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Design of an Eco-Friendly Ag_2O/AC New composite for Wastewater Remediation via Dual Adsorption and Oxidation to Maximize Organic Pollutant Degradation in Industrial Effluents

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ABSTRACT

This work prepared new composite (Ag_2O/AC) used as adsorbent and oxidation from activated carbon (AC) prepared from Upholstery waste (UW) by carbonization and precipitation methods by hydrated 5% silver nitrate ($AgNO_3$) by Photo Oxidation Batch Reactor (POBR) to organic elimination from refinery wastewater (RWW) through a batch technique and compared between them on activated carbon. The FTIR, FE-SEM, EDX and BET analyses were used to characterize the physicochemical properties of the AC and Ag_2O/AC samples. The removal efficiency of organic contaminants was inspected under four working conditions: dose (0.2-1 g), pH (3-9), agitation speed (100-300 rpm), and contact time (30-120 min). The removal efficiency under various working conditions was studied to assess the surface efficiency of organic removal on prepared activated carbon and new composite and compare them with the largest organic removal efficiency were 99.6 % and 74.6 % of Ag_2O/AC and AC at 1 g, pH3 , 300 rpm and 120 min respectively, obtained with Ag_2O/AC, which presented a superior adsorption efficiency for organic removal in refinery wastewater.

Keywords: Wastewater, Adsorption, Batch process, New composite, Oxidation, Optimization.

1. INTRODUCTION

Nowadays, wastewater treatment has garnered significant importance because of the considerable release of oil contaminants with high concentration in wastewater **(Raheem et al., 2024)**. This influx of impurities into water bodies poses a severe threat to aquatic ecologies, precipitating a weakening in living standards and ecological superiority **(Ibrahim et al., 2019)**. To address this pressing subject, various approaches have been working, including physical, chemical, and biological approaches **(Hasannajy et al., 2021)**. However, these methods are beset by limits such as the perseverance of refractory oil pollutants and

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the high apparatus costs **(Rashid et al., 2020).** So, the quest for an efficient and cost-effective wastewater handling method perseveres as an important challenge. In recent years, the use of adsorbents has emerged as a straightforward, effective, economical, and ecologically friendly approach to water cleansing **(Al-Zobai and Hassan, 2022)**. Adsorbents offer the advantage of selectively removing pollutants from water, thereby improving water quality and mitigating ecological squalor **(Sulaymon and Kshash, 2010)**. Hence, bio-based chemicals hold promise aimed at diverse requests **(Al-Jubouri et al., 2019).** Research efforts have progressively focused on exploring the potential of bio-based materials derived from polymer **(Qureshi et al., 2020)**, with the added advantage of the adsorbent's possibility for recycling through suitable desorption and regeneration procedures **(Jafer et al., 2019)**

While activated carbon adsorbents have traditionally been used because of their high surface area and large pore volume, polymers offer distinct compositions, structures, and properties **(Esgair, 2017).** The provided resources are unsafe by nature. Taking care of this before elimination is vital. It might be possible to recover wastewater separation and preserve environmental permits by treating these wastes **(Al-Hassan and Shakir, 2024)**. This treatment was used because it is very actual at eliminating oil contaminants from wastewater and uses very little energy because it runs at room temperature and atmospheric pressure **(Flayyih and Ali, 2022)**. Extra supports of this data were expected to comprise the wide obtainability of adsorbents and the comfort of regeneration of wasted bio adsorbent. Adsorbents that selectively adsorb oil-containing resources via chemisorption and physisorption come into direct contact with wastewater throughout the adsorptive oil development **(Nawaf and Abdulmajeed, 2024**). Silver (Ag) nanoparticles have been established to be potent oil agents against a spectrum of Gram-positive and Gram-negative oil and can be obtained through the reduction of silver salts **(Ding et al., 2024)**. It was shown that AC doped/ impregnated with silver can be professionally used for oil elimination from wastewater. Although nowadays, different adsorbents, including zeolite, kaolinite, bentonite, and cellulose, are widely used for water treatment applications, there remains an essential need to develop even more well-organized and inexpensive sorbents and filters, particularly for use in dirty areas. Many efforts have been made to solve these challenges by using modified AC-based composite resources **(Al-Gaashani et al., 2021)**. The purpose of the work is to prepare a new composite (Ag_2O/AC) from activated carbon from upholstery waste with precipitation in silver nitrate and investigate how the treatment affects the effectiveness of oil pollutants from refinery wastewater under various operating conditions of pH, time, agitation speed and dose by a newly developed innovative photo oxidation batch reactor of organic compounds in refinery wastewater. It was stated that the POBR would have a greater impact than a batch reactor. In this experiment, we used silver oxide to help oxidize organic compounds.

2. EXPERIMENTAL WORK

2.1 Material and Analytical Test

The Chemicals and materials used in this work are Sodium hydroxide, potassium hydroxide, hydrochloric acid, and silver nitrate, which were purchased from India and directly used without further purification. Refiner wastewater with high oil pollutants was measured by UV spectrophotometer (UVA type with wavelength 340 nm). After adsorption treatment, 40 mL of wastewater was placed in the closed cylinder with the purpose of disturbing the emulsion of pollutants. 4 ml of n-hexane was added with the acidic condition with low pH and followed by energetic mixing aimed at 3 min. Afterward, for 15 minutes, the solution was separated into two layers. The above layer involved the oil pollutants with solvent, and after that, the calibration curve was measured **(Hassan et al., 2019)**. The properties of wastewater from Al-Dora oil field in Iraq in **Table 1.**

Table 1. Wastewater properties

Parameters	**Oil pollutants (OP) (mg/L)**	**pH**	**Turbidity (TUR) (NTU)**	**TSS (ppm)**	**Conductivity (ms/cm)**
Value	285.4	6.77	77.4	17.1	144

2.2 Preparation of Activated Carbon

The activated carbon was prepared from upholstery waste by the carbonaceous method from local Iraqi. The polymer wastes were cleaned to remove any dirt that might have adhered, dried, and chopped to a size of 0.5 to 5 mm. The treated polymer waste was impregnated with 0.5 M NaOH for 24 hours to remove any impurities in the treated waste and enhance hydrophobicity. The pre-treated waste material was carbonized in a controlled environment (often in a furnace without oxygen) at a temperature of 600°C to remove volatile components, and a porous carbon structure was produced. The resulting activated carbon to cool below an inert atmosphere and impregnated the prepared activated carbon with potassium hydroxide, and the prepared material was washed thoroughly with ionized water and hydrochloric acid to eliminate residual activating agents and ash material. The prepared activated carbon was washed at 110 °C for 4 hours and used the prepared activated carbon for the preparation of photocatalyst material.

