

UNIVERSITI TEKNOLOGI MARA

**SEAWATER DESALINATION
USING SPIRAL WOUND KENAF
MEMBRANE**

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ABSTRACT

Membrane technology is widely used in many industries, such as water treatment and water reclamation plant. The problems with current membrane technology are low flux with low rejection and high fouling. Hence, many researchers develop membranes with different materials to improve membrane performance. The performance of the membrane is depending on material used during membrane fabrication. However, there are still lack of research focusing on using biomaterials. Therefore, this research proposing a new material extracted from Kenaf plant. The material chosen in this study was Polysulfone (PSF), Polyvinylpyrrolidone (PVP), Microcrystalline Cellulose (MCC), and N-Methyl 2 Pyrrolidinone (NMP). The objectives are to study the effect of Kenaf Microcrystalline Cellulose (MCC) on membrane morphology and membrane performance in terms of water flux and salt rejection. Secondly is to evaluate the performance of the Thin-film Composite of Kenaf Microcrystalline Cellulose membrane. Thirdly is to develop spiral wound Kenaf MCC membrane for desalination and the fourth objective is to evaluate the performance of Kenaf Desalination system in term of water flux and salt rejection. The membranes were fabricated by using a dry-wet phase inversion method using a glass rod and glass plate. The membranes were analysed by using Scanning Electron Microscope (SEM) and Fourier Transform Infrared (FTIR) to understand the morphology and surface pore size. Three of the membrane samples were then undergone surface treatment using Thin-film Composite (TFC) and tested again using 2000ppm and 35000ppm Sodium Chloride (NaCl) concentration. SEM images show that the membrane exhibits a finger-like structure inside the membrane sublayer. MWCO study shows that all the membranes are in the range of ultrafiltration. Wettability study shows that Kenaf MCC has the highest hydrophilic characteristic, which is 60° contact angle. The highest NaCl rejection was by TFC MK3, which is 98.9% rejection using 1.5 MPa pressure. MCC Kenaf membrane (MK3) shows a good pure water flux value, which is 2.864 L/m²h at 0.5h. Moreover, it was found that increasing Kenaf MCC concentration in dope solution will reduce the rejection because of the MCC characteristics to create bigger pore size. The highest NaCl rejection and water flux is from Spiral-wound Kenaf MCC, which is 66% and 181 L/m²h. These results indicate that the Kenaf Desalination System membrane can be used to remove NaCl in seawater.

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