UNIVERSITI TEKNOLOGI MARA

EQUILIBRIUM ADSORPTION ISOTHERMS OF BOVINE SERUM ALBUMIN ONTO NITROCELLULOSE MEMBRANE

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ABSTRACT

Rapid diagnosis of infectious diseases and timely initiation of appropriate treatment are critical determinants that endorse optimal clinical outcomes and public health. Therefore, nitrocellulose membrane is used as a material on diagnosis kit to overcome this problem. The objectives of this research are to characterize NC membrane in term of its morphology and polymorph and investigate the equilibrium aspects of protein adsorption. Water contact angle is analyzed as indication for hydrophobicity of the membrane and it is found NC is hydrophilic with zero angle. The porosity of membrane is found to be 12.75% which indicates NC membrane has a non-porous structure. From the FESEM image, the pore size distribution is highest within range of 0.5µm to 1.0µm with frequency of 139. FT-IR analysis showed at the peak of 3429.19 cm-1 strongly O-H that proved NC membrane able to absorb water and at the peak of and at the peak of 1094.98 cm -1 of C-N bond and proved of present of nitrile group. BSA is used as standard protein and BCA assay kit is used as indicator for protein blotting. Langmuir and Freundlich are common isotherms applied in adsorption. BSA standard curve is used to detect the final concentration of protein based on the absorbance value obtained from UV-VIS spectroscopy. The results showed that Langmuir Type 1 and Type 2 are best fitted for quantify protein adsorption with R2 value 0.9997 and 0.9994 respectively. It is showed that the membrane characteristics influenced binding of protein. A proper storage of the membrane also important to avoid destruction on sample surface and error on obtaining desired results.

Keywords : nitrocellulose membrane, adsorption, protein, Langmuir, Freundlich

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CHAPTER 1

INTRODUCTION

1.1 RESEARCH BACKGROUND

Membrane typically is a thin material with planar structure which mostly used in separation, absorption and adsorption. Membrane has a finite volume. There are two types of membranes which are artificial and biological membrane. Lipids, proteins and sugar are three components that made up the membrane (Brown, 1996). Artificial membranes or synonymy synthetic membranes are developed membranes practically for laboratory and industrial purposes. Since the middle of twentieth century, synthetic membranes are productively used for small and large scale industries. Over the last two decades, improvements in membrane technology have expand the applications in many industrial sectors; chemical, petrochemical, mineral and metallurgical, food engineering, pharmaceuticals, electronics, biotechnology and biomedical (Mark C Potter, Handbook of Industrial Membrane Technology, 1st Edition, Richard W. Baker, United States of America, Noyes, 1990, 249p).

Biomedical engineering is the application combinations of engineering principles and design concepts specifically for biology and healthcare purposes. Some of the biomedical applications include therapeutics, multimodal imaging, bio-separation and biosensor (Mark C Potter, Handbook of Industrial Membrane Technology, 1st Edition, Richard W. Baker, United States of America, Noyes, 1990, 250p). Biosensor is an analytical device used to detect the presence or concentration of biological analyte. Since it commencing,