2.3 The Preparation of Photocatalyst

Firstly, the supported (AC) were washed with distilled water and then dried at 110 ˚C until a constant weight was attained. Steps in the dissolution process include the following: an appropriate amount of hydrated silver nitrate active compounds are blended for two hours using a magnetic stirrer that has been heated to a high temperature until a saturation mixture is reached. The mixture is mixed with activated carbon in a container and continuously stirred for two hours at room temperature after it has been fully impregnated. The impregnated AC is then dried and calcined in a furnace employing a tubular furnace, a programmed furnace device, and procedures with 600 ^{o}C. The charring process of material-support is avoided by using low nitrogen gas flow.

2.4 Technology of Photo Oxidation Reactor

By using the photo-oxidation treatment, the POBR was locally built to provide the most heat and mass transfer possible. Baghdad University, Chemical Engineering Department has built a new design of oxidation reactor. **Table 2** shows the pilot plant's stipulations. The digital baffle photo-oxidation batch reactor has three baffle attachments with the reactor wall (at the high 4 cm, width 0.3 cm, and thickness 1.2 mm), a mechanical mixer, a 25 cm shift of the impeller, and an impeller design (three flat-blades turbine) with a shift diameter of 0.6 cm (the impeller's dimensions were 1.2 cm, 0.8 cm, and 2.2 mm). The entire experimental arrangement of the photo oxidation reactor. The shape of the photo oxidation system is shown in **Fig. 1**. Next a specified oxidation period, the mixture was filtered to eliminate the adsorbents, and a spectrophotometer was used to determine the filtrate's overall oil concentration. Eqs. (1) and (2) were used to determine the oil elimination efficiency (Y%) and adsorption capacity (qt) of AC and the prepared Nano composite respectively.

$$Y\% = \left[\frac{C_o - C_t}{C_o}\right] * 100\%. \tag{1}$$

$$q_t = V\left[\frac{C_o - C_t}{w}\right] \tag{2}$$

Where: C_o, are the initial and final oil pollutants (ppm); V is the wastewater volume; and w is the prepared material (gm).

Table 2. Stipulations of the Digital baffle batch oxidation reactor

No.	Description	Specification
1.	POB reactor	250 ml
2.	Diameter of reactor	5 cm
3.	Depth of digital baffle	6 cm
4.	Impeller design (stainless steel)	Length 1 cm, width 0.6 cm and thickness 1.2 mm
5.	Baffle (design from Pyrex)	Three distributions
6.	Baffle design	High 4 cm, width 0.3 cm, and thickness 1.5 mm
7.	Preheater	Electrical heater
8.	Protected reactor	Glass wool

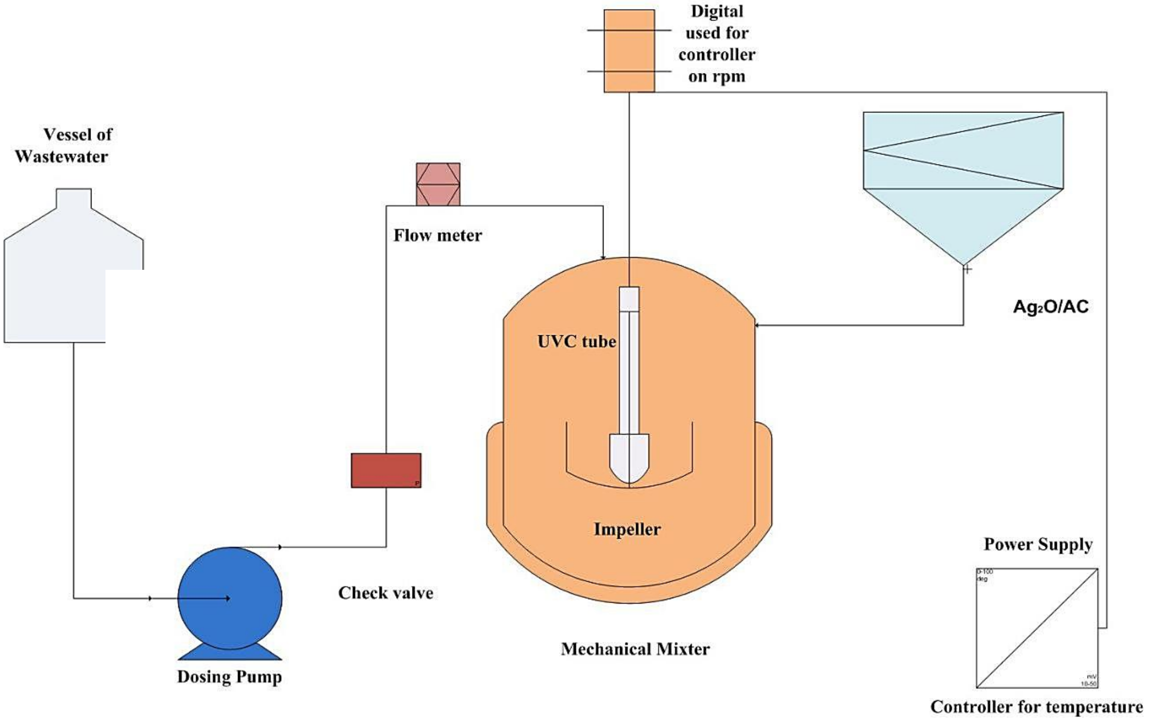

Figure 1. Design of Photo Oxidation Batch Reactor

2.5 Experimental Design

In this work, the finest of best conditions for wastewater treatment in the batch adsorption were available finished the Box Behnken design method by Response Surface Design. The independent variables are contact time (X_1), pH (X_2), Agitation speed (X_3), and dose (X_4). They were coded finished low and high levels in the design of Box Behnken (BBD) as shown in **Table 3.**

Table 3. Independent variables in the adsorption treatment

Limits	Ranges	Limits	Ranges
X_1: Adsorption time (min)	30-120	**X_2: pH**	3-9
X_3: Agitation speed	100-300	**X_4: Dose (g)**	0.25-1

3. RESULTS AND DISCUSSION

3.1 Examination of the Prepared Adsorbent Morphology

FT-IR test demonstrates that the adsorption treatment meaningfully affects the structure of activated carbon and prepared composite in **Fig. 2**. The region from 3000 to 3500 cm^{-1} in the FT-IR analysis corresponds to –OH stretching vibrations, which were characteristically connected to the number of hydroxyl groups in AC and prepared new composite samples **(Nawaf and Hassan, 2025)**. The comparative intensities in this variety drop subsequent to wastewater treatment, signifying a notable decrease for functional groups. The mechanical qualities of treated activated carbon were lost because of this reduction in the partial breaking of hydrogen bond structures in the prepared activated carbon. FTIR analyses of the AC with metals were carried out to characterize functional groups on their surfaces and follow any potential structural change because of the treatment with magnesium and silver metal **(Hassan and Shakir, 2024)** .

