

PHENOL ORGANIC IMPURITY REMOVE FROM POLLUTANTS WATER BY BATCH ADSORPTION STUDIES WITH USING MAGNETO CHITOSAN NANOPARTICLE

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ABSTRACT

Magnetite Nanoparticle was prepared by coprecipitation of iron with aqueous NaOH. The Fe₃O₄-chitosan magnetite-chitosan Nanoparticle with a core-shell structure diameter of 20-40nm. (1) Use of magnetite-chitosan Nano composites on the removal of organic pollutants from waste water. The water treatment became the most critical in all universes. Increase in the population and industrialization resulting into the water the impure water is toxic and carcinogenic for animals and human and in which technique can be used adsorption method for water treatment with magnetite-chitosan Nanocomposites. (2) The MCNPs use for this purpose can be the best method; the magnetite-chitosan Nano composites efficiency for removal of harmful in solution could be changed by applying moderate magnetic field. Magnetite-chitosan Nano composites were studied to remove phenol organic pollutants from waste water. A simple and an effective approach was used in regard to preparing MCNP on the chitin surface and chitosan-magnetite MCNPs characterization method of FTIR, SEM, TEM, UV. The magnetite-Chitosan composite were optimized to remove organic pollutants, phenol with amount of adsorbent, initial concentration, agitating time, initial concentration. Pollutants and pH parameters. (4). In optimum conditions, room temperature, the magnetite-chitosan NPs could recover organic pollutants, phenol, the removal capacity of MCNPs has been increased to 48%. The MCNPs composite have heavy adsorbents which could explore a bio-compatibility and strategy environment-friendly for organic pollutants removal, and appears to be the new promising material treatment pollutants water application. (5)

Keywords: Magnetite, Adsorption, Chitosan, Phenol, MNCP nanocomposites.

Introduction

The all world country are facing distilled water problems and they are very

suffering especially in developing countries. (6) all the country is facing challenges in meeting rising demands of pure water as the available supplies of drinking Water has a broad impact on all aspects of human life including but not disadvantage to, energy health, food, and economy. In addition to the, economic environmental, and social impacts of poor water, the available of fresh water is compulsory for the safety of children and the poor. It is about that 15–20 million human dead every year due to water diseases and nonfatal infection causes death of more than 780 million people every year. Every week, about 7,000–8,000 children die due to the water-related problem of diarrhea. There are currently more than around 0.80 billion human in different-different country who did not have idea to safe water result resources in major health problems. *safe water a day* – 24 liters – is the minimum needs a child. This is enough for drinking and washing, eating, and basic some working. 2.5 billion do not have available equate sanitation. Human die annually from the consequences of water and disasters-related diseases. Various treatment indicate that, based on fresh water as usual, ~3.5 planets Earth would be needed to sustain a global population achieving the current lifestyle of the average. (7) Adsorption methods using very low cost compare to other different method like as a reverse osmosis, activated charcoal, and ions filtrations, coagulations and floatation and filtration and method oxidations reduction process for waste water treatments. adsorption different

methods available like as a column chromatography adsorptions, adsorptions langumerier,frandlich method available for water treatment but batch adsorptions studies methods available for waste water treatment for different concentrations check the adsorbents by atomic absorption spectroscopy Phenol remove during drinking water analysis because phenol very harmful organic pollutants this disease create using phenol water solution like as a heartattack,liver damage,kindey damage etc.differernt disease create in human body

Chitin contains nitrogen is a modified polysaccharide that; it is synthesis from units of N-Acetyl-D(-glucosamine 2-acetyl amino)-2-deoxy--glucose). These units form covalent β -(1 \rightarrow 4)-linkages (similar to the linkages between glucose units forming cellulose).(8) however , chitin may be prepared as cellulose with an acetyl amine group on each monomer replaced with an one hydroxyl group. This allows for chitin-polymer matrix increased strength increased hydrogen bonding between adjacent polymers giving. In the current study, a modification of pure chitosan was realized to form two differently modified derivatives: (1) cross-linked with functionalized with magnetic Nanoparticle and Glutaraldehyde (denoted as chitin) and cross-linked with glutaraldehyde (denoted as chitosan) Many possible interactions between materials and organic pollutants phenol were conclusion after batch adsorption studies and explained by characterization with many techniques (SEM,TEM TEM EDAX of MCNP) The batch adsorption studies result was done studying different parameters as the effect of pH, temperature contact time, , in line with a brief thermodynamic analysis.(9)

