CATALYTIC ACTIVITY AND REUSABILITY OF GOLD ON ANODIC ALUMINIUM OXIDE (Au-AAO) MEMBRANE FOR REDUCTION OF *p*-NITROPHENOL

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This Final Year Project Report entitled **"Catalytic Activity and Reusability of Gold on Anodic Aluminium Oxide (Au-AAO) Membrane for Reduction of *p*-Nitrophenol"** was submitted by Nuryasmin Binti Noor Ariff Afanddi in partial fulfilment of the requirements for the Degree of Bachelor of Science (Hons.) Applied Chemistry, in the Faculty of Applied Sciences, and was approved by

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ABSTRACT

CATALYTIC ACTIVITY AND REUSABILITY OF GOLD ON ANODIC ALUMINIUM OXIDE (Au-AAO) MEMBRANE FOR REDUCTION OF *p*-NITROPHENOL

Anodic aluminum oxide (AAO) serves as a template and support material for gold nanoparticles (Au NPs), enhancing their stability and catalytic activity. While Au on conventional powdered alumina has been extensively studied, the potential of Au immobilized on AAO membranes remains largely unexplored. This study focuses on the immobilization of Au on AAO membranes and its reusability as a catalyst. AAO membranes were fabricated via electrochemical anodization, followed by gold deposition through the deposition-precipitation method to create Au/mAAO catalysts. The catalysts were then evaluated for their efficiency in reducing *p*-nitrophenol (*p*-NP) to *p*-aminophenol (*p*-AP) and assessed for reusability. Field Emission Scanning Electron Microscopy (FE-SEM) and Fourier transform infrared spectroscopy (FTIR) were used to characterize Au/AAO catalysts. Next, using an ultraviolet-visible (UV-Vis) spectrophotometer, the activity of the Au/AAO catalyst for the reduction of *p*-nitrophenol (*p*-NP) to *p*- Aminophenol (*p*-AP) was then ascertained. Finally, the catalysts' reusability was assessed for the effect of the catalyst weight and its reusability for one reaction cycle. The *k*-value obtained for 1 mg of the catalyst was 1.90E-03 s^{-1}, while the *k*-value for 1 mg of the reused catalyst was 3E-05 s^{-1}, resulting in an 8.2% conversion rate. Based on the FE-SEM result, the anodic aluminium oxide (AAO) membrane pattern is closely packed and resembles regular-shaped holes with pore sizes of 76±32 nm. FTIR revealed a shifting IR peak for O-H stretching and the C=O bond, proving that Au NPs were attached to AAO efficiently. The catalyst's characterization by ICP- OES showed a value of 0.59 wt%.

TABLE OF CONTENTS