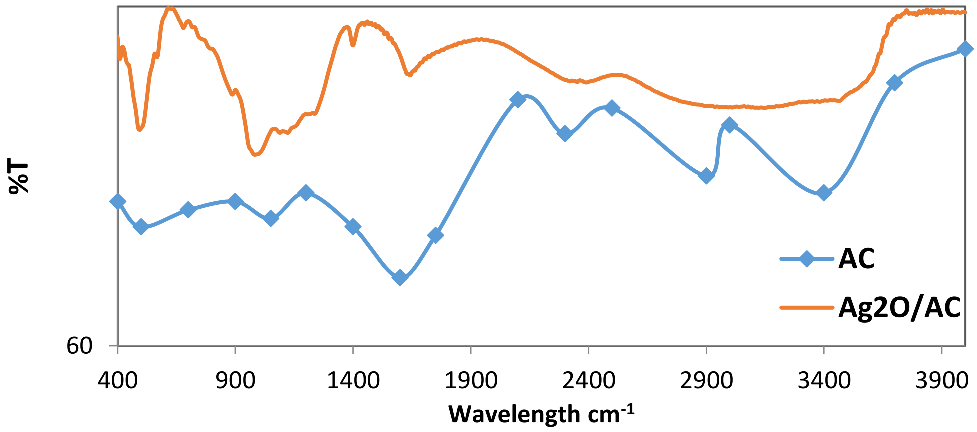

Figure 2. The FTIR test of (a) AC and (b) Prepared Composite

The grains were arranged with FE-SEM pictures in **Fig. 3 a, b, c,** and **d** for AC and prepared samples correspondingly. The surface of the new composite prepared by way of signifying the distribution of OH over the provision prepared AC. Excellent delivery of hydroxide ions over the surface of the provision. The characteristic different pores of the prepared nanocomposite were marked in the triangular and the FE- SEM picture, protests randomly distributed grains with smaller sizes **(Nawaf et al., 2025)**. From the FE-SEM test, it can be concluded that the creation of nanoparticles has a homogeneous shape structure, and it was grown in very high density with almost uniform spherical shapes. **Fig. 3c and d** show the FE-SEM micrograph measured for silver particles ranging from 20-45 nm. The activated carbon was in the range of 80-100 nm, and silver and magnesium oxides in nanocomposites were recognized with the average size of 150 nm **(Karthik and Radha, 2016)**.

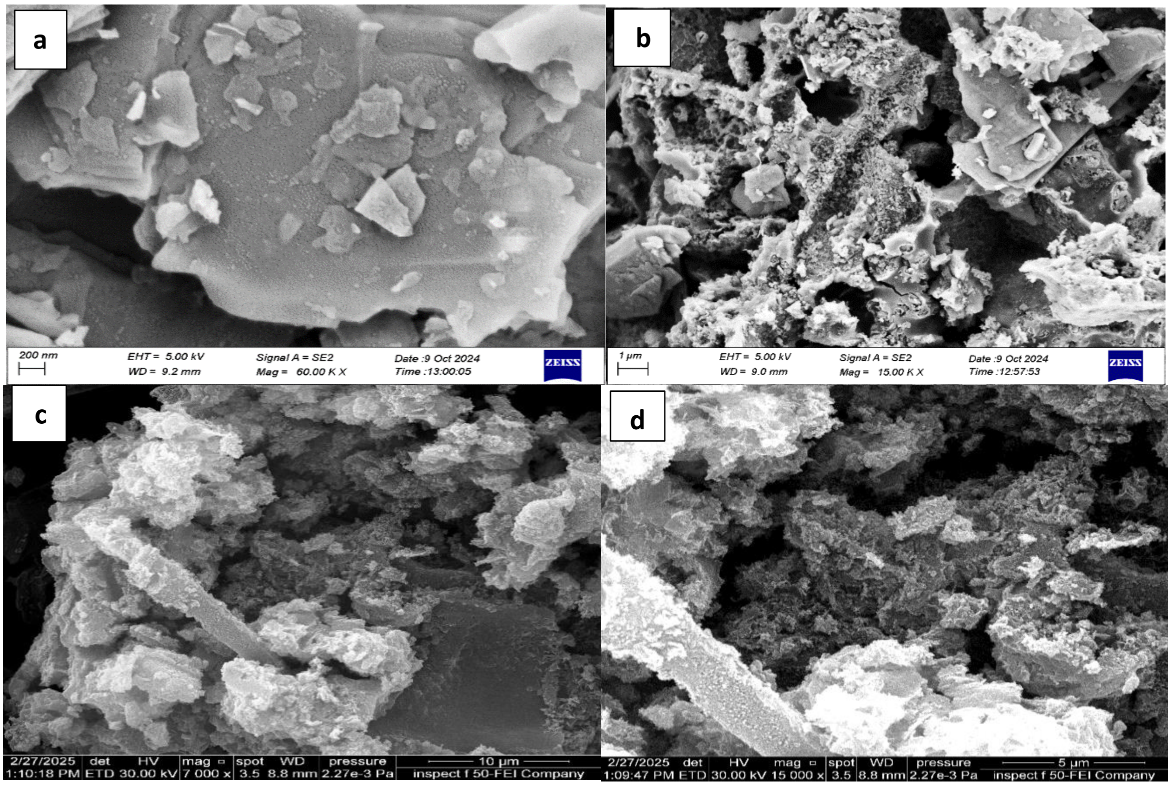

Figure 3. FE-SEM Test of (a) AC at 200 nm(b) AC 1µm and (c) Ag_2O/AC at 10µm (d) Ag_2O/AC at 5 µm

EDX determination was conducted to evaluate the purity of AC and Ag_2O obtainable in **Fig. 4**. The analysis exposed the presence of C, Ag, and O elements in the prepared samples, as shown in **Table 4**. No impurity peaks were experiential, illustrative high sample purity and settling the attendance of the intended elements examination was used to regulate the optical characteristics of the prepared activated carbon and activated carbon with magnesium dioxide correspondingly **(Alfattal and Abbas, 2019)**, the prepared activated carbon sample's surface area and pore volume were examined. It was found that the surface area derived from the present study is 510.3 and 488.9 m^2/g for AC and Ag_2O/AC correspondingly , this mean lead to reduce the surface area and increase the functional groups in prepared composite , suggesting that there may have been differences in activated carbon and activated carbon with metal preparation, untried setup, or logical methods between studies **(Pandi et al., 2021)**. In the manner shown in **Fig. 5a** and **b** for prepared composite with metal oxides respectively.