2. Material and Methods:

2.1 Materials: standard reference sodium hydroxide and chitosan and chitin and

with a degree of deacetylation of 80–90% used without any further treatment. Phenol (atul product ltdAll the other chemicals used were of analytical grade. 28% (mass/volume) ammonia. 0.5% (volume/volume) glacial acetic acid, 0.5g of chitosan in 200mL of 0.5% (volume /volume) acetic acid solution 4.7g of FeCl₃·6H₂O and 2.4g of FeSO₄·7H₂O, 6mL of Epichlorohydrin (10)

Method Batch adsorption studies

Batch experiments were performed to observation phenol batch adsorption studies property on the prepared MCNCs by placing 0.1 mg of Nanoparticle in a series of flasks containing 50 mL off pollutants aqua solution at pH 4 - 10. Then the contents of the flasks were stirred in a stirrer at 15 - 40°C for 1 - 120 minutes with 100 - 150 rpm stirring. The residual concentration of thephenol ions in the pollutants aqua was observed d by atomic absorption spectroscopy . The amount of phenol adsorbed per gram of the MCNCs adsorbents was calculated according to the this equation:((12)

$$q_e = \frac{(C_e - C_o)V}{W}$$

Where: q_e is the adsorption capacity (mg/g), C_0 and C_e are the initial and equilibrium concentrations (mg/L), respectively, W is the weight((g) and phenol in solution, V is the volume (L), of the adsorbent MCNCs

2.4. Preparation of magnetic-chitosan Nanocomposites (MCNCs).

The MCNP was synthesized as the technique described in different former research paper study [10], with the main steps as follows.(13) Chitosan solution was prepared by dissolving 0.5g of chitosan in 200mL of 0.5% (volume/volume) Acetic acid solution with continuous stirring. 4.7g of FeCl₃·6H₂O and 2.4g of FeSO₄·7H₂O, which was dissolved in 22mL of distilled

water, respectively, were added to the chitosan solution by stirring at 1000 rounds per minute for 20 min in a water bath at 40°C. After that, 40mL of 28% (m/v) ammonia added drop -wise into pour the reaction system.(14) After 20 min, the system temperature was fixed to 60°C and then 6mL of Epichlorohydrin was added to the system with continuous stirring at 1000 rpm for 3 hour . the separated resulting MCNP by a magnet field. Finally, the obtained MCNP was washed by 0.5% (volume/volume) Acetic acid, alcohol for three times And distilled water, respectively and dried in a oven at 60°C till reaching constant weight. The total amount of amine groups, or the degree of deacetylation (DDA%) of MCNCs can be obtained with the nitrogen to carbon nation (15)

