UNIVERSITI TEKNOLOGI MARA

RECLAMATION OF NUTRIENTS FROM KENAF RETTED WASTEWATER USING MODIFIED ULTRAFILTRATION MEMBRANE

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ABSTRACT

Increase in demand of fiber from kenaf industry, increases the water usage for water retting. Traditional water retting method producing large amount of water in greenish color, high in suspended solids, high BOD load, the reduction of DO, high nutrient levels and non-biodegradable substances where discharge directly into watercourses triggering eutrophication in aquatic ecosystem. The aim of this research is to formulate and fabricate membrane for reclamation of nutrients from kenaf retted wastewater. The flat-sheet Polysulfone (PSF) membrane were prepared by dry/wet phase separation technique with various Polyvinyl-pyrolidone (PVP) additive concentrations (0, 1.5, 4.8, 9.1 wt. %) and were analyzed towards morphology, flux performance and nutrients reclamation to verify the potential for reclamation of nutrient from kenaf retted wastewater (KRW). It is observed that the NaCl rejection was increased, while membrane flux was decreased with the increase in PSF concentration. Results from modified membrane using PVP at different concentration obtained the inconsistent water flux results. These experimental results suggest that the modified PSF ultrafiltration membrane which is added of 1.5 wt. % PVP together with 14.8 wt. % PSF/ 83.7 wt. % DMAC has high flux, obtained close to 50% NaCl rejection and it successfully rejects the solute solution with molecular weight 100 kDa in 90%. This membrane also has high resistance to pressure 5 bar in 180 minutes. $PVP_{1.5}$ was efficiently reclaiming more than 90% of total nitrogen (TN), near to 90% of total phosphorus (TP), above 85% of potassium (K) from KRW. The finding obtained indicated that modified membrane has a successful potential for nutrients reclamation of kenaf retted wastewater.

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CHAPTER ONE
INTRODUCTION

1.1 BACKGROUND OF STUDY

Kenaf planting has been increased around the world due to its high biomass yield and the raised fiber content (Hossain, Hanafi, Talib, & Jol, 2010). As reported Utusan Malaysia (2012) total of 10 hectares of land in Malaysia is used for the cultivation of kenaf per season. Kenaf (*Hibiscus cannabinus L.*) has been identified as a new commodity crop also known as 'New Sources of Growth in Malaysia'. Kenaf have received high attention among researcher and manufacturer as a cheap, biodegradable, environmental friendly, high tensile strength and high prices in the international market (Hadi, Basri, Abdu, Junejo, & Hamid, 2014). The products that are manufactured from the kenaf fiber served as bio-composite materials such as, paper, particle boards of various densities, textiles, ropes, nets, brushes, mats and carpets, recycled plastic, as well as automotive products (Juliana, Paridah, Rahim, Nor Azowa, & Anwar, 2012; Webber & Bledsoe, 1993).

However, the rapid development of kenaf industry has caused environmental issue through their retting process due to it takes about one to two weeks to be completed (Mahmudin et al., 2012). This process is the main challenge faced during the processing of bast kenaf plants. A quality of fibre is largely determined by the retting condition and duration (Paridah & Khalina, 2009). Retting can be defined as loosening or separation process of bast fibres into individual fibres (Zawani, Chuah-Abdullah, Ahmadun, & Abdan, 2013). It can be done in several ways like microbe, enzyme, dew, water and chemical (Banik, Sen, & Sen, 1993; Henriksson, Akin, Slomczynski, & Eriksson, 1999; Akin et al., 2007; Chen, Wang, Hua, & Du, 2007; Sharma, 1987).

Water retting process had been identified to be the best method for fiber extraction that was practiced in most producing countries such as China, India and Bangladesh. Water retting is a wet process whereby fibrous plants were soaked in water which will enable the separation of outer layers of stalk from non-fibrous matter by removal of pectin and other gummy substances (Nabilah Huda, Ramlah, Zakiah, &