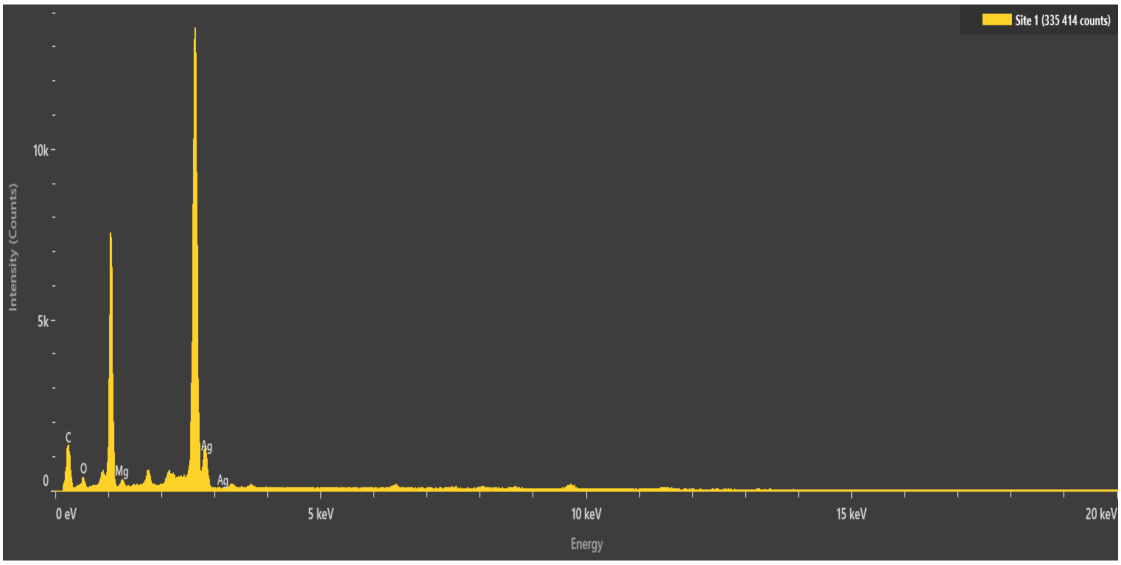

Figure 4. EDX Test of Prepared Composite

Table 4.EDX of prepared adsorbent

Element	Atomic %	Atomic % Error	Weight %	Weight % Error
C	57.3	2.2	51.8	1.9
O	38.2	1.7	45.6	2.0
Mg	1.4	0.2	2.6	0.3
Ag	3.1	0.15	1.8	0.2

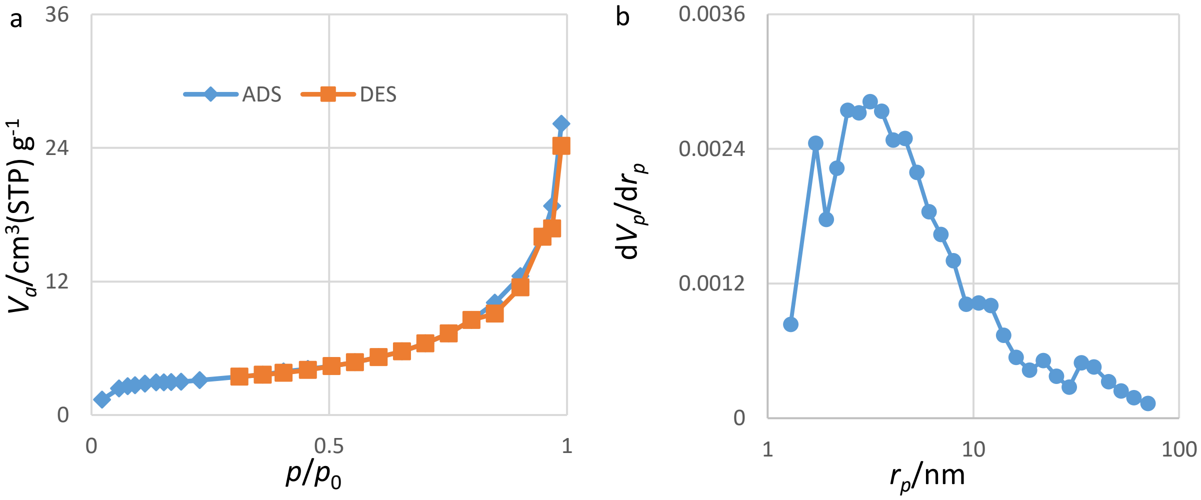

Figure 5. Adsorption-Desorption Isotherms (a) and the Distribution of Pore Size (b) of the Prepared Composite

3.2 Regression Model

The final runs pollutants in RWW (27 tests were conducted by BBD), and the elimination competence response at each AC, and Ag_2O/AC on the oil adsorption and oxidation treatment run were explained in **Table 5** was manufactured in terms of actual factors connecting the oil elimination response to the active variables, representative of the interconnections between these variables, and was founded based on activated carbon and prepared composite and compared between them. The consequences in **Fig. 6** clarify the high-competence response of elimination along the contact time of all values of the oil elimination by Ag_2O/AC new composite. The prepared new composite was highly eliminated at an acid solution and had a strong interaction directed to oil pollutants and vice versa to pH on the oil elimination when increasing the pH led to a reduction in the oil elimination. This is because there is an interaction between the oil compounds in RWW and the prepared adsorbent due to the van der Waals forces and high surface area of the adsorbent **(El Kaim Billah et al., 2023)**.

Table 5. Results of the BBD experiments

NO.	**Time (min) X_1**	**pH X_2**	**Agitation speed (rpm) X_3**	**Dose (ppm) X_4**	**Oil elimination by AC**	**Oil elimination by Ag_2O /AC**
1	30	3	200	0.6	60.4	78.77
2	120	3	200	0.6	74.2	89.5
3	30	9	200	0.6	44.1	75.9
4	120	9	200	0.6	64.6	82.3
5	75	6	100	0.2	40.5	65.4
6	75	6	300	0.2	52.4	73.3
7	75	6	100	1	70.4	95.5
8	75	6	300	1	77.4	98.9
9	30	6	200	0.2	51.5	74.6
10	120	6	200	0.2	69.5	87.6
11	30	6	200	1	69.3	89.3
12	120	6	200	1	74.6	99.6
13	75	3	100	0.6	72.6	92.3
14	75	9	100	0.6	68.4	87.6
15	75	3	300	0.6	70.2	98.3
16	75	9	300	0.6	73.2	92.3
17	30	6	100	0.6	61.3	79.1
18	120	6	100	0.6	68.8	87.2
19	30	6	300	0.6	68.6	89
20	120	6	300	0.6	72.8	95
21	75	3	200	0.2	65.6	84.4
22	75	9	200	0.2	58.4	77.6
23	75	3	200	1	71.9	97.5
24	75	9	200	1	71.6	87.6
25	75	6	200	0.6	72.8	87.7
26	75	6	200	0.6	71.5	88.8
27	75	6	200	0.6	72.7	87.8

