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PREPARATION OF NATURAL MATERIALS FOR TREATMENT OF WATER

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Abstract

Water soluble polymers are often used in treatment as coagulants and one of these materials is Chitosan, which was extracted from the outer shell of crustaceans (*Corbicula fluminea*). Water samples were collected from hospital, dietary factory, Treatment Plant, Al- Hilla River and Al-Yahodiya Drainage. Samples were treated by addition of the Chitosan with different dose, different contact time, and different sedimentation time. It has been recorded that 0.5 g/l was the best concentration with 10 minutes contact time and 10 minutes sedimentation time. Total Removal Efficiency for each samples was (74.2, 49.1, 80.2, 29) % respectively.

Key words: Organic Carbon, Removal Efficiency, Waste Water Treatment

Introduction

Water is the most sensitive and necessary component of human and economic development. The increase in population leads to an increase in the demand for safe water supply, so this important resource needs to be managed properly and sustainably for sustainable human development (Medema *et al.*, 2008). Treatment plants are used in the treatment and purification of polluted water, and these plants targets have evolved over the years. It originated from sanitation needs and moved towards environmental protection. Wastewater has become a positive aspect as it has become a source of energy production in addition to its organic content necessary in agriculture that the proper management of wastewater will contribute many beneficial additions in the environment, health and economy (Maryam & Büyükgüngör, 2017). Often used as water-soluble polymers in the treatment as coagulants, but these polymers, although useful in treatment but have potential problems associated with the lack of biodegradability and toxicity in addition to high cost and also can cause Health problems like Alzheimer's disease (Pan *et al.*, 1999). Found Bina (2009) an improvement in floc size when using chitosan as an aid to coagulation with alum compared to alum or chitosan alone. The results showed that the dose of coagulant and coagulation aid decreased with increased turbidity. Additionally, chitosan significantly reduced the required alum dose between 50 to 87.5%, thereby reducing the cost of treatment Therefore, the use of environmentally friendly natural materials as an important alternative to water treatment, one of these materials is chitosan, a bio-polymer can be obtained from the outer shell of crustaceans and is characterized by low dosage required and high efficiency in the removal of suspended substances and organic materials and metal ions and easy to decompose biologically and quickly sedimentation (Hesami *et al.*, 2014).

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Materials and Methods

Samples were collected from :

- Effluent of treatment plant in Al-Hilla district (Maamira),
- Al-Hilla river,
- Al-Yahoudiyah drainage,
- from a juice factory, and
- Effluent of hospital**.**

Chitosan was extracted from *Corbicula fluminea* according to the method previously used (AL-Dubakel *et al.* ,2018). Initially, chitosan was tested by using different concentrations of chitosan (0.1,0.5,1) g/l respectively, and the mixing time and sedimentation period was changed which is (5, 5) min, (10,10) mins and (20.20) mins respectively. Tempertuer (T), PH, Chemical Oxygen Demand (COD), Total Nitrogen (TN), Total Phosphorus (TP) and Some Organic Compound (OC) were selected to examined the ability of Chitosan to treatment. Finally (FTIR) test used to inform the adsorption of pollutants on Chitozan

Results and Discussion

Chemical Oxygen Demand (COD):

Chemical Oxygen Demand (COD) is one of the methods used as an indicator to determine the quality and characteristics of wastewater (Kang *et al.*, 1999). According to Table 1, Removal Effeciency (R.E) was (71, 79, 77, nil & 70) % for each samples respectively, Chitosan has shown high R.E in removing (COD) of various types of water due to the adsorption and coagulation processes the through presence of functional groups in the composition of chitosan (Malhoum *et al.*, 2009), (Chung , 2006), (No and Meyers, 1989), (Cheng *et al.*, 2005) and (Nechita, 2017) .

Total Nitrogen (TN)

Inorganic anions are one of the important aquatic pollutants and have been found in potentially harmful concentrations in numerous water sources, thus it must be removed from drinking water supplies is an emerging issue. In recent years, chitosan have been successfully utilized for some anions removal from water (Chatterjee & Woo, 2009). From results of table 1, R.E of T.N was (51.1, 43.5, 45.5, 51.1, 54.7, and 38,1) % respectively for each sample. Consequently, the highest R.E in the drainage was due to the high concentrations of nitrogen elements in the Drainage as a result of overtaking them by discharging the Sewage on them which leads to the eutrophication phenomenon and that this ratio is close to the percentage mentioned (Li *et al.,* 2019) and was 65.5%. (Chung, 2006) stated that the ratio of ammonia removal (NH_3), which is a component of the total nitrogen, is 89.2%, The total nitrogen removal is due to the adsorption and coagulation process of the chitosan compound.

