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Effective Adsorption and Optimization of Chromium (VI) Using Potato Peels as Bio-Sorbent

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KEYWORDS

Effective Adsorption, Optimization of Chromium, Potato Peels

ABSTRACT:

Introduction: The potato (Solanum tuberosum) is the most important food crop in the world. It is the 4th most important part of daily consumption in the human diet after rice, wheat, and corn. The treated water can be used as potable water for agricultural and industrial purposes. The water from the different areas of Jaipur is found to have deteriorated water quality. Water pollution is a major environmental concern these days and is the main cause of major health issues.

Objective: The present work is carried out to study the physicochemical characteristics of water samples collected from different areas of Jaipur using activated carbon prepared from potato peels.

Methods: The wastewater of different areas is characterized by extreme fluctuations in many parameters, such as pH, EC, salinity, TDS, and chromium concentration.

Results: The use of low-cost adsorbents obtained from potato peels is highly productive because they are not only cost-effective but also economical. The adsorbent prepared from potato peels is found to be very effective as it comprises bioactive compounds and is also rich in phenolic groups.

Conclusion: This study is evaluating the efficacy of potato peels in removing Cr(VI) ions from aqueous solutions by adsorption. The efficacy was investigated by batch experiments to evaluate the influence of pH and initial ion concentration, agitation speed , contact time Keywords: Potato Peel , Cr VI, Activated Carbon, Batch experiment.

1. INTRODUCTION

All around the globe, surface and underground water sources are fundamental needs to our daily life. Untreated, the majority of industrial effluents in developing nations are released into the environment unchecked and inturn increasing the likelihood of surface and underground water contamination [Degefu and Dawit 2013]. A multitude of industries contribute to the accumulation of heavy metals, which are very harmful to ecosystems [Rai,Giri et al2018;George 2012]. These include different industries such as mining, dying , paints . Chromium (Cr) is a heavy metal that is present in high concentrations in industrial effluent and has devastating effects on ecosystems and human health [George 2012]. The concentration of Cr is as high as 1000 mg/L, which is accumulated from different sources. [6].The standard limit of acceptable discharge of Cr for surface water bodies is much higher than the 0.05 mgL-1 [Rai &Nath etal 2018] and just 30 to 40% of Cr is actually used effectively in the process [Soltani & Khorramabadi et al 2014]. The treatment of wastewaters must be done to ensure they are below the legal threshold level before they are released into aquatic habitats. A negative impact on people and the environment can result from its untreated effluent instead [Bayisa & Bullo et al 2021]. Cr has the potential to cause a variety of symptoms in humans, including

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skin irritation, epigastric pain, nausea, vomiting, severe diarrhea, hemorrhage, and malignancy [Rai,Giri et al2018; Senthil 2013]. Environmental toxicity, harm to aquatic life and human health might result from a concentration of Cr in the water supply. Hence, prior to disposal, Cr has to be extracted or reclaimed. Cr removal from different kinds of wastewater is now being investigated using a number of treatment approaches. There are several methods to attenuate concentration of metal such as chemical reduction, adsorption, and biological procedures, solvent extraction, ion exchange [Oliveira & Franca 2008; Yang & Kang et al 2018]. However, there are downsides to some of these methods and some of these strategies, and they provide significant challenges when used in underdeveloped countries. Even so, adsorption becomes a versatile and efficient heavy metal removal alternative when combined with appropriate regeneration methods. Activated carbon include a wide variety of carbons, including black carbon, electrode graphites, transparent graphite, carbon fibers and many more. Though they've all been carbonized and manufactured in different ways, they all start with organic materials. With the use of locally sourced raw materials, activated carbon may be prepared to provide adsorbent materials with high saturation capacity, low cost, and the ability to be recycled, readily replacing the limits of more expensive chemical and biological treatment methods. Thus, there has been a rise in interest in using these locally sourced, environmentally acceptable adsorbent materials to remove heavy metals from various wastewaters [Marsh & Reinoso 2006; Ahalya & Kanamadi et al 2010]. From what we can gather from the literature, activated carbon may be made from a wide range of materials. Agricultural byproducts included the following: teff straw [Desta 2013], rice husk [Srivastava & Tyagi et al 1989], coffee husk [Ahalya & Kanamadi et al 2010]], and industrial trash [Kadirvelu & Thamaraiselvi et al 2001] ,wood sawdust [Sciban & Radetic et al 2007] are all included. Activated carbons made from these different types of waste have been tested in many studies for their ability to adsorb Cr material [Bayisa & Bullo et al 2021; Adane & Dessie 2020]. Contact time [Iscen & Kiran et al 2007], solution pH [Lodeiro & Cordero et al 2005], adsorbent surface [Arshadi & Amiri et al 2014; Mekonnen & Yitbarek et al 2015], and other parameters all affect their adsorption effectiveness. For developing, the most cost-effective treatment options have been found to involve adsorption using agricultural residue. However, there is a severe lack of research on the use of activated potato peels carbon to remove Cr from wastewater in Jaipur , India . As a result, our research enhanced the use of activated potato peels carbon, a cheap material, to remove Cr from wastewater effluent.