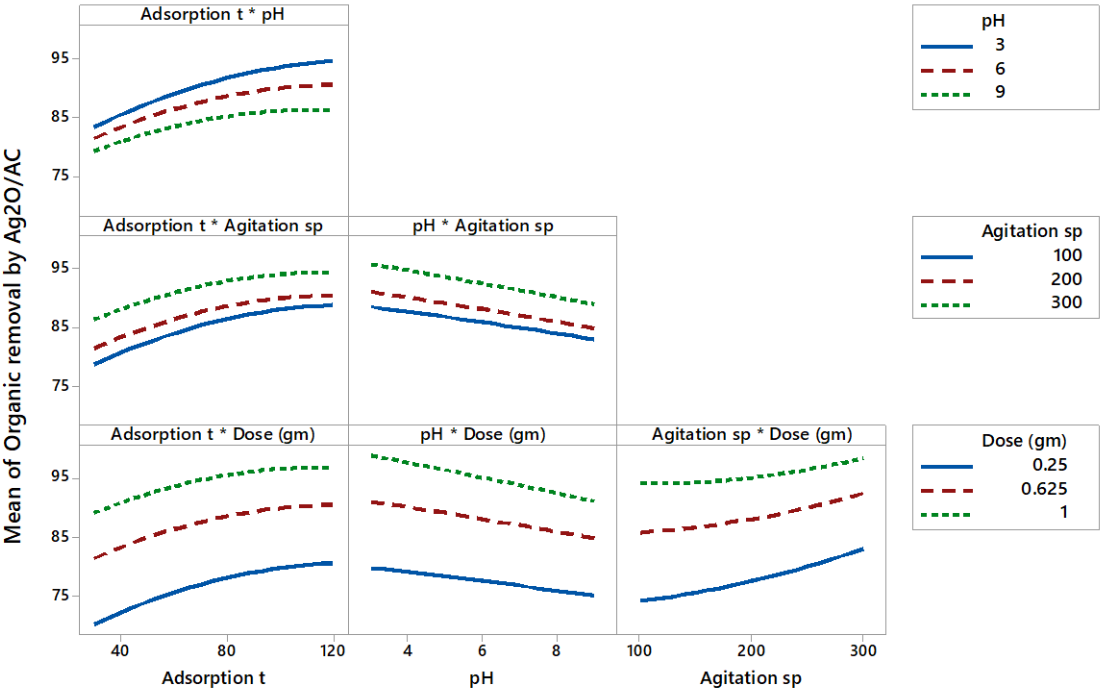

Figure 6. Plot of Working of Prepared Nano Adsorbent

3.2.1 Effect of pH Solution

One of the most important factors manipulating the adsorption process in RWW was pH. The rating of ionization of the wastewater during this method and the prepared activated carbon shallow charge are both impacted by pH. H+ can be temporarily powerfully contested through the oil compounds intended for this treatment site. So, the effect of solution pH on oil pollutant adsorption in RWW was verified **(Su et al., 2023)**. The trials were conducted at an early pH in the range from 3 to 9 to select the best pH and stop the precipitation of oil compounds, the oil elimination of 93.4 and 80.5 to 85.9, 77.5 of Ag_2O/AC, and AC at 3 and 9, correspondingly, were presented in **Fig.7**. Like findings on the oxidation of pollutant contaminants **(Hassan et al., 2020)**.

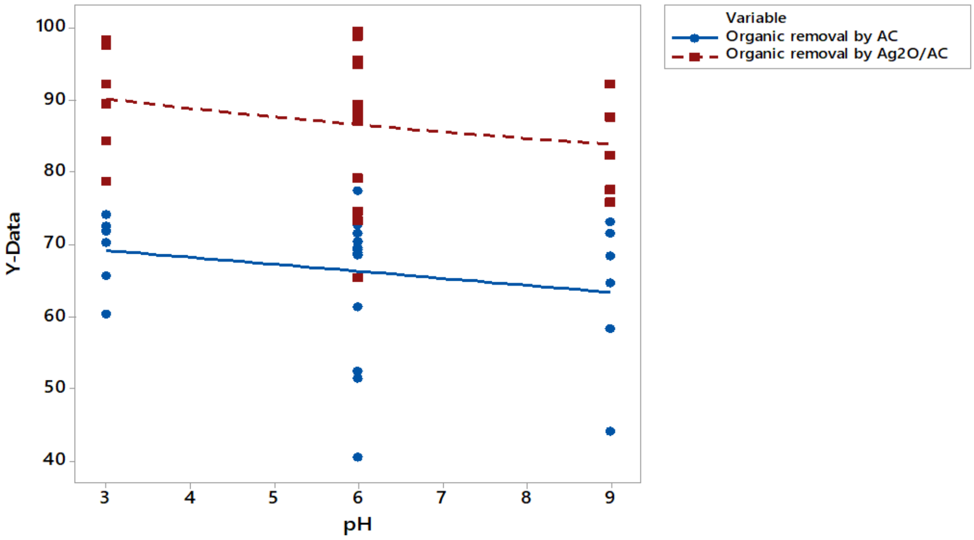

Figure 7. Effect of pH on Oil Elimination

3.2.2. Effect of Dose

The effect of dose on the ratio of pollutants detached from RWW with an increase in the dose leads to an increase in the oil elimination as presented in **Fig. 8**. To upsurge the dose from 0.2-1gm, the percentage elimination augmented from 55.3 and 76.4% to 65.2and 93.4% at constant the other variables of AC, and Ag_2O/AC correspondingly as shown with increase in the dose lead to increase in the oil removal in refinery wastewater and the increasing adsorption locations and empty site consumption had a minor consequence on the relative oil elimination at high adsorbent amounts **(Hassan and Al-Zobai, 2019)**.