RESULTS AND DISCUSSION

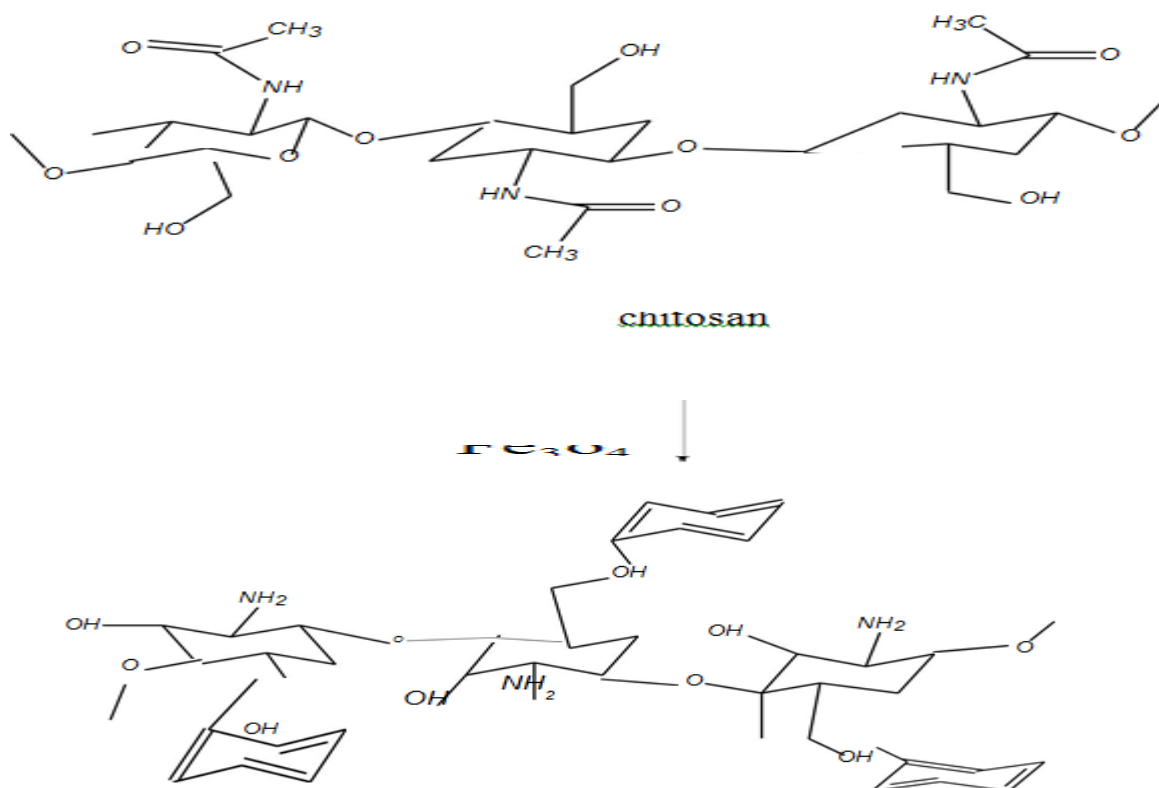
The preparation of chitosan involves different chemical steps such as preparation of the chitin from the crude

shells which will be the initiation of the chitin synthesis with the remove of the proteins in the cells followed by demineralization for the removal of the carbon and other salts in the crude present form which would be preceded by the deacetylation of the chitin that would be analysis in chitosan polymer.(16)

Chitin is the polymer chitosan is a modified polysaccharide that contains nitrogen; it is prepared from units of Acetyl D-Glucosamine (to be precise, 2-(Acetyl -amino)-2-deoxy-D-glucose).

These units form covalent β-(1→4)-linkages (similar to the linkages between glucose units parts

Forming cellulose).however, chitin may be described as cellulose with an acetyl amine group on each monomer replaced with one hydroxyl group . This allows for increased strength Between adjacent polymers giving the chitin-polymer matrix increased hydrogen bonding.(17)



Characterization of magneto-chitosan nanoparticle . The structure of magneto chitosan nanoparticles was studied Previous Work Characterizations

By spectroscopy figure ; Transmission Electron Microscopy Figure : TEM EDAX of MCNP Figure : Scanning Electron Microscopy image of MCNP.

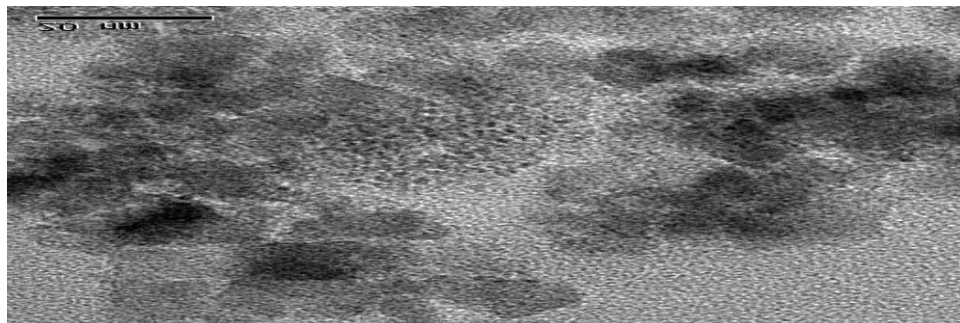
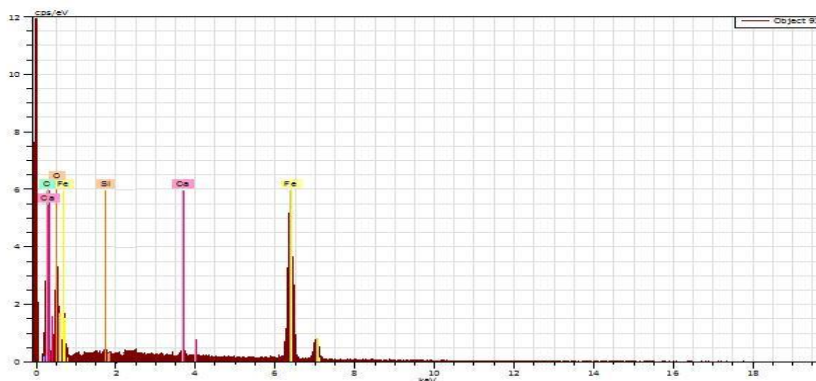