Potato peels (PP), which are considered agricultural solid wastes, might be regarded as low-cost adsorbents due to their abundance in nature, low cost, little processing needs, and effectiveness as a material. In addition, PP are insoluble in aqueous solutions because to their large molecular weight and highly branched molecular structure, and they may be a potential adsorbent for the removal of wastewater-borne methylene blue and metal ion removal . According to Anastopoulos and Kyzas, both modified and unmodified PP were utilized as adsorbents to remove a variety of contamination including metal ion, total hardness , total dissolved solids and metal ions [Anastopoulos & Kyzas 2014]. The most popular non-grain food product worldwide is the potato. It yields approximately 300 million and 325 million tons annually. The majority of contaminants may be removed from aqueous solutions using PP because of its large molecular weight and highly branched molecular structure. The primary goal of this experiment is to evaluate the extent to which PP functions as a bio-adsorbent, especially to remove contamination from aqueous solution .The effects of operational variables including pH of the solution and physiochemical analysis.

2.MATERIAL AND METHODS

Characterization and Preparation of Adsorbate solution

We sourced the potato from a nearby market in Jaipur, Rajasthan. After peeling, it was first rinse in tap water followed by many times in distilled water in order to eliminate any surface dust or contaminants. It was sun-dried until the moisture disappeared, crushed using a mixer-grinder, then sieved to get for the bio sorbent. Preparation for the experiment included storing the bio sorbents at room temperature (25 ± 50C). The samples were treated with HNO_3 to retain the solubility of the Cr ion before being stored at 4° C for analysis. We prepared adsorbent solutions from wastewater samples by using the correct dilution procedure.

Wastewater sampling and characterization

The 5-liter container (from plastic lab ware, India) was used for collecting wastewater samples . In Jaipur, Rajasthan, India, water samples were collected from several places, such as Jagat Pura, C. Schem, Pratap Nagar, Sita pura and other industrial areas. Total suspended solids, total dissolved solids , pH, electrical conductivity , salinity, and Cr were analyzed in accordance with the conventional method outlined in Stevens [Heavner & Morgan et al]

Activated carbon preparation

An activation-carbon mixture was prepared using 25 grams of potato peel, 11.9 milliliters of 85% phosphoric acid (H_3PO_4), and 150 milliliters of deionized water. Mixture was stirred two hours at 100 °C and then followed by drying for about 24 hours . Afterwards, the dehydrated substance was heated to 500 °C for 30 minutes at a rate of 2 °C min-1 in a tube furnace that had a fixed-bed reactor. The rate of pyrolysis was 100 mL min-1 in a nitrogen environment. To eliminate any contaminants that comes out during preparation of activation and to restore a normal pH, the sample was washed with water when it cooled to room temperature. We dried the potato peel sample at 120 °C for 24 hours. We labelled the sample PP because of studies by Heilarinejad et al. (2020) and Li Y et al. (2015). By using established protocols, we were able to determine the activated potato peel carbon's physicochemical properties: pH, electrical conductivity, ash concentration, pore volume, bulk density, organic matter, moisture, carbon yield, and electrical conductivity.