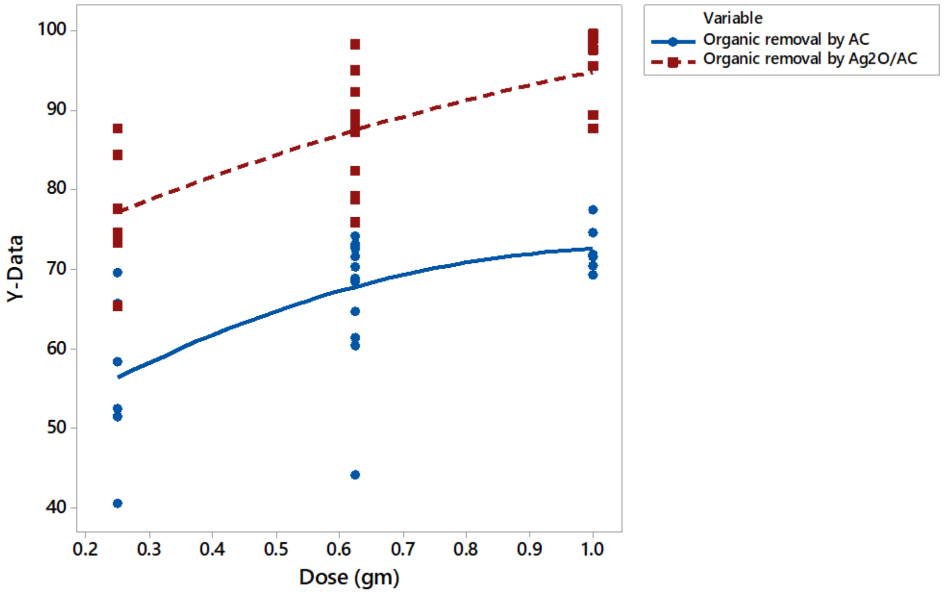

Figure 8. Effect of dose on oil elimination

3.2.3 Effect of Adsorption Time

The adsorption method was progressively augmented by the contact time. This continued for 1.5 hours, after which it remained constant. As a consequence, the equilibration duration was prudently set at 2 hours, which was carefully sufficient to ensure that this absorbent would eliminate any oil pollutants in refinery wastewater **(Hamza et al., 2025)** . To preserve adsorption symmetry, the adsorption duration was kept constant at 2 hours in the following tests. Prominently, the contact time arcs in **Fig.9** remain flat and continuous, indicating the possibility of monolayer attention of oil contaminants on the prepared activated carbon surface from polymer waste. Since the available lively sites have saturated, and the time has been conserved after two hours **(Jafer and Hassan, 2019)**.

3.2.4 Effect of Agitation

To study the effect of agitation speed on the performance of the adsorption method of the prepared Nano adsorbent, experiments were tested at agitation speeds of 100,200, and 300 rpm. The pollutants removal augmented with the cumulative speed, which reached 64.1, 85.2 to 68.4, and 90.2% at 100 and 300 rpm of AC, and Ag_2O/AC correspondingly, as presented in **Fig.10 (Fayazmanesh et al., 2015)**. A higher speed would lead to a higher mix of prepared activated carbon with oil contaminants in refinery wastewater, leading to a greater degradation of oil pollutants **(Sulyman et al., 2021)**.

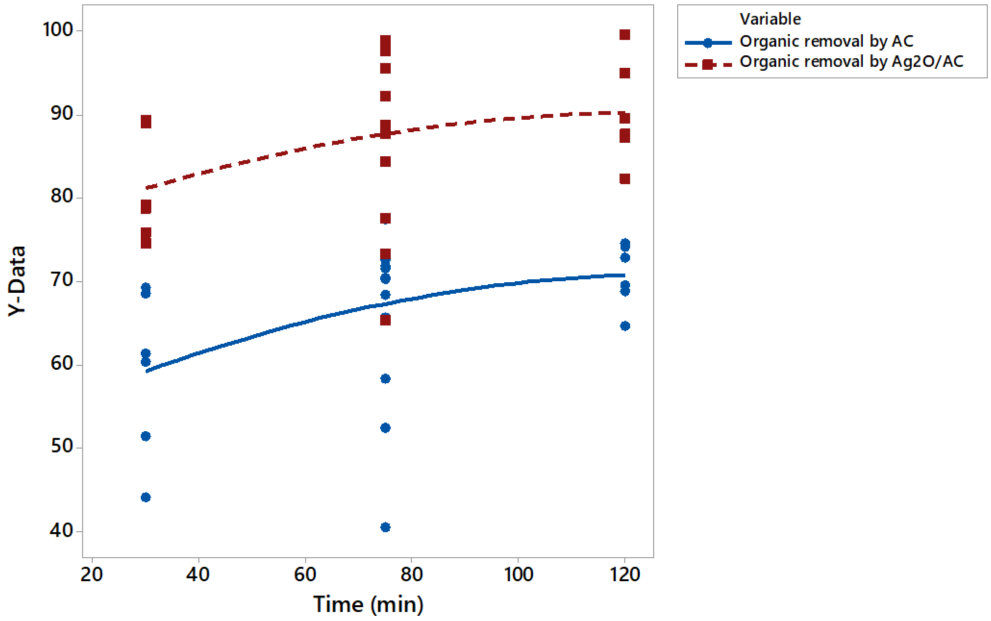

Figure 9. Effect of Adsorption Time on Oil Elimination

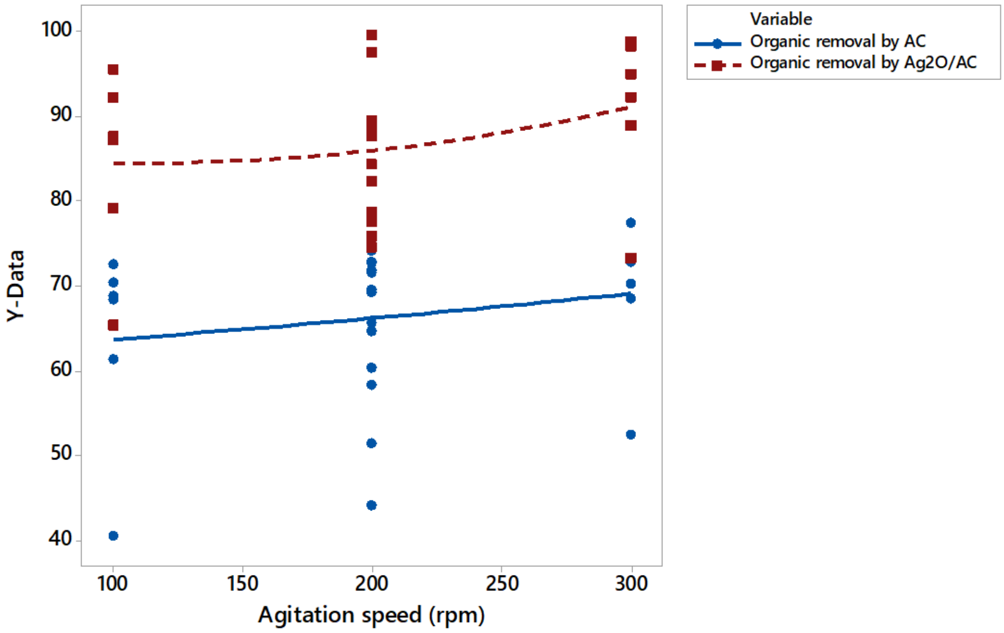

Figure 10. Effect of Mixing on Oil Elimination

3.3 Adsorption Isotherm Models

Langmuir and Freundlich adsorption isotherm models are used to fix the relationship between the wastewater as the adsorbate and the prepared nanocomposite as the adsorbent. The Langmuir model is founded on the statement that the adsorbent surface is homogeneous, with known adsorption places that happen in a monolayer with one layer of wastewater molecules adsorbed. The Freundlich model is an experiential model that applies to heterogeneous surfaces with different types of adsorption sites with varying affinities for the wastewater **(Manesh et al., 2022)**.