Figure: TEM image of MCNP.



Figure; TEMEDAXofMCNP.

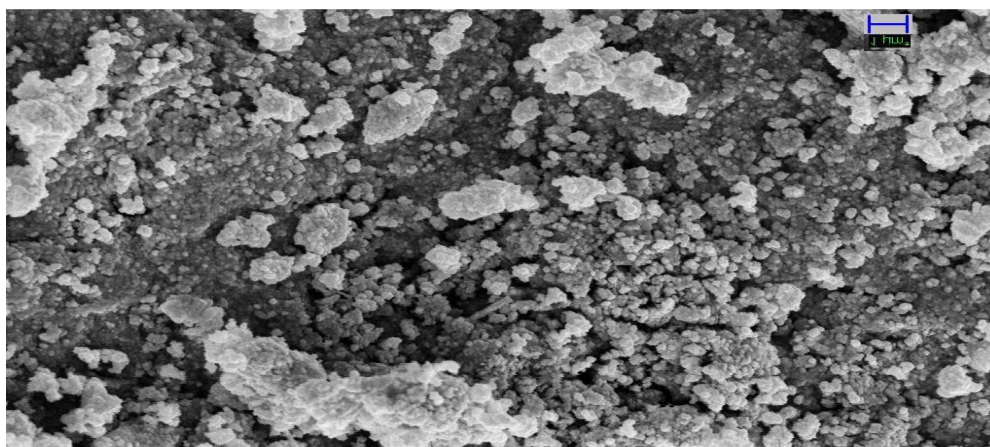


Figure:SEM of MCNP.

Charaertisation of MCNPs

The transmission electron microscopy (TEM) Characterization by materials,

ceramic matrix nanocomposites (MCNCs), in particular. Scanning electron microscopy is a different to obtain

information about a sample's surface shape topography and composition in industries and different fields such as medical devices microelectronics, general manufacturing semiconductor and litigation adjusted and food processing. Digital image resolution as low as 15 nanometers Magnification for all imaging is to traceable and calibrated standard For the case of MCNP, structural and morphological characterizations of Chitosan and nanostructure phases were carried out, and for the case of MCNPs, distribution and dispersion of nanoparticles as well as inter particle distances between them were investigated. The analysis Image for coating, grain size thicknesses determinations and particle sizing can be applied to the saved images Qualitative.(18)the Elemental analysis, quantitative analysis, x-ray line scans and mapping could be performed on both of the SEM analysis.(19) Chemically MCNCs Nanocomposites have been prepared by a gel- sol route. Analysis by TEM-EDAX confirmed that the dopants, magneto chitosan had been in- incorporate into the pollutants. However, each sample displayed variability in the level of doping in- corporation in many particles within the equal sample. Particle sizes were ≤ 100 nm for samples modified by magneto-

chitosan analysis with particle morphology, with dimensions $\sim 200\text{nm} \times 50 \text{ nm}$ (20)

Phenol analysis by chromatography method;

The phenol concentrations were detected chromatography by high-performance liquid (HPLC) chromatograph RP-select B column (11 cm, 5.5 mm.) and an UV detector. The isocratic mobile phase was water-methanol 30:70 v/v, the flow-rate was 1 mL/min, and detection was done at 272 nm. Before detected, supernatant samples were filtered (0.40 mm membrane porosity).

