THE OXFORD COLLEGE OF ENGINEERING
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A PROJECT REPORT ON

"STANDARDISATION OF PROTOCOL FOR THE ISOLATION OF CHITIN FROM MARINE SHELLS AND ITS APPLICATIONS IN DYE REMOVAL FROM TEXTILE INDUSTRY"

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1 INTRODUCTION AND OVERVIEW

Polysaccharides of natural origin such as starch and cellulose have enormous importance in our technological word because they are readily available and posses unique features unmatched by polymer of artificial production. (Inmaculada Aranaz et al. 2009) Natural, nontoxic, biopolymer such as Chitin, poly [ß-(1-4) -2-acetamido-2-deoxy-Dglucopyranose] occurs in insects, crustaceans and molluscs as an important constituent of the exoskeleton and in certain fungi as the principal fibrillar polymer in the cell wall. In nature it is second in abundance to cellulose. The most important derivative of chitin is chitosan: poly [ß- (1-4)-2- amino-2-deoxy-D- glucopyranose] and is chemically or enzymatically produced by deacetylation of chitin.

Commercial production of chitin and chitosan takes place from waste shells of shrimps, prawns, crabs, lobsters and crayfish. About 30-40% of crustacean shell waste consists of protein, 30-50% calcium carbonate and 20-30% chitin. Approximately 50 to 60% of the total weight of shellfish, such as shrimp, crab, and krill, consists of nonedible material, i.e., "heads" and exoskeletons rich in chitin but also protein, which form, on the one hand, major environmental pollutants as a result of uncontrolled dumping . On the other hand, however, due to their chemical composition (20 to 30% chitin, 20 to 40% protein, 30 to 60% minerals, and 0 to 14% lipids) and their actual availability from seafood industries, shrimp waste also constitutes the major source for chitin and chitosan production. (Rinaudo, 2006). Newer sources for chitin production continue to be explored from fungi and insect larvae. There are great variations in the properties of chitin and chitosan that occur depending on procedures used for preparation.

Chitin is a hydrophilic heteropolymer neither random nor block orientation , however chitin is stable over a wide pH range of aqueous solution due to the strong polysaccharide structure which is formed through intermolecular hydrogen bonds between its acetylamino groups. Therefore chitin has the excellent properties as support for solid phase extraction, in which the collection and elution of species is rapid, and its protonated acetylamino groups act as an anion exchanger for various types of anionic species in a weak acidic medium. Chitin soluble only in strong mineral acids or in lithium thiocyanate solutions, lithium chloride/*N*,*N*-dimethylacetamide

, most of which cause disintegration or rapid degradation with loss in molecular weight or hydrolysis of the acetyl groups or both. (Kofuji et al. 2005). Important characteristics of chitin and chitosan are molecular weight and degree of deacetylation and purity. These vary with process conditions and they influence the functional properties of chitosan. (Crini, 2005)

This has attracted significant interest in view of the varied proposed novel applications of these functional polymers especially chitosan as readily seen over a broad range of scientific areas including applications in biomedical, food and various chemical industries . These proportions vary with species and season. The preparation of chitin and chitosan differ with crustacean species and preparation methods. Along with its deacetylated derivative chitosan, chitin recently has gained biotechnological significance, not only because of favorable pharmaceutical features, such as antimicrobial, anticholesterol, and antitumor activities, but also because of its potential for wastewater treatment, drug delivery, and wound healing and as a dietary fiber . (Rinaudo, 2006)

In view of the extensive applications of Chitin and Chitosan in various processes, biological environments and keeping in view that it is a low cost polysaccharide, easily available, nontoxic and biodegradable, the purpose of this work was

- To isolate chitin and Chitosan chemically from Hermite crab shells.
- To study the factors affecting its preparation such as sodium hydroxide concentrations, reaction time and temperature.
- To characterize the resulting product by nitrogen percent and reaction efficiency.
- To use the resulting chitosan as sorbent for the decontamination of water containing dyestuffs.
- To vary amount of chitosan for adsorption studies.
- To develop adsorption isotherms.