(i) pH and EC: A 250 mL beaker was used to measure these adsorbent qualities according to the [ASTM 2009] technique, which included weighing 1 g of activated carbons, adding 100 mL of distilled water, and stirring the mixture. The next step was to use a magnetic stirrer to combine the ingredients for one hour. When the samples had settled, we used an electronic pH and EC meter (Labtronics LT-16) to test the pH and EC.

(ii) Ash content: To determine the ash content [ASTM 2009] was used. The activated carbon powder made from potato peel weighed 2.5 g and was cooked in a porcelain crucible before being moved to a muffle furnace set at 550° C for 5 hours. Following cooling in desiccators, the crucible was weighed once again. The activated carbon sample was heated, cooled, and then weighed again until its weight did not change. Based on the dry basis, the ash content was approximated using the following equation:

Ash % = Weight of ash (g) / Oven dry weight (g) x100

(iii) The pore volume was determined by using the activated carbon's bulk density and particle density. Equation was then amended to include the values obtained from these two densities.

Pore volume = Bulk density − particle density Bulk density

(iv) Bulk density: Based on the [ASTM 2009], the density was determined by filling a 25 cm3 density bottle with an activated carbon sample using the bulk density device. This was done by repeatedly tapping the bottle until it reached the desired level. The quantity of powder in the bottle was determined by weighing it and then dividing the difference in volume by the total volume. To get the powder's bulk density, we divided the bottle's weight of powder by the density of its tapped volume using the equation .

Bulk density (g /m3) = Weight of dry sample (g) / Volume of sample(m3)

(v) Moisture content: The moisture content was determined using the protocol [ASTM

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JCHR (2024) 14(1), 1722-1734 | ISSN:2251-6727

2009]. 5 gm of activated carbon was measured and then a three-hour period was thereafter spent with the crucible in an oven preheated to 105 degrees Celsius. Once the crucible had cooled in a portable desiccator, it was taken out of the oven and weighed again. Iterative heating and weighing was carried out until the target moisture content was reached, and the percentage of moisture content was computed using the given equation.

Moisture content (%)= Loss in weight on drying (g) / Initial sample weight (g) x100

(vi) Volatile organic matter: A measured amount of 2.5 g of dry activated carbon powder was added to a crucible. Place the crucible in a muffle furnace and maintain it at about 925° C for 90 minutes, as stated by Heavner et al., [Heavner & Morgan et al]. The crucible was reweighed after it had cooled in the desiccator. One way to determine the amount of volatile organic materials was by applying the formula

Volatile organic matter (%)= Weight of volatile components (g) / Oven dried weight (g) x100

(vii) Carbon yield and Nitrogen content determination: The total carbon yield was determined using the loss ignition technique. For determination of nitrogen concentration of the activated carbon (Kjeldahl technique), on the other hand. Based on these individual values, we then approximated the C:N.

Carbon yield = Weight of carbon after furnace (g) / weight of carbon (g) x100

(viii) Analysis of pHPZC: The method outlined by Vakros et al. [30] for potentiometric mass titration was used to ascertain the point of zero charge (PZC). To conduct the experiment, 0.5 g, 1.0 g, and 1.5 g of activated carbon from potato peels were dissolved in electrolytic solutions containing 0.1 N $NaNO_3$ in 50 mL of distilled water. The aqueous suspensions were then allowed to equilibrate for 1 hour under a N_2 atmosphere. The procedure called for heating a 2 g sample on a crucible at 950° C for 2 hours [34]. The weight of the carbon sample after drying was divided by the weight of the carbon that was removed from the furnace to get the result.

