

TABLE OF CONTENTS

| | |
|--|------|
| RATIFICATION PAGE | iii |
| STATEMENT PAGE | iv |
| ACKNOWLEDGEMENT | v |
| TABLE OF CONTENTS | vi |
| LIST OF FIGURES | viii |
| LