Review and Performance of Chitosan and the Resulting Compounds as Adsorbents

Sepehr Azizkhani¹, Nader Mokhtarian²*, Sepanta Dokhani³, Mohammad Javad Akbarzadeh⁴

¹ Departments of Chemical Engineering, Shahreza Branch, Islamic Azad University, Shahreza, Iran
² Department of Chemical Engineering, Islamic Azad University, Shahreza Branch, Esfahan, Iran
³ Young Researchers Club, Shahreza branch , Islamic Azad University, Shahreza, Iran
⁴ Departments of Chemical Engineering, Shahreza Branch, Islamic Azad University, Shahreza, Iran

Received: June 10 2013
Accepted: July 9 2013

ABSTRACT

Chitosan is a good absorber for removing cationic and anionic dyes as well as the removal of heavy metals ions. Chitosan and bio polymers is used for water purification and sterilization in recently years, for removal some materials that are harmful for human body even at low concentrations.

Chitin is one of the most materials in the earth extract from crustacean shell such as prawns, crabs, shrimp, fungi and other crustaceans. chitosan has a certain reputation for many reason like :absorption properties, no toxicity, ability to decomposition, stabilize of enzymes.

The use of chitosan have a high speed and is an economically and efficiently. chitosans are for separation of materials such as copper, zinc ,chrome ,iron nickel ,cadmium ,mercury that is debated mechanism to coordinate the metal ions with an amino group. Each of the ions separate in special conditions that related to elements like: ion adsorption on the surface,chemical absorption ,PH, rate mix ,temperature ,concentration.

KEYWORDS : Chitosan , adsorption heavy ion, separation , effect of PH in separation

1. INTRODUCTION

Heavy metals in water has created many environmental problems that some of this ions have irreversible damage to human health as injury to the nervous system and kidney. Remove heavy metals are very important that there are many ways that chitosan is one of the best way.¹

Chitosans are derived from glucan with repeating chitin units that was found with boil chitin in KOH solution by roget in 1895. chitin is a mucopoly saccharides that be found wide in exoskeletons of crustaceans such as lobster ,shrimp ,crab and in yeasts too.²

To improve chitosans performance specially adsorbent ,referrals such as epichlorohydrin and glutaraldehyde have been used cross-linking agent stabilize chitosan in acid solution and also enhance its mechanical properties.

Chitosan properties

Because chitosan has a special structure ,special properties that are used in various industries.

1-LipoPHilic properties

Cellules, chitosan has a structure similar to that of a free amino group is available cellulose is a plant fiber that has a hydro PHilic property ,but because chitosan has amino group it has low lipid friendship for properties of chitosan.it use in various industries including the construction of anti fat and anti cholesterol.

2-Ability to retutn th the environment

Chitosan is a natural structure that can be hydrolyzed by the enzyme chitosanaz .if it gets in to the environment and hydrolyzed by the enzyme is converted to units of mono saccharides.

3-Environmenta sustainability

Chitosan is a natural biopolymer bio compatibility that if entrance to the environment do not contaminate it

Effect of PH

Chitosan is very sensitive to PH and it can separate with the two models: as the gel and as the solution.

Low –acid solution PH is reason to increase the capacity of environmental adsorption and with stand the acidic environment

*Corresponding Author: Nader Mokhtarian, Department of Chemical Engineering, Islamic Azad University, Shahreza Branch, Esfahan, Iran
Chitosan is hydrophilic and cationic and in suitable range of PH has a optimum absorption that it different for each ion generally with increase of PH protein decrease and cross linker help to improve adsorption capacity.

Improper methods for control of metal ions in wastewater maybe increase the risk for humans in the long term ,toxic heavy metal ions that discharged from chemical industries include chromium ,cadmium and mercury³.

**Combinations of chitosan**

1. **Chitosan compounds of alumina ceramics**
   Chitosan alumina ceramics remove an ionic and cationic heavy ions such as: AS(III), AS(V), Cr(VI), Ni(II).
   Oxalic acid is used in this process act as a bridge between alumina and chitosan, while others use the amine link.⁴

2. **Chitosan compounds cotton fiber composites**.
   Cotton is a natural cellulosic fiber that have some use full properties such as soft, comfort, absorbancy and good strength. In this compounds hydroxyl group in cellulose ,allow hydrogen create between two polymer links.⁵

3. **Magnetite composite chitosan**
   Magnetite absorption capacity for the adsorb of some radio nuclides. magnetite iron oxide such as Fe₃O₄,Fe₂O₃ can be renovate to have a better magnetic properties, with low toxicity and low price, that with cross linking such as epichlorohydrin has a more adsorption capacity.⁶

4-Polyvinyl alcohol (PVA) composite with chitosan
   PVA is a highly hydrophilic, non toxic and PH stability according to the highly polar nature of the PVA has a minimize sediment. Because hydrophobic balance, which is include natural compounds, force non -polar surfaces to absorb pollutants⁷.

5- Polyvinyl chlorid (PVC) with chitosan
   PVC has high surface and good Physical and chemical stabilities. Additional the surface of pvc is a good area for adsorb metal ions efficiently.⁸ We can cover this surface with sodium dodecyl for separate of nickel and copper.

**Conclusion**

This paper indicates that the adsorption using chitosan composite are becoming alternatives formula absorption in removal dyes and heavy metal ions.

Modified chitasons ability to absorb heavy metals from aqueous solutions was offer by Langmuir.

Totally, cross linking or alternatives of chitason led to a notification decrease in adsorption ability that should use hydroxyl or carboxyl and amino group for effective adsorption.

**REFERENCES**