Batch adsorption experiments

The batch adsorption investigations were carried out at room temperature by swirling measured amounts of the potato peel adsorbent in 50 ml of wastewater at a rate of 150 rpm with the requisite pH, contact duration, adsorbent dosage, and adsorbate starting concentration. The timing began with the addition of adsorbent. These tests were carried out in several Erlenmeyer flasks with a size of 150 ml. After shaking, the sample was collected and filtered using 0.45 m pore size Whatman membrane filter paper. Finally, the residual chromium ion in the solution was determined using an FAAS (Flame Atomic Absorption Spectrophotometer, Model 210 VGP). The experiments were carried out in triplicate, and the average findings are shown. The removal efficiencies of potato peels adsorbent were examined using the formulae below. The percentage of chromium removal is obtained using Eq.1, while the adsorption capacity *qe* is calculated using Eq.2

(1) $$\% \text{ removal} = \frac{Co - Ce}{Co} \times 100$$

(2) $$qe = \frac{(Co - Ce)\ V}{w}$$

where Co = initial adsorbate concentration (mg/L); Ce = final equilibrium adsorbate concentration (mg/L). where Co and Ce are the initial and equilibrium concentrations of the Cr ions in mgL, V is the volume of the solution in L, w is the amount of adsorbent used in g, and qe is the removal efficiency of adsorbent in mg/g.

3.RESULTS AND DISCUSSION

Physicochemical Properties of potato peels Activated Carbon.

An activated potato peels carbon's physicochemical characteristics are shown in Table 1. pH is one of the most influential features on the adsorption capacity of the adsorbent. In line with Malik's findings, the pH of the activated carbon derived from potato peels in this

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JCHR (2024) 14(1), 1722-1734 | ISSN:2251-6727

study is 3.2. A decreased moisture content of 1.02% was observed in potato peels activated carbon compared to the research report value of Dula et al. [Dula & Siraj et al 2014] (Table1), resulting in an enhanced adsorbent capacity. With an ash percentage of 5.98%, activated potato peels carbon was used. There is less ash, which means it is more efficient and has a larger adsorption capacity [Bayisa & Bullo et al 2021]. The adsorbent also contains more carbon, thus it is of good quality. A much greater carbon content of 68% was found in the activated carbon, according to Table 1, compared to Köseoğlu and Akmil-Başar [Gecgel & Ozcan et al 2013] . As a result of its lower nitrogen component content, it may have other carbonaceous groups accessible for metal adsorption. As an alternative to adsorbents that are high in protein, PP with low nitrogen levels may have a low protein percentage [Degefu and Dawit 2013]. The carbon:nitrogen ratio, surface area, pore volume, particle size, porosity, and volume were the other significant physical properties of the activated potato peels carbon. These properties were measured as 8.39:1, 245-550 µm, 93.54%, 1200 (m2 g-1), and 0.814 mLg-1, respectively, and all played a crucial role in the effective removal of heavy metals. One example is the removal effectiveness of adsorbents; larger adsorbents may bind heavier metals more effectively. An argument against this might be the strong Cr binding ability of activated potato peels carbon in electroplating effluent. In **Figure 1,** we can see the pH of the point of zero charge (pHPZC) of the activated carbon of potato peels. A value of 5.05 was found. Activated carbon derived from dust of potato peels has a pHPZC of 5.2, according to research [Sreejalekshmi & Krishnan et al 2009]. At a neutral charge, the number of protonated sites is equal to the number of deprotonated sites, making it possible for the charge to be zero [Eastwood & Cremel et al 2009]. The present study found that an adsorbent's surface acquired a positive charge below pH 5.05 and a negative charge above pH 5.05, allowing it to attract and adhere ions that were positively charged in the solution.

Table 1: Exploring the physicochemical properties of activated potato peels

Physicochemical characteristics	**Present study value**
pH	3.2
EC (µscm-1)	75.56
Bulk density (gcm-3)	2.90
Pore volume (mLg-1)	0.814
Moisture content (%)	1.02
Ash content (%)	5.34
Volatile organic matter (%)	63.56
Carbon (%)	68
Particle size (µm)	245-550
Porosity (%)	93.54
Particle density (gcm-3)	0.51
Nitrogen (%)	8.10
Surface area (m2 g-1)	1200

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Wastewater Physicochemical Properties.