Total Phosphorous (TP)

Phosphorus (P) is one of essential elements and important the nutrients for the growth of living organisms and the normal functioning of ecosystems (Liu & Zhang, 2015). Through table 1 we note that the R. E. for total phosphorous (TP) were (75.9, 72.7, 92.4, 83.3, 77.1, 72.6) %

Table1: Removal Efficiency % for of some parameters for different sites.

Sample	Removal Efficiency %			
	COD	TN	TP	O.C
Hospital	71	51.1	75.8	19.1
Factory	79	43.5	72.7	71.9
waste water treatment	77	45.5	92.4	40.7
AL-Hilla river	Nil	51.1	83.3	1.3
Al-Yahodiya Drainage	70	54.7	77.1	12.4

respectively, the highest rate was due to the process of removing phosphorous compounds by the coagulation process that depends on the presence of functional groups on the surface and the adsorption process that depends on the porosity of the surface and the length of the polymer chain that is characterized by chitosan (Sowmya and Meenakshi, 2013).

Organic Compounds (O.C)

The liquid organic source is derived from industrial activities, and the increase in these industrial activities has led to an increase in the concentrations of this wastewater in the expenses of these facilities and are often toxic and carcinogenic to substances such as hydrocarbons and phenols and may cause serious environmental problems (Vidal& Moraes, 2019). Table 1 explain that the proportions of organic compounds were the following (19, 1, 71, 9, 40, 7, 1, 3 & 12.4)% respectively, chitosan has a high ability to remove these compounds (Farias *at el*, 2015). The rate of removal by chitosan is due to the adsorption process, as chitosan is characterized by high ability to adsorption due to the high porosity of its surface as well as the presence of effective groups, also chitosan is one of the most efficient natural polymers in removing organic compounds from polluted water (Escudero-Oñate & Martínez-Francés, 2018; Vidal & Moraes, 2019).

Fourier-transform infrared spectroscopy (FTIR)

With regard to results of Fig. 2-5 it were observed that some bonds were disappeared, as well as changing some of their locations as the linkage was work on a

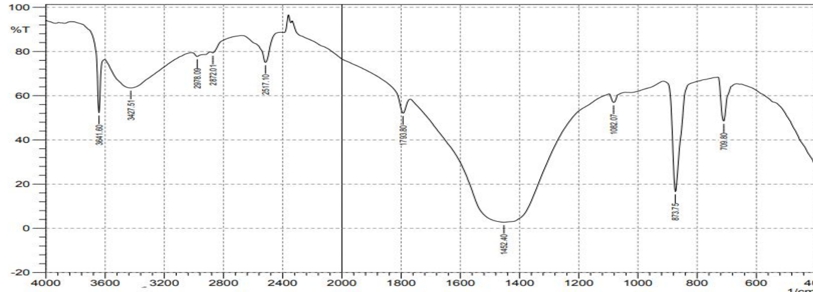

Fig. 1: FTIR for chitosan before treatment.