The Langmuir equation can be represented by Eq. (3).

$$q_e = \frac{q_{mK_L C_e}}{1 + K_L C_e} \tag{3}$$

q_e Is the quantity of oil adsorbed, C_e the oil pollutants at equilibrium, $K_L$the Langmuir coefficient, and q_m is the adsorption capacity.
The Freundlich model is presented by Eq. (4), can be practical for adsorbent multilayer adsorption.

$$q_e = K_F\, C_e^{1/n} \tag{4}$$

Where K_F was the Freundlich constant connected to the adsorption capacity, and n was the heterogeneity limit that specifies the model **(Abdul majeed and Sabar, 2017)**.

Freundlich, Langmuir, and isotherm equations were fitted to the adsorption data for the prepared nano adsorbent. According to connotation coefficients, the Freundlich model outstripped the other model in terms of how well it accounted for the evidence ($R^2 > 0.98$ and the Langmuir model in **Fig. 11a** and **b** vs. 0.92 and the Freundlich model in **Fig. 12a** and **b**) of activated carbon from AC and Ag_2O/AC correspondingly. In addition, this outcome is similar to that of **(Yin et al., 2023)**.

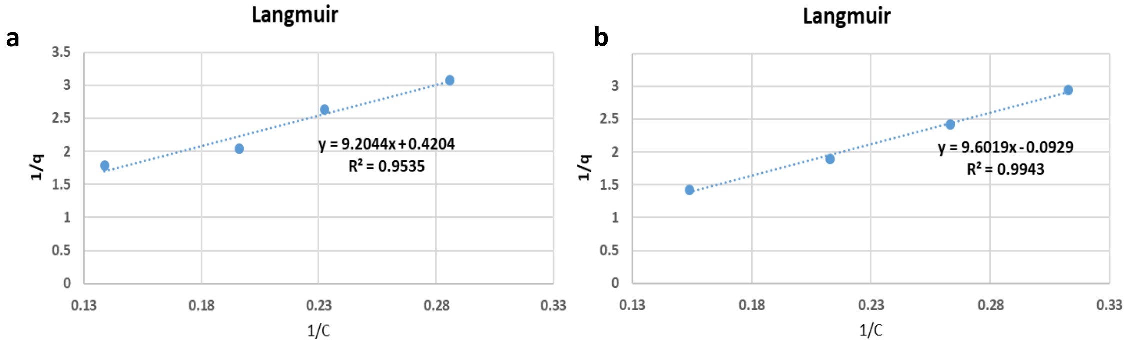

Figure 11. Langmuir model of (a) AC and (b)Ag_2O/AC

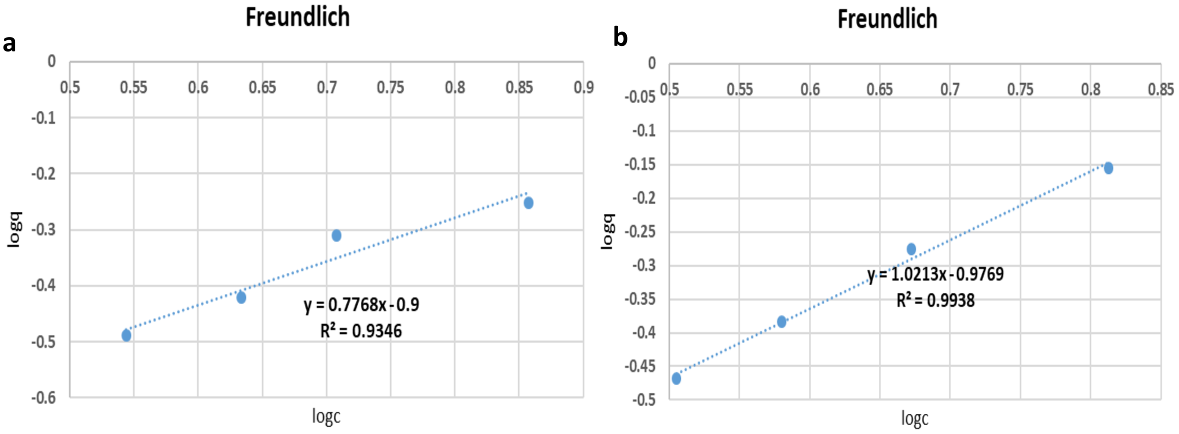

Figure 12. Freundlich model of (a) AC and (b) Ag_2O/AC

3.4 The Kinetic Catalytic Oxidation

The impact of photocatalytic organic compounds oxidation degradation over Ag_2O/AC related to the new composite and pH solution **(Nawaf et al., 2025)**. The activated carbon with metal oxide was deliberately subjected to certain coefficients: a range of pH and silver oxide, with coefficients for the other limits, with a 0.1 g dose, a 15 min time, and room temperature **(Al-Hassan and Shakir, 2024)**

. The results showed that by way of pH and an increase, more free radicals were produced due to the degradation of silver oxide in the acid solution, and an increase in Ag_2O volume, a highly reactive agent was produced, which assisted in the treatment of organic compounds and enhanced the oxidation. So, the step of degradation step accelerated. However, pollutant degradation only slightly decreased when the pH value was changed from 3 to 9, and the different results for metal concentration increased with increased concentration. The intricate actions involved in the elimination of organic compounds in refinery wastewater make it stimulating to discern between various responses. As a result, expected kinetics for the breakdown of the pollutants can be presumed. Most organic removal curves, according to the author, are with first-order kinetic oxidation. The kinetic is expressed by of first-order model with Eq. (5).

$$\ln\left[\frac{C_O}{C}\right] = K_1 t \tag{5}$$

As shown in **Fig. 13**, the pseudo-first-order model was recommended by the kinetics examination of the prepared composite created in this study, which exposed a satisfactory relation between reaction time and the concentration ratio logarithm. A first-order model constant (k_1) value of 0.0431 min^{-1} was experimental in the prepared composite when the pH concentration was preserved in an acid solution.

