UNIVERSITI TEKNOLOGI MARA

MERCURY REMOVAL THROUGH INTEGRAL COMPOSITE MEMBRANE

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ABSTRACT

In this current study, a novel of chitosan, polusolfone and polyvinyl alcohol composite membrane were prepared and used for the removal of mercury in mercury solution. Chitosan, a hydrophobic polymer which can increased the hydrophilicity of the membrane while polysuflone (Psf) in one the the polymer that widely used in membrane separation process. Polyvinyl alcohol (PVA) was used because of the hydrophilicity polymer which have high water selectivity and dehydration process. The composite membrane was prepared by dissolving 20ml psf, 0.1ml chitosan and 0.1ml PVA to form a hybrid solution before cast the solution to form membrane. The membrane then was characterized by using FTIR and TGA while hydrophilicity of the membranes was measured by water uptake, mercury removal, swelling properties and antifouling. FTIR result indicates the existence of Cs, Psf and PVA chemical group at the wavelength of each type of polymer. Higher water uptake is recorded at the higher content of PVA membrane in the water uptake study which are 204.12% of 4 wt% PVA membrane compared to 198.48% of 3 wt% PVA membrane. The membrane was showed higher flux value for the higher PVA content membrane. The mercury rejection by the membrane was carried out and the value of rejection was recorded at 96.73%. The obtained results proved that higher concentration of PVA can increase performance of the membrane.

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CHAPTER ONE

1 INTRODUCTION TO RESEARCH

1.1 Title of Research

Mercury removal through integral composite membrane.

1.2 Background Research

Mercury is one of the heavy metals that are known as one of the dangerous pollutants that contain in wastewater. The water that contain the pollutants usually came from the effluent of industrial process which need to be treated before being released to the surrounding. The release of great amount of heavy metals into water can give a huge impact to the human health and environment. Mercury that is released into river and lake water is fatal to human beings and aquatic life and upon consumed, these discharges may not be digestible in stomach and can lead to cancerous diseases.

Therefore, the aim of this research is to fabricate am integral membrane that can remove mercury in the wastewater. Few methods had been discovered to remove mercury from wastewater such as through adsorption, flocculation, reverse osmosis (RO) and chemical precipitation (Shafeeq et al., 2012). Adsorption is one of the methods that have been widely used to remove heavy metal from wastewater due to its advantages such as ease of operation, economic feasibility, wide availability and simplicity of design (Malik, Jain, & Yadav, 2016). Despite of its wide availability, the adsorption technique also has the disadvantages such as high cost, small capacity and difficulty for large-scale application (Khulbe & Matsuura, 2018).

Adsorption process is a mass transfer of a substance which in liquid phase transferred through a solid surface and bounded by the chemical or physical interactions. In the adsorption process, membrane separation is used due to its convenient operation. The chemical adsorption process traps the heavy metals ion in