

**SYNTHESIS OF CeO<sub>2</sub> NANOPARTICLE-SUPPORTED  
GOLD CATALYST (Au-CeO<sub>2</sub>) FOR *p*-NITROPHENOL  
REDUCTION**

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**AUGUST 2024**

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**Synthesis of CeO<sub>2</sub> Nanoparticle-Supported Gold  
Catalyst (Au-CeO<sub>2</sub>) for *p*-Nitrophenol  
Reduction**

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## ABSTRACT

### SYNTHESIS OF CeO<sub>2</sub> NANOPARTICLE-SUPPORTED GOLD CATALYST (Au-CeO<sub>2</sub>) FOR *p*-NITROPHENOL REDUCTION

The reduction of *p*-nitrophenol (*p*-NP) is a well-studied reaction and serves as an important model for evaluating catalyst activity. This study used a simple synthesis method to prepare cerium oxide (CeO<sub>2</sub>) support using chemical (A) and co-precipitation (B) methods. Gold (Au) was then deposited on the cerium oxide support using the deposition-precipitation (DP) method presented in the work. Cerium oxide support was prepared by mixing cerium nitrate with ammonia solution and potassium carbonate using chemical precipitation and co-precipitation techniques, respectively. The resulting particles were characterised using Fourier Transform Infrared spectroscopy (FTIR), which showed peaks at 3320, 1320, and 500 cm<sup>-1</sup>, indicating O-H stretching, O-H bending, and Ce-O groups, respectively. Additionally, a small peak at 1630 cm<sup>-1</sup> indicated the presence of CO<sub>3</sub><sup>2-</sup> impurities from the preparation process. The X-ray diffraction (XRD) pattern for both samples indicated cerium oxide with a cubic fluorite crystalline structure (JCPDS No. 01-075-0076). Furthermore, the characterisation of Au-CeO<sub>2</sub>-A and Au-CeO<sub>2</sub>-B by FTIR confirmed the immobilisation of Au on the CeO<sub>2</sub> support due to band shifting of the support peaks. Both catalysts showed 100% conversion to *p*-aminophenol, with a rate constant (*k*) of 5.78 x 10<sup>-4</sup> s<sup>-1</sup> for Au-CeO<sub>2</sub>-A and 4.37 x 10<sup>-4</sup> s<sup>-1</sup> for Au-CeO<sub>2</sub>-B.

## TABLE OF CONTENTS

	Page
<b>ABSTRACT</b>	iii
<b>ABSTRAK</b>	iv
<b>ACKNOWLEDGEMENTS</b>	v
<b>TABLE OF CONTENTS</b>	vi
<b>LIST OF TABLES</b>	viii
<b>LIST OF FIGURES</b>	ix
<b>LIST OF TABLES</b>	xi
<b>LIST OF SYMBOLS</b>	xii
<b>LIST OF ABBREVIATIONS</b>	xiii
 <b>CHAPTER 1: INTRODUCTION</b>	
1.1 Background of Study	1
1.2 Problem Statement	2
1.3 Significance of Study	4
1.4 Objective of Study	4
1.5 Scope and Limitations of Study	4
 <b>CHAPTER 2: LITERATURE REVIEW</b>	
2.1 Cerium Oxide, CeO <sub>2</sub>	6
2.2 Preparation Method of CeO <sub>2</sub>	7
2.2.1 Co-precipitation	7
2.2.2 Chemical Precipitation	9
2.3 Structural Study of CeO <sub>2</sub> Nanoparticles	12
2.3.1 Fourier Transform Infrared (FTIR) Spectroscopy	12
2.3.2 X-ray Diffraction (XRD)	14
2.3.3 Field Emission Scanning Electron Microscope (FESEM)	15
2.4 Supported Catalyst	16
2.4.1 Supported Gold Nanoparticle	16
2.4.2 Au-CeO <sub>2</sub> via Deposition-precipitation Method	16
2.5 Catalytic Study for p-Nitrophenol Reduction	17
 <b>CHAPTER 3: METHODOLOGY</b>	
3.1 Material	20
3.2 Preparations Method	20
3.2.1 Co-precipitation	20
3.2.2 Chemical Precipitation	21
3.2.3 Catalytic Study for <i>p</i> -Nitrophenol Reduction	21
3.3 Characterizations	22