Effect of adsorbent mass

The effect of the dosage of adsorbent (3.5×10^{-3} to 3.5×10^{-2} g/mL) on organic pollutants Phenol remove is shown in graph 1. It can be observed that organic pollutants phenol adsorption increases in the range (5.5×10^{-3} - 1.5×10^{-2} g/mL) for both chitosan and chitin (21). The adsorbent dosage was fixed at 1.5×10^{-2} g/mL for all further experiments. That as changes pH and different particle size (in this case: 50-100 mass) almost, smaller organic pollutants phenol particles have heavy capacity of analysis remove(22)

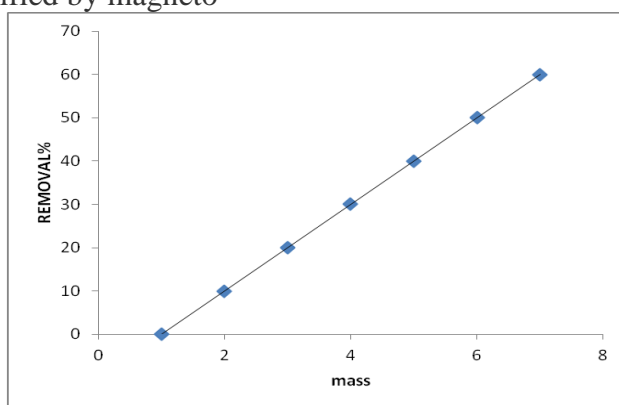


Figure 1: Effect of adsorbent doses on removal of phenol by magneto chitin and chitosan.

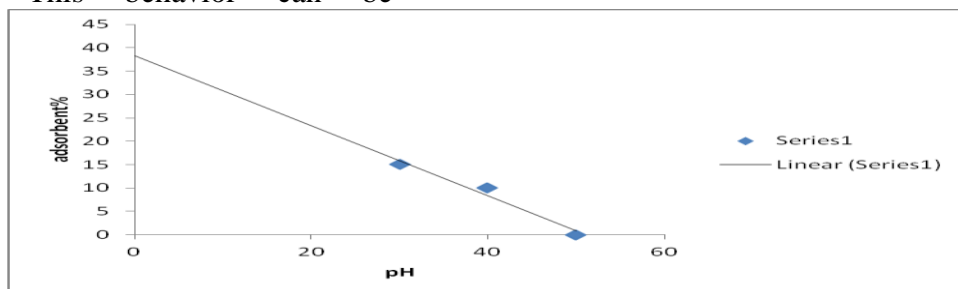
Effect of adsorbent of chitosan pH.

The effect of pH on phenol adsorption by chitosan and chitin is represented in graph 2 The data show that the phenol removal increased with decreasing initial pH for both adsorbents. Chitin and chitosan

contain different organic functional groups such as hydroxyl, acetamido, and amino that is prone to adsorb molecules by hydrogen bonds, Van der Waals interactions, and ion exchanges. Depending on the pH, the amino groups are present

in prorogated or neutral forms.(23) At low pH, the ammonium groups may exert electrostatic interaction with phenol thereby increasing the adsorption efficiency. This behavior can be

explained considering the fact that variations of pH affect the ionization of phenol and the surface properties of the adsorbent(24)



Figure;2 Effect of adsorbent of chitosan and chitin ph.

CONCLUSIONS

Magneto chitosan Nanomaterial's have characteristics, for example, large surface areas, size, shape, and dimensions, that make them particularly attractive for pollutants water treatment (25) applications such as disinfection, adsorption, and membrane separations. Adsorption of organic pollutants phenol at magneto chitin and magneto chitosan was most efficient into the pH range of 2.0-6.5. Kinetics for chitin. Complete removal of 20 mg/L phenol from industrial waste water provided possible using 2×10^{-2} g/mL of adsorbent dosage. two adsorption/desorption cycles were carried out with water-ethanol (1:1, v/v) as desorbing agent without appreciable reduced in adsorption capacity. The parameters from industrial wastewater as measured by pH were drastically reduced after treatment with chitin and chitosan.

Thus, the present studies suggestions that magneto chitin and magneto chitosan are attractive less cost natural adsorbents for remove of phenol and other pollutants from industrial wastewaters (26)

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