SYNTHESIS OF Au-Cu/AAO CATALYST FOR *p*-NITROPHENOL REDUCTION

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Final Year Project Report Submitted in
Partial Fulfilment of the Requirements for the
Degree of Bachelor of Science (Hons.) Chemistry with Management
in the Faculty of Applied Sciences
Universiti Teknologi MARA

FEBRUARY 2024

This Final Year Project Report entitled **"Synthesis of Au-Cu/AAO Catalyst for *p*-Nitrphenol Reduction"** was submitted by Nurul Afifah binti Ramli in partial fulfilment of the requirements for the Degree of Bachelor of Science (Hons.) Chemistry with Management, in the Faculty of Applied Sciences, and was approved by

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ABSTRACT

SYNTHESIS OF Au-Cu/AAO CATALYST FOR p-NITROPHENOL REDUCTION

Gold-copper (Au-Cu) bimetallic catalysts were prepared via chemical reduction with Cu and Au precursors and hexadecylamine (HDA) as the capping agent to form Au-Cu bimetallic nanoparticles (Au-Cu NPs). The colloidal Au-Cu NPs were subsequently spin-coated onto an anodic aluminium oxide (AAO) support. The AAO support was fabricated via a two-step anodization technique at 80 V using oxalic acid as an electrolyte. The bimetallic catalysts outperformed monometallic Au and Cu NPs in terms of activity towards reducing *p*-nitrophenol (*p*-NP). The optimized Au-Cu/AAO catalyst exhibited 100% *p*-NP conversion to *p*-aminophenol (*p*-AP), demonstrating its capability in pollution treatment and chemical synthesis. Furthermore, the AAO membrane support made it simple to recover and reuse the catalyst, supporting long-term stability and sustainability. The highest rate constant (k) of 1.2×10^{-3} s^{-1} was achieved over 1 mg of Au-Cu/AAO catalyst. The k value for Au/AAO, and Cu/AAO is 1.0×10^{-4} s^{-1}, and 8×10^{-5} s^{-1} respectively. Meanwhile, the k value for reused catalysts of Au-Cu/AAO, and Au/AAO is 3.0×10^{-5} s^{-1} and 8.0×10^{-5} s^{-1}, respectively. However, the reused catalyst of Cu/AAO showed no *p*-NP reduction. Fourier Transform Infrared (FTIR) spectroscopy, Inductive Coupled Plasma-Optical Emission Spectroscopy (ICP-OES) and Field Emission Scanning Electron Microscopy (FESEM) were used to characterize the synthesized catalysts, and an Ultraviolet-Visible (UV-Vis) spectrophotometer was used to monitor the catalytic investigation.

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