As shown in Table 2, the concentration of Cr in collected from various sources was 455 mgL-1. Possible variations in the chemicals used for wastewater and cleaning account for the increased quantity of heavy metals here compared to Gandhi [Gandhi 2013]. The current result was also similar to early finding suggested national discharge standard limit for surface discharge national, which is 1 mgL-1 total Cr content [ESID 2003], and its release into a neighboring river presents severe health and environmental hazards.

Table 2: Waste water physicochemical characteristics.

Parameters	Mean ± SD
pH	4.10 ± 0.001
EC (µs)	3012 ± 0.01
TDS (ppm)	1040 ± 0.012
Salinity (ppm)	7.063 ± 0.07
Cr (mgL-1)	455 ± 0.023

ppm: part per million; SD: standard deviation.

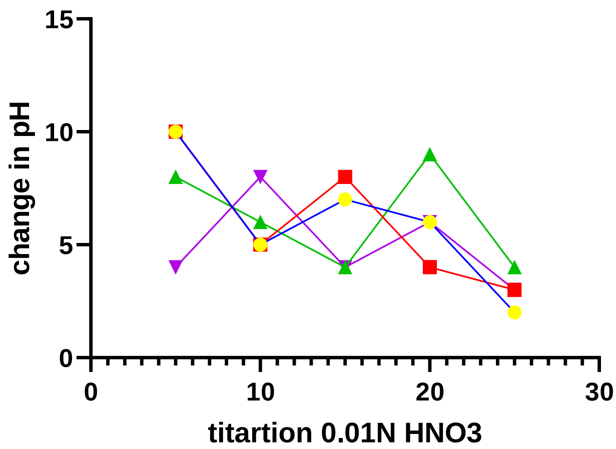

Figure1: pH of activated carbon from potato peels (pHZC)

Effect of various parameters on adsorption of chromium

Effect of initial concentration on chromium

The treatment of wastewater enriched in metal ions by adsorption depends significantly on the investigation of the influence of initial adsorbate concentration and contact time between adsorbent and adsorbate. The adsorbent's suitability for use in wastewater treatment is shown by a quick absorption of adsorbates and the quick achievement of equilibrium. Equally crucial is the examination of how an initial concentration of pollutants or adsorbates affects a certain amount of adsorbent at a particular temperature and pH. A certain mass of adsorbent may clean a tiny volume of low concentration contaminants. However, the fractional adsorption is minimal at higher concentration ranges [Sen 2023] The contact time required to achieve equilibrium for primary materials such as activated carbon and polymeric adsorbents is longer; however, the equilibrium time is lower for porous or non-porous adsorbents [Obulapuram & Arfin 2021].The majority of adsorbate species are promptly adsorbed on the solid-solution interface in physical adsorption [Goyal & Amar 2023]Strong chemical bonds between adsorbate and adsorbent, on the other hand, need a longer contact period for equilibrium [Obulapuram & Arfin 2021] to be achieved. According to a study of the current adsorption literature, the process of adsorbate species uptake is quicker in the early stages of the contact period and slows down later. Despite these changes, the adsorption rate is determined to be almost constant. In the early stages, there are more surface sites accessible for adsorption of contaminants; but, as the process progresses, the remaining surface sites become harder to occupy because of the repulsion between the molecules of solute of the solid and bulk phases. The investigation of the change in adsorption rate with adsorbate concentration provides insight into the rate regulating stage of the adsorption process. Thus, the influence of adsorbate concentration on the rate of adsorptive uptake is crucial for predicting the most effective way in which adsorbent may be used to remove the solute from the solution [Elkhaleefa & Brima 2021] Adsorption dynamics must be studied in order to have a better knowledge of the process. The rate at which contaminants or adsorbate molecules are removed from wastewater is another factor that controls the amount of time that the two substances come into contact with one other. On top of that, the retention duration of the adsorbent

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JCHR (2024) 14(1), 1722-1734 | ISSN:2251-6727

and the starting concentration of the adsorbates or pollutant molecules are also critical factors in wastewater treatment.

The present section examines the influence of starting concentration on metal ion removal efficiency per unit weight of adsorbent and contact time to achieve equilibrium. The removal of chromium (VI) concentration from activated carbon at different initial concentrations. Influence of the initial concentration,the impact of varying concentrations of Chromium (VI) on the effectiveness of adsorbents and the time required to achieve equilibrium was investigated throughout a broad spectrum of Chromium (VI) levels. All other variables (agitation speed, dosage, and temperature) remained unchanged, while the pH was maintained at its ideal level. The results at equilibrium condition are given in the table no-4

Table no:3 Effect of initial concentration of adsorbate on Cr removal efficiency

Co	Agitation speed (rpm)	Contact time (min)	Dose (g/L)	pH	*C*f (mg/L)	Cr adsorption%	q (mg g−1)
20	140	190	15	3	1.19±0.10	94.58	1.89
40	140	190	15	3	2.43±0.09	94.28	3.75
60	140	190	15	3	3.48±0.06	94.02	4.29
80	140	190	15	3	4.87±0.05	93.62	5.72
100	140	190	15	3	5.94±0.16	93.53	6.90
120	140	190	15	3	16.07±0.12	85.82	7.62
140	140	190	15	3	23.02±0.01	83.82	8.29

Effect on pH

Because of its influence on adsorption effectiveness, in the adsorption process, pH parameters have a vital role [Attia & Khedr & et al 2010; Shahnaz & Fazil 2020a] pH has a significant impact on the functional groups responsible for metal ion binding at the adsorbent surface. There is competition for the adsorbent's active sites among ions in the solution. The pH of the key influences this competition [Reddy & Lakshmipathy et al 2014] The effect of pH on the process of adsorption was examined. using a batch approach with a 140-minute contact duration, room temperature, continuous agitation speed of 150 rpm, and adsorbent dose of 15 g/L. Table 4 shows the findings of the study on the influence of pH on chromium removal by potato peel adsorbent. The absorption of Cr increased with lowering pH, as shown in Table 1. As a result, the optimal pH for maximal chromium absorption was pH 3. Potato peels adsorbent had the maximum removal percentage at pH 3, which was 75.20%. At pH 6, however, the lowest adsorption capacity was found to be 72.14%. Since the adsorbent dosage and starting concentration of the adsorbate were held constant in this experiment, both adsorption percent and removal in mg/g exhibit comparable rising patterns with lowering pH of the solution [Ajmani & Shahnaz 2019b] The highest level of chromium absorption in mg/g was measured at pH 3, which is 5.64 mg/g . Due to this, at lower pH, chromium is high in acidic media.

Journal of Chemical Health Risks

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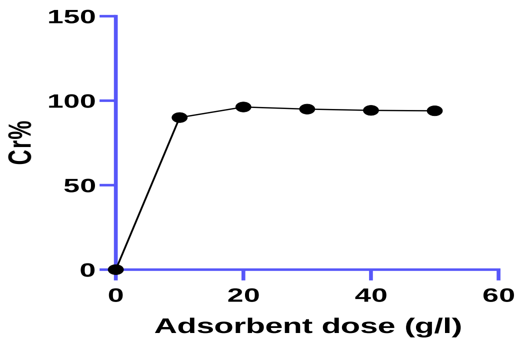
JCHR (2024) 14(1), 1722-1734 | ISSN:2251-6727

Table 4 Effect of pH on Cr removal efficiency (*Co* = 110 mg/L, agitation speed = 150 rpm)

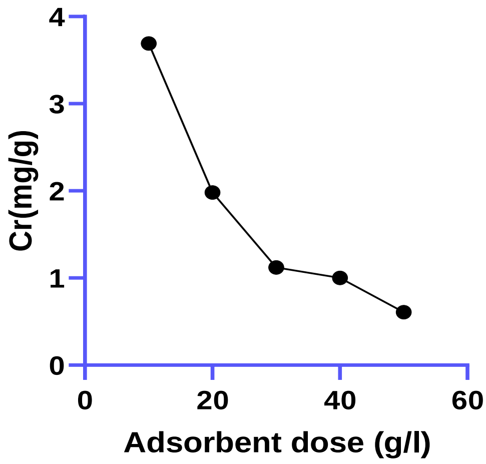
pH	Contact time (min)	Dose (g/L)	*Cf* (mg/L)	Cr asorption %	q (mg g−1)
3	**140**	**15**	**25.092±0.12**	**75.207**	**5.64**
4	**140**	**15**	**25.49±0.02**	**74.890**	**5.60**
5	**140**	**15**	**27.37±0.07**	**73.205**	**5.50**
6	**140**	**15**	**27.50±0.62**	**72.148**	**5.48**

Effect of Adsorbent Dosage.

