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EFFECT OF ADSORPTION OF TOXIC METAL IONS ON FRUIT SKIN

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ABSTRACT

The Phenomenon of higher concentration of any molecular species at the surface shows the adsorbtion.In present work study of adsorbtion of toxic metal ions such as Pb(II), Hg (II), Cd (II), Cu(II), on agricultural byproducts like Orange,Potato,Chickoo,Guava, Carrot and Banana at 25^0C has been studied at different concentrations.Rateofadsorbtion. increases with increasing the concentration of metal ions.

INTRODUCTION

The force of attraction existing between molecules in any state of matter shown an intermolecular attraction or cohesive force of attraction. Adsorption shows the collection of adsorbate on the surface of adsorbent due to cohesive force of attraction. The phenomenon of higher concentration of any molecular species at the surface shows the adsorption. M.C. Bain suggested that adsorption and absorption take place simultaneously.

The presence of toxic metal ions in industrial waste has attracted worldwide attention. Several methods such as chemical precipitation, ion exchange, ultrafiltration, electrochemical treatment etc. are suggested for the removal of these metal ions. Few workers have suggested methods for the adsorption of their ions by using inexpensive agricultural byproducts**1-2**, tree barks**3-6**, peanut skin**7-8** and agricultural waste material**9-10a**.

We thought of using agricultural byproducts in their natural state. In the present work, an attempt has been made to study the adsorption of toxic metal ions such as Pb(II), Cd(II), Hg(II) and Cu(II) on agricultural byproducts (like Orange, Potato, Chickoo, Guava, Carrot, Banana) at 25**0**C.

P. J. Sondawale**11** and Y. K. Meshram have studied the adsorption of Cd**2+**, Pb**2+** and Cu^{2+} on agricultural by products such as orange skin and banana husk. Adsorption of cadmium

and leaf from aqueous solution by spent grain have been studied by K. S. Low and C. K. Lee**12**. Carolyn A. Burns et. al.**13** has studied the adsorption of aqueous heavy metals onto carbonaceous substrates.

EXPERIMENTAL

Orange skin, Potato skin, Chickoo skin, Guava skin, Carrot skin, Banana husk, Pomegranate husk, Radish skin and Papaya skin were collected, exposed to sunlight for one week. Subsequently they were ground, exposed to sunlight for 24 hours and were preserved in air tight plastic bottles. The solution of different concentrations (0.01, 0.02, -----, 0.09 and 0.1) of Cu(II), Cd(II), Pb(II), Hg(II) were prepared in different conical flask. The absorbance of each metal ion at □**max** is recorded. 1 gm of each of the adsorbent was weighed and placed in each conical flask. The flasks were corked and placed overnight. The solutions were filtered and the absorbance is measured for each of the filtrate spectrophotometrically.

The data obtained of % adsorption along with concentration for two representative systems are presented in table 9 and 10.

RESULT AND DISCUSSION

It would be seen from tables 9 and 10 that adsorption increases with respect to increase in concentration of metal ions.

The order of adsorption between metal ions and agricultural byproducts are as shown under :

1]	Orange skin	:	Pb(II) > Cu(II) > Hg(II) < Cd(II)
2]	Potato skin	:	Pb(II) > Hg(II) > Cd(II) > Cu(II)
3]	Chickoo skin	:	Cu(II) >Pb(II) > Cd(II) > Hg(II)
4]	Guava skin	:	Pb(II) > Cu(II) > Cd(II) > Hg(II)
5]	Carrot skin	:	Pb(II) > Hg(II) > Cd(II) > Cu(II)

It could be seen from above adsorption order that, the order of adsorption is found to same in case of potato skin and carrot skin. However, there it is also observed that the adsorption

of Pb(II) toxic metal ion on the surface of all agricultural by-products except chickoo skin. This may be the fact of more active centres on the surface of absorbent by-products.

Table 1: Adsorption of Metal on Chickoo skin

Pb(II)		Cd(II)		Cu(II)		Hg(II)		
A. Conc.	. Δ A (After A After – adsorp.)	A (AAfter – Abefore)	. ΔA (After adsorp.)	A (AAfter – Abefore)	. ΔA (After adsorp.)	. ΔA (After ABefore)	A (AAfter – adsorp.)	. ΔA (After ABefore)
0.01	1.582	1.504	1.411	1.202	1.448	1.381	1.725	1515
0.02	1.602	1.524	1.427	1.212	1.467	1.391	1.732	1.521
0.03	1.712	1.621	1.437	1.242	1.482	1.398	1.749	1.531
0.04	1.719	1.631	1.479	1.249	1.492	1.400	1.767	1.549
0.05	1.801	1.712	1.482	1.329	1.526	1.420	1.798	1.563
0.06	1.832	1.732	1.588	1.330	1.542	1.441	1.803	1.570
0.07	1.890	1.790	1.591	1.371	1.562	1.461	1.818	1.575
0.08	1.910	1.820	1.594	1.382	1.584	1.479	1.842	1.579
0.09	1.927	1.836	1.599	1.395	1.599	1.485	1.852	1.582
0.10	1.932	1.890	1.610	1.398	1.532	1.489	1.865	1.599

Table 1: Adsorption of Metal on Chickoo skin

Pb(II)		Cd(II)		Cu(II)		Hg(II)		
A. Conc.	. Δ A (After A After – adsorp.)	A (AAfter – Abefore)	. ΔA (After adsorp.)	A (AAfter – Abefore)	. ΔA (After adsorp.)	. ΔA (After ABefore)	A (AAfter – adsorp.)	. ΔA (After ABefore)
0.01	1.782	1.732	1.628	1.521	1.618	1.552	1.751	1.641
0.02	1.840	1.742	1.642	1.510	1.757	1.681	1.882	1.659
0.03	1.872	1.750	1.651	1.532	1.810	1.724	1.889	1.671

0.04	1.880	1.755	1.666	1.541	1.834	1.736	1.812	1.613
0.05	1.896	1.759	1.682	1.555	1.855	1.750	1.896	1.691
0.06	1.921	1.780	1.696	1.565	1.876	1.761	1.901	1.711
0.07	1.954	1.792	1.712	1.571	1.900	1.776	1.926	1.731
0.08	1.973	1.810	1.724	1.589	1.926	1.792	1.930	1.752
0.09	1.983	1.830	1.729	1.590	1.954	1.811	1.957	1.772
0.10	1.999	1.890	1.740	1.601	1.989	1.836	1.996	1.789

Table – 3
Values of k and n for different Adsorption Systems

S.N.	Metal ions		k	1/n
1	Orange	Pb(II)	1.1177	0.0321
		Cd(II)	2.1781	0.1142
		Cu(II)	1.8534	0.0493
		Hg(II)	1.8731	0.0327
2	Potato	Pb(II)	1.6699	0.0162
		Cd(II)	1.6782	0.0141
		Cu(II)	1.6018	0.0122
		Hg(II)	1.6220	0.01720
3	Chickoo	Pb(II)	2.4217	0.0422
		Cd(II)	1.9021	0.103
		Cu(II)	1.9212	0.0277
		Hg(II)	1.8118	0.1718
4	Guava	Pb(II)	1.711	0.0156
		Cd(II)	1.8377	0.0576
		Cu(II)	1.8141	0.0281
		Hg(II)	1.6177	0.0396

5	Carrot	Pb(II)	2.0927	0.0136
		Cd(II)	1.7871	0.0213
		Cu(II)	1.7492	0.0246
		Hg(II)	1.9171	0.0099
6	Banana	Pb(II)	1.8713	0.0326
		Cd(II)	1.481	0.0146
		Cu(II)	1.8321	0.0106
		Hg(II)	1.8214	0.0168

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