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EFFECT OF DIFFERENT DEGREE OF CROSSLINKING ON CHITOSAN/PEG MEMBRANE

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ABSTRACT

In this study, the effect from degree of crosslinking by varying the concentration of tetraethylorthosilicate (TEOS) in hybrid membrane formulation was studied. The thin film composite (TFC) was fabricated from polymer blend chitosan (CS)/polyethylene glycol (PEG), crosslinked with different percentage of TEOS, 0%, 1%, 3% and 5%TEOS. Polysulfone was used as the porous support to hybrid membrane of CS/PEG hybrid membrane. The thin film composite membrane was characterized using Fourier Transform Infrared Spectroscopy (FTIR) and Thermogravimetric Analyzer (TGA) and antifouling performance was conducted. Antifouling was carried out by using humic acid solution and deionized water as the feed solution. Based on results, it shows that TFC membrane with 3% TEOS have an excellent result in characterization of membrane and performance. Furthermore, TFC membrane crosslinked with 3% TEOS have good properties in performance test, flux ratio and antifouling properties. Excellent properties of relative flux recovery (RFR) and low in relative flux decay (RFD) compared with other TFC membranes. Therefore, this study conclude that thin film composite crosslinked with chitosan gives excellent antifouling membrane which suitable and being used in membrane filtration applications.

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CHAPTER ONE

INTRODUCTION

1.1 Background of Study

Over the past two decades, natural polymers have increasing attention due to their abundance and low cost. Furthermore, it was due to gain depletion of petroleum resources and also for environment care. These had made the developing on chemical and biochemical processes utilize their usage inherent properties acquire and modify natural polymers based on wide range of applications of industrial interest in different fields.

Natural polymer, polysulfone (PSF) is widely used due to its excellent in mechanical property, thermal stability and chemical stability over different values of pH. It is also have disadvantages which are increasing the penetration resistance of the membranes, low permeability and high fouling of PSF membranes due to its hydrophobic character. This nature gives a limitation on its application and reduces the membrane life. By blending it with other polymer such as chitosan (CS) which is much likely improves the properties of the membrane with high permeability and antifouling property. (Rajesha Kumar, Arun M.Isloor A.F.Ismail,T.Matsuura, 2013)

Recently Chitosan (CS) has attracted many attention of scientist all around the globe due to its impact in membrane separation. Chitosan has its abundance, versatility, unique properties and facile modification including biodegradability, biocompatibility, non-toxicity, antimicrobial activity, immunological activity and anti-bacterial (Ying-Chien Chung, Chih-Yu Chen, 2008) together with the hydrophilicity which occupies a special position among the natural polymers. It is very suitable for membrane separation and it is also environmental benign. (Vignesh Nayak, Mannekote Shivanna Jyothi, Prof. R Geetha Balakrishna,Dr. Mahesh Padaki, and Prof. Ahmad Fauzi Ismail, 2015) Due to this, the chitosan have a very useful compound in a wide range of applications in medical, pharmaceutical, chemical, agricultural and environmental fields.

However, CS also had their disadvantage which is low in mechanical stability which limits the CS usage for a large consumption. Even though, Polymer consists of hydrophilic nature functional groups, normally CS is not soluble in water and in most common organic solvents (DMSO, DMF, NMP, organic alcohols, pyridine). Many trials had been done on increasing the solubility of the CS in water. In membrane technology and bio-functional