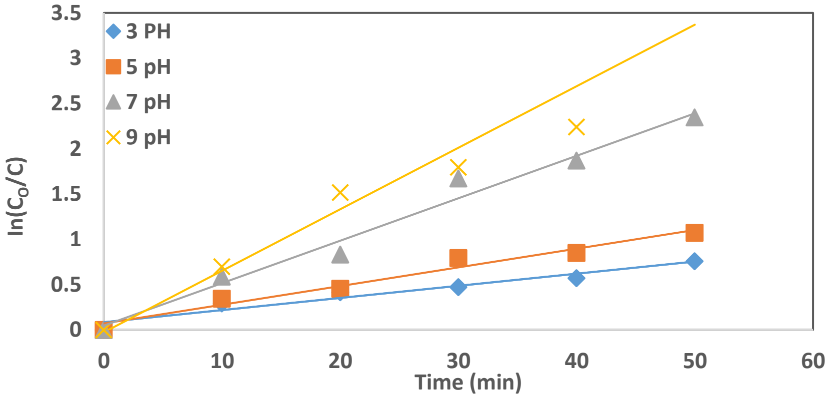

Figure 13. First-order model for Fenton-like degradation at pH

3.5 The Mechanism of New Composite

The removal of organic compounds from refinery wastewater using the new composite occurs through a synergistic photo oxidation and adsorption mechanism in which the porous activated carbon support for organic removal onto its high-surface-area structure, while magnesium oxide nanoparticles fastened on the support surface provide basic sites that enhance adsorption and indorse interfacial charge transfer, and silver oxide particles act as visible-light-active centers that absorb photons (hv) to produce electron–hole pairs**(Hassan and Naeem, 2018)**, where the photo generated electrons migrate from the conduction band of silver oxide and magnesium oxide to the conduction band activated carbon matrix, efficiently separating charges and overpowering recombination, though the remaining holes in the valence band of silver oxidize water or surface hydroxyl groups to produce highly reactive free radicals (•OH), and the transferred electrons react with dissolved oxygen to form superoxide radicals ($\bullet O_2^-$) for organic compounds removal in refinery wastewater which together initiate a series of oxidation reactions that decompose complex organic contaminants into into carbon dioxide and water as shown in the **Fig. 14** **(Al-Hassan and Shakir, 2024)** .

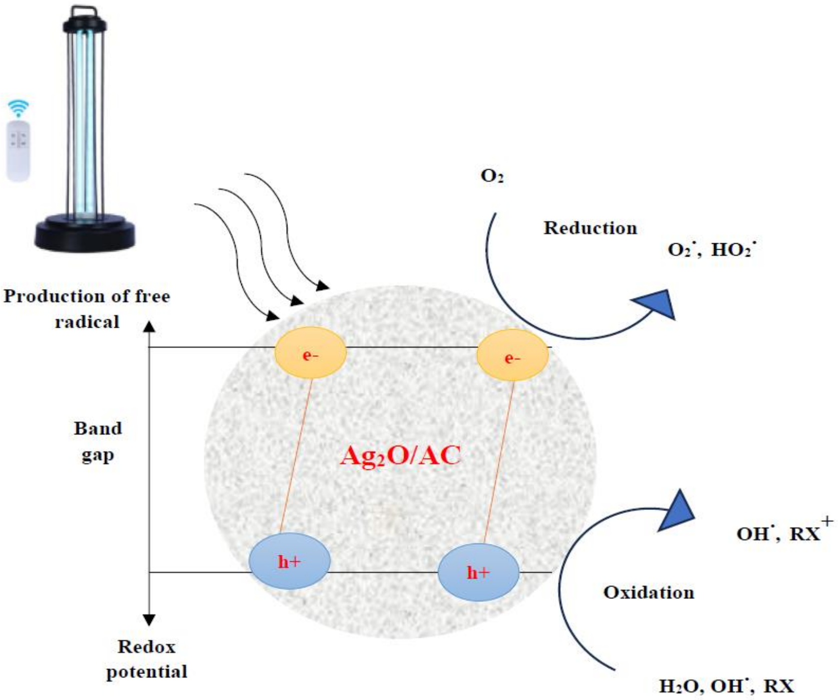

Figure 14. The suggested mechanism of Ag_2O/AC

4. CONCLUSIONS

The results showed that the prepared new composite used as adsorbent and photo degradation from activated carbon prepared from upholstery waste silver nitrate are a low-cost composite that can be used to remove oil pollutants from refinery wastewater. The enhanced electron density on the AC surface brought on by the attached hydroxyl functional groups was most likely caused by the development of a microporous structure of prepared activated carbon. The Freundlich isotherm model was shadowed through the adsorption treatment. The composite Ag_2O /AC, manufactured by incorporating silver dioxide onto the surface of the AC, exhibits improved oxidation capabilities because of the synergistic effect of oxidative properties and the high surface area and porous structure of activated carbon. The use of the precipitation method for Ag_2O deposition ensures uniform distribution, additionally enhancing the material's efficiency in removing oil pollutants from refinery wastewater. The incorporation of the prepared composite into a newly designed UV-assisted oxidation batch reactor meaningfully improved the degradation presentation, owing to the synergistic effects of adsorption and photocatalytic oxidation under UV irradiation.

Credit Authorship Contribution Statement

Raghad F. Almilly conceptualized and designed the work, shared the investigation data examination, and manuscript preparation and editing. Talib M. Subkh conducted the experiments and contributed to data analysis and manuscript writing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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تصميم مركب جديد صديق للبيئة من Ag_2O/AC لمعالجة مياه الصرف عبر الامتزاز والأكسدة المزدوجة، مدمج مع مفاعل جديد يعمل بالأشعة فوق البنفسجية لتحلل الملوثات العضوية في النفايات الصناعية

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الخلاصه

.تم في هذا العمل تحضير مركب جديد (Ag_2O/AC) يُستخدم كمادة ممتزة ومؤكسدة، وذلك من الكربون المنشط المُحضّر من نفايات التنجيد باستخدام طريقتي الكربنة والترسيب بمحلول نترات الفضة المائية بتركيز 5% وبالاستعانة بمفاعل ضوئي للتأكسد لإزالة المواد العضوية من مياه الصرف الصناعي لمصفاة النفط باستخدام تقنية التشغيل الدفعي، حيث تمت مقارنة كفاءة الإزالة بين الكربون المنشط والمركب الجديد باستخدام تقنيات FTIR وFE-SEM وEDX وBET لتوصيف الخصائص الفيزيائية والكيميائية للعَيّنات المحضره، وتم اختبار كفاءة الإزالة تحت ظروف تشغيلية شملت الكميات (0.2–1 غم)، ودرجة الحموضة (3–9)، وسرعة التحريك (100–300 دورة/دقيقة)، ومدة الاكسده (30–120 دقيقة)، وقد أظهرت النتائج أن المركب Ag_2O/AC حقق أعلى كفاءة إزالة للمواد العضوية بنسبة 99.6% مقارنة بـ74.6% للكربون المنشط عند الظروف المثلى (1 غم، pH = 3، 300 دورة/دقيقة، 120 دقيقة)، مما يثبت تفوق المركب الجديد في امتزاز وإزالة المواد العضوية من مياه صرف مصافي النفط..

الكلمات المفتاحية: مياه الملوثه، الامتزاز ، عملية الدفعي، المركب، الاكسده، التحسين.