Constant values for all other parameters allowed us to evaluate the adsorbent dosage effect, which had a major bearing on Cr adsorption Figure 2(a). At an adsorbent dose of 20 gL-1, the greatest removal of Cr was recorded at 96.3% Figure 2(a). However, the adsorption effectiveness dropped beyond this dosage. This result is similar with other reported by Yu et al. [Yu &Shukla et al 2003] , who found that increasing the adsorbent concentration enhanced the removal efficiency of metal ions. One possible explanation is that there are more adsorption sites and a larger surface area of the adsorbent. Nevertheless, it is possible that the reduced efficacy of Cr adsorption in this research is a result of the higher dosage of adsorbents, which uses up all of the available active sites. The adsorption capacity, measured in mgg-1, also decreased with increasing adsorbent dosage Figure 2(b). An increase in the adsorbent dosage could explain the reduced adsorption capacity [Makeswari & Santhi 2014].



(A)



(B)

Figure 2:Effect of adsorbent dose on Cr removal(A) mass adsorption efficiency (B)

Effect of Agitation Speed

The results of this impact study demonstrated that the removal of Cr was enhanced by increasing the agitation speed Figures 3(a) and 3(b)). Rising the agitation speed from 30 to 200 rpm resulted in an increase of 85.25% in adsorption efficiency, as shown in Figure 3(a). The current work is in keeping with Saifuddin and Kumaran's findings that a higher agitation speed (ranging from 30 to 150 rpm) improves metal ion transport towards the adsorbent surface and increases the adsorption capacity (from 1.25 to 1.86 mgg-1) equivalently. When the agitation speed was raised over 150 rpm, the adsorption efficiency dropped in this research. This may be associated with the desorption of

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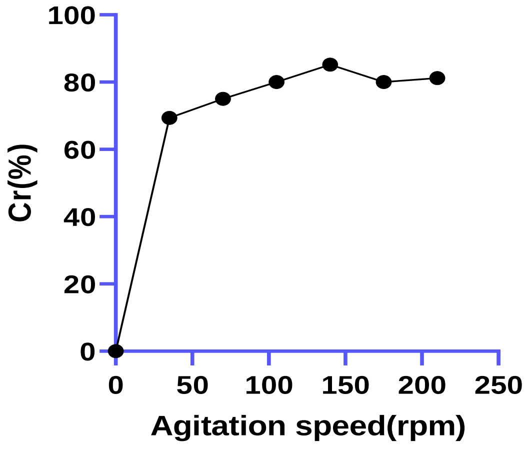
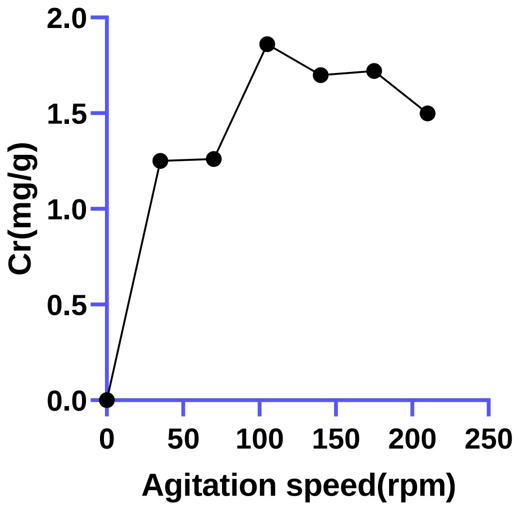
JCHR (2024) 14(1), 1722-1734 | ISSN:2251-6727

metal ions from the adsorbent surface due to the use of too fast of an agitation speed [Lakshmi & Sudha 2012]. For instance, as the stirring speed affects the adsorption rate, a thinner solvent film layer is produced by a low agitation speed [Zhu & Zhang et al 2012], while an increasing stirring speed results in a thinner film layer. Thus, metal ions move rapidly across the film, with diffusion via pores serving as the rate-controlling step [Thakur & Parmar 2013]. The adsorption rate is controlled by diffusion via holes because the rate-controlling phase is the slowest.