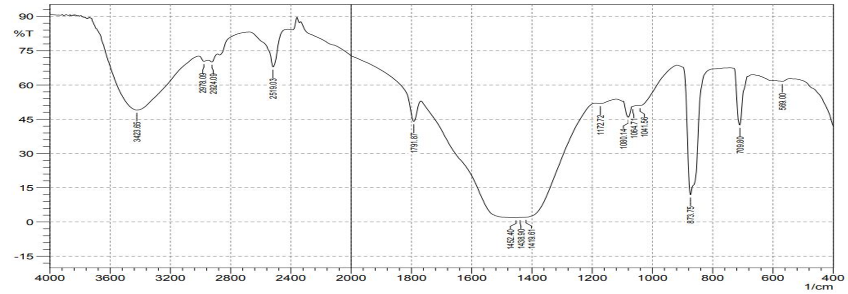

Fig. 2: FTIR for chitosan after treatment of hospital water

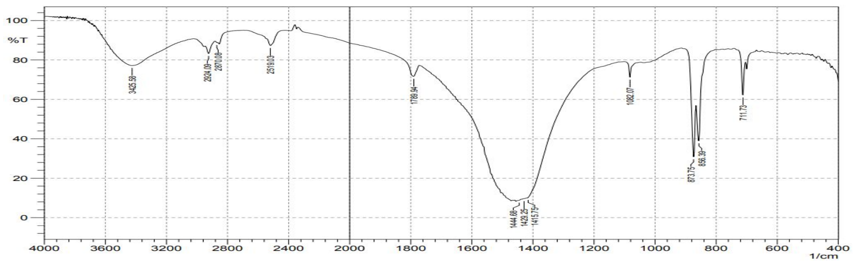

Fig. 3: FTIR for chitosan after treatment of factory water

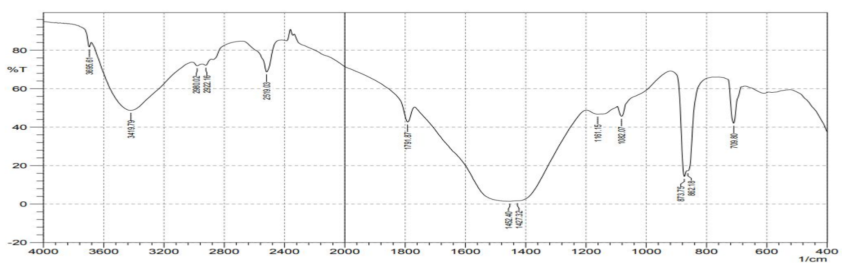

Fig. 4: FTIR for chitosan after treatment of waste water plant

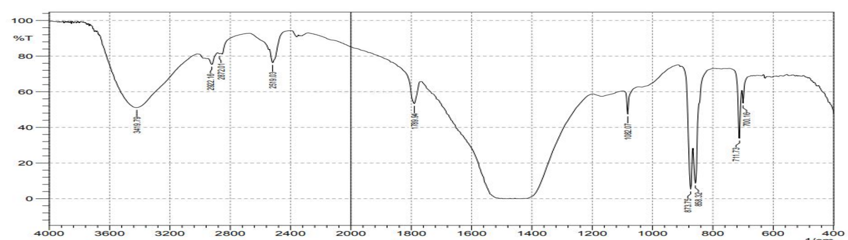

Fig. 5: FTIR for chitosan after treatment of water river

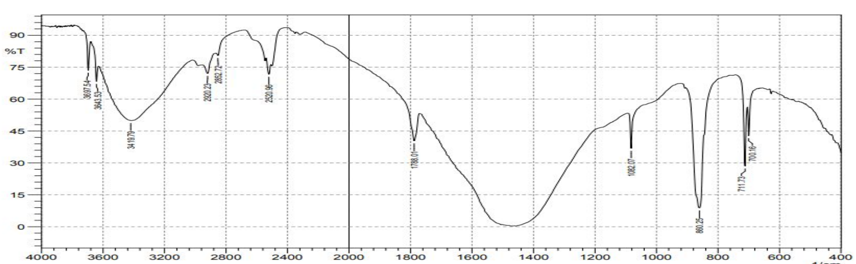

Fig. 6: FTIR for chitosan after treatment of water drainage

change in the vibration of electrons in the chemical bonds of the active groups (in the case of reducing the intensity or changing their locations within the range of the bonds).Other bonds were change in the absorbance within the range of the triple bonds of the active groups . Adsorption was caused a change in the location of the bonding of some bonds while the range that represents the single bonds which appear significantly reducing in intensity values and the link with adsorbent caused the emergence of new bonds and change sites which shows a correlation between article adsorbent (chitosan) and components of water, which proves the existence of treatment in the removal values for samples obtained by measuring some environmental pollutants (Wanule *et al.* ,2014; Farias *et al.* ,2015; Balkhande & Ratnakar ,2019).

Conclusion

1- Contamination of water sources as a result of the overflow of factories and hospitals and the overflow of citizens over water resources through the discharge of sewage without treatment to water sources.

2- The use of inorganic synthetic polymers in treating polluted water has health and environmental impacts.

3- The use of natural polymers in treating polluted water is better in terms of health, environment and economics.

4- Chitosan as a natural polymer can be prepared in labs by shells *Corbicula fluminea* at a low economic cost.

5- Chitosan is a natural, environmentally friendly, renewable polymer that has no health effect and can be eliminated by using it as an enrichment and soil fertilizer.

6- Chitosan is highly effective in removing organic, inorganic and biological pollutants from polluted water.

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