

SYNTHESIS AND CHARACTERIZATION OF CHITOSAN – BENTONITE COMPOSITE

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Abstract. Composite is a material that made off more than one material to modify and form the combination of the best characteristics of its constituents. The composite material is interesting for further study since this material is not found in nature. Generally, the composite has several advantages such as it has good strength, resistant to high temperatures, and easy to modify according to its applications. The aim of study is to synthesis composite made off natural bentonite and chitosan with some experimental variables such as the weight ratio between the bentonite and chitosan and time processes. The study is to obtain the best operating conditions that will produce a composite material with desired characteristics. The composite was synthesized by reacting chitosan in dilute acetic acid and bentonite suspension by varying ratio of bentonite to chitosan for several reaction times at different pre-treatments. The composite materials was characterized by FTIR to determine the functional groups of composite, XRD to identify the change on material structure and also SEM to characterize composite morphology. The optimum composite was obtained at ratio of bentonite to chitosan 1 : 2 and 12 hours reaction.

1. Introduction

Chitosan is the second largest biopolymer after cellulose. Chitosan is interesting because of its low cost, availability of amino and hydroxyl groups in the structure, which are potential to react.[1] However, the chitosan has limitation in their application due to its low surface area, and mechanic resistance.[2] In order to overcome the limitation, several works have been conducted on the development of chitosan based materials such as membranes [3], fibers [4], films [5] and scaffolds. [2] Chitosan film have prepared by Dotto et.al to remove dyes from aqueous media. The film showed high adsorption capacities, good mechanical properties and easy for separation. Esquerdo et al. have developed chitosan scaffolds which has good characteristics for adsorption, including porosity of 92% and specific surface area of $1135 \text{ m}^2 \text{ g}^{-1}$. Chitosan based materials with good mechanical and functional characteristics, able to remove anionic and cationic dyes, are scarce. An alternative is the development of chitosan/bentonite composite, once chitosan is polycationic and bentonite has anionic groups in its structure. Another study showed that Gunister have prepared and characterized chitosan-montmorillonite composite.[6] They used chitosan which has an average molecular weight of 400,000. The composite was prepared by mixing chitosan solution in different concentration into montmorillonite suspension. chitosan attached on the surface of clay particles. XRD analyses displayed that organic molecules did not enter enough sufficiently into the layers of clay structures. (Gunister, E., et.al., 2006) This work aimed to synthesized and characterized a composite based on chitosan and bentonite. Chitosan/bentonite