UNIVERSITI TEKNOLOGI MARA

MOLYBDENUM (IV) SULFIDE-GRAPHENE (MOS_2-RGO) MEMBRANES SUPPORTED ONTO ALUMINA SUBSTRATES FOR BPA REMOVAL

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ABSTRACT

Graphene oxide (GO) is an example of graphene derivatives composed of carbon atoms that are bonded by van der Waals forces and have intriguing characteristics such as single atomic layer thickness, high mechanical strength and large specific surface area. GO membranes have been widely used for water treatment and electronic applications. Removal of endocrine disrupting compounds such as BPA into the water system can cause harmful effects to the environment and membrane separation is found as one of the cost efficient in removing BPA. In this study, adsorption of BPA by using molybdenum disulfide-reduced graphene oxide (MoS_2-rGO) as adsorbent supported onto alumina has been made. Simple physical method has been used in synthesizing MoS_2 and rGO by exfoliation and modified Hummer's method respectively. The composite membrane were characterized under scanning electron microscope (SEM), fiels scanning electron microscope (FESEM), mercury porosimeter (Hg Porosimetry), atomic force microscope (AFM), digital microscope and contact angle while UV-Vis for BPA rejection. The effects of pressure found that higher pressure resulted the better separation and after 120 ppm the performance of membrane decrease due to fouling. MoS_2-rGO/alumina membrane exerts the best BPA rejection at 120 ppm and 1.5 bar with 63.18% rate.

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TABLE OF CONTENT

CHAPTER ONE
INTRODUCTION

1.1 Research background

From previous finding, water pollution has become the most serious problem in the entire world as the polluted water may contain heavy metals such as chromium (Cr), copper (Cu), lead (Pb) and organic pollutants such as dye which is mostly used in textile industries (Nicholas, Hoong and Ismail, 2018). According to Petrie, BPA is frequently found in the environment including surface waters (Petrie et al., 2019). Other than the organic contaminants, many techniques have been applied in treating waste water which are adsorption, photocatalytic degradation and chemical oxidation (Wu et al., 2018).

BPA is an abbreviation used for bisphenol A, a chemical that is being used in the manufacturing of plastics and resins and it is a colourless solid that is soluble in organic solvent but poorly soluble in water (Singh, 2016). The conventional technique in treating BPA is by biological treatment method. BPA treatment however possess many problems with the conventional technology which are it is ineffective and the regeneration is expensive hence will result in loss of the adsorbent leading to higher cost (Kyzas, Fu and Matis, 2013) in treating the organic contaminants. Suspended solid concentrations in the effluent is particularly high is subjected to the problem with conventional technology in treating BPA. The current technology used to treat BPA is through electrochemical oxidation but the effectiveness is not really assured. This method is depending on the properties of anodes and the organic contaminants to be removed. For instance, graphite is the traditional electrodes used for wastewater treatment and it is observed that the performance in wastewater is low (Yang, 2015).

Membrane is used as an alternative to remove BPA as membrane technology can be reliable, do not harm the environment where no generation of secondary products, ease of operation, low cost and has low energy consumption (Ali et al., 2018). It has low energy consumption because there is no phase change occurs throughout the process (Maldovan, 2018). Despite of the advantages, membrane separation is exposed to some disadvantages of having membrane fouling