(A)

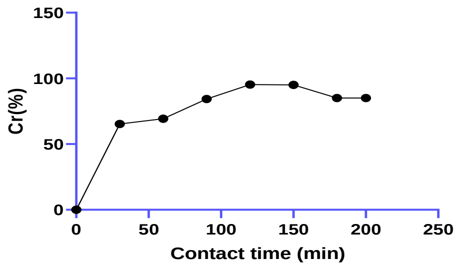


(B)

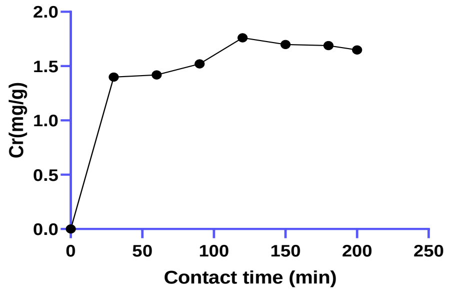
Figure 3:Effect of agitation speed on Cr removal(A) mass adsorption efficiency (B)

Effect of Contact Time

In addition, we measured the impact of contact time on the adsorption capacity of activated carbon, which can be shown in Figures 4(a) and 4(b).At the first point of contact, the findings demonstrated a high adsorption efficiency for Cr. Its rate of adsorption, however, reduced with time. The abundance of free binding sites on the adsorbent surface, which is proportional to the quantity of Cr metal, may explain the remarkable adsorption efficiency that was attained [Makeswari & Santhi 2014]. Figure 3(a) shows that during the course of the experiment, adsorption efficiency rose with increasing contact time. However, after reaching a peak efficiency of 84.25% after 120 minutes of contact time, the efficiency began to decline dramatically. The equilibrium point showed a delayed visible decline in residual Cr concentration after 120 minutes of contact time. Beyond this threshold, the increase became stable, and the amount of Cr metal adsorbed on the adsorbent was in dynamic equilibrium with the amount of Cr metal desorbed. As shown in Figure 3(b), during 120 minutes of contact time, the mass adsorption efficiency reached 1.76 mgg-1 Cr. Consequently, a duration of 120 minutes of interaction was selected as optimum,



(A)



(B)

Figure 3:Effect of contact time on Cr removal(A) mass adsorption efficiency (B)

4.CONCLUSION

Obtaining and taking in safe drinking water has been a big concern in recent years. As a result, recycling wastewater successfully addresses these fundamental issues. Adsorbents are the most prevalent issue in the water treatment process. Adsorbents used in the water treatment process are both expensive and scarce. As a result, the entire process becomes costly and unprofitable. As an adsorbent, activated carbon made from agricultural biowaste can be employed. Because of its low cost and good performance, it has a significant potential to replace commercial activated carbon in wastewater treatment operations. On the hand ,the characterization findings of adsorbent from potato peels, which reveal the pores on the adsorbent's surface before and after adsorption, were an indicative of its adsorption capability. Contact time, pH, adsorbent dose, and starting adsorbate concentration all had an effect on the adsorption capacity of potato peels adsorbent. The batch experiment revealed the optimal contact time, pH, potato peels dosage, and starting chromium concentration of 190 min, pH 3, and 15 g/L, respectively. Potato peels adsorbent absorbed 94.58% Cr from wastewater under ideal testing circumstances and at room temperature. It concluded , the capacity of potato peels to adsorb Cr from aqueous solutions has the potential to alleviate the problem of chromium-containing industrial effluents, which continue to pose rising dangers to human health and the environment.

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