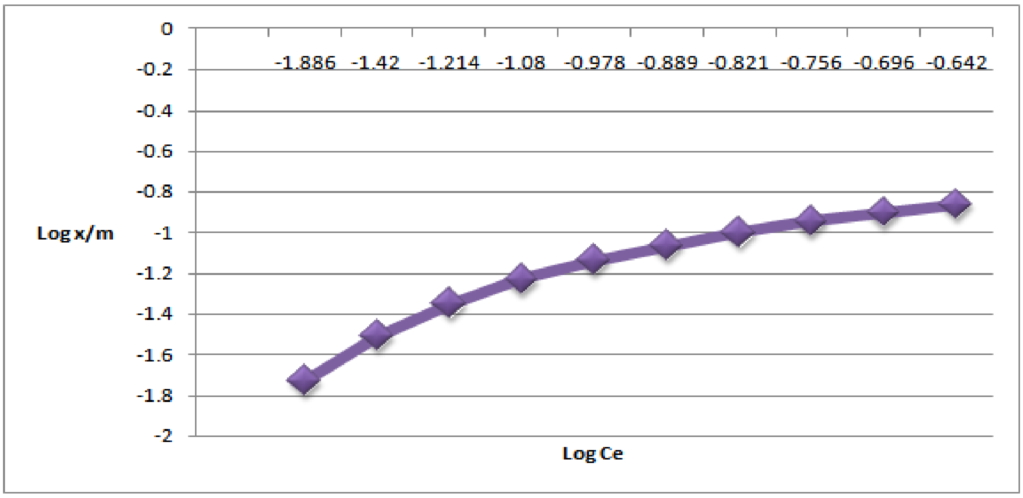
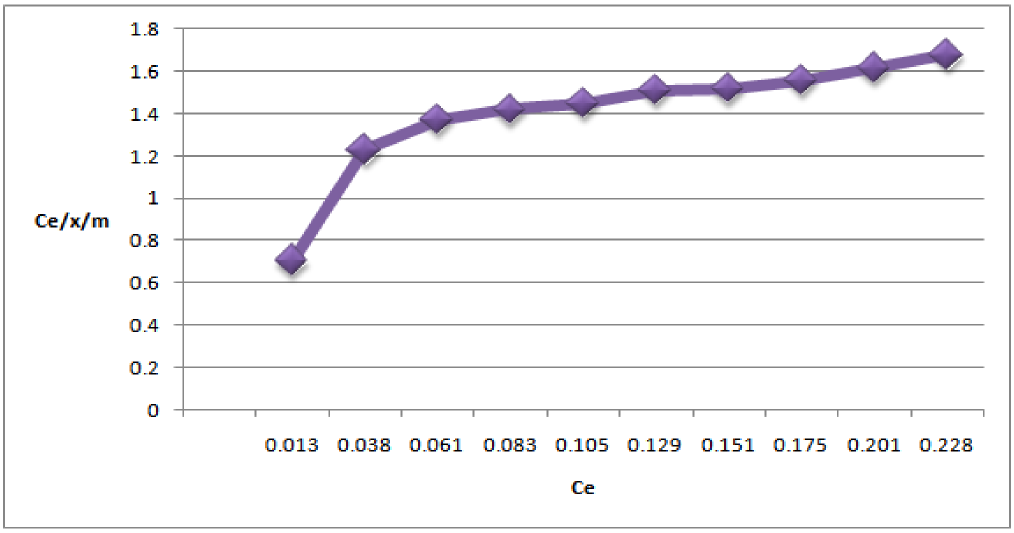
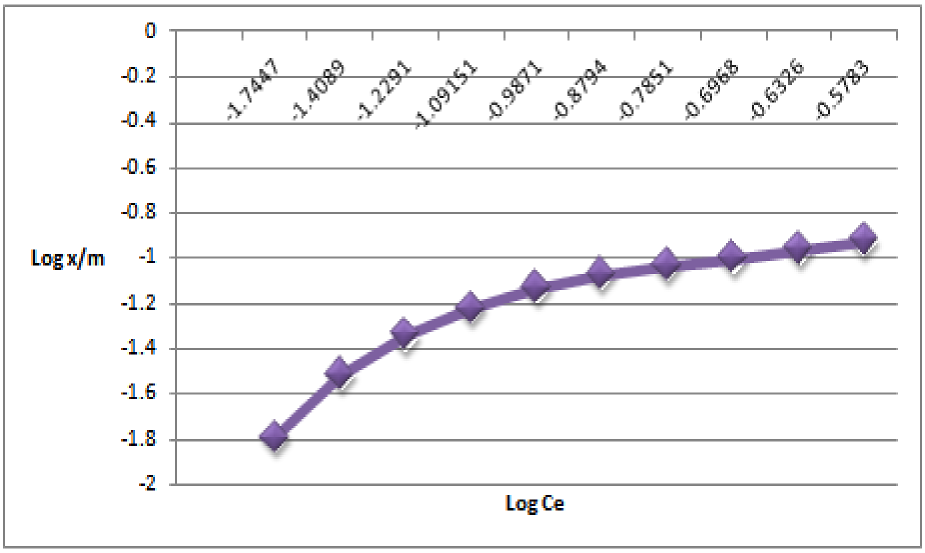


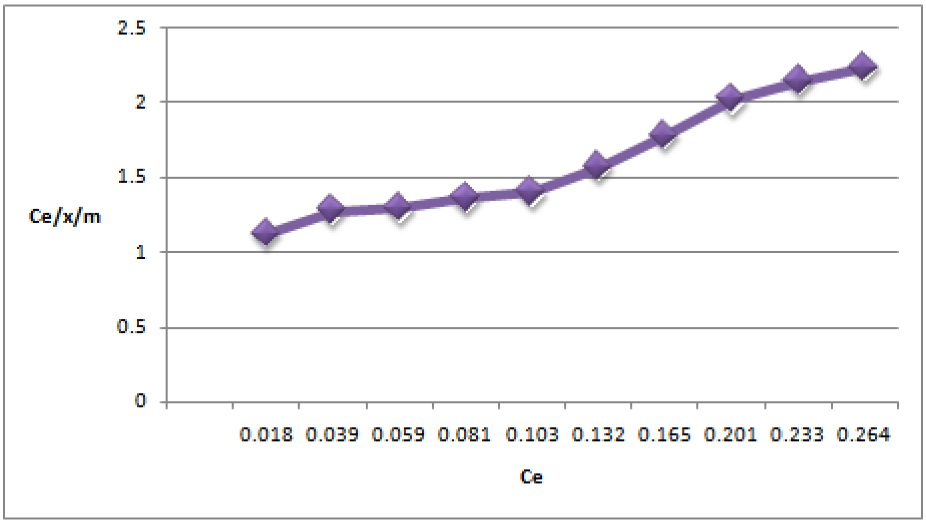
Fig 1: Freundlich and Langmuir Plot for Acetic Acid with 0.2gm of Mango Flower





Freundlich and Langmuir Plot for Phosphoric Acid with 0.2gm of Mango Flower





Freundlich and Langmuir Plot for Oxalic Acid with 0.2gm of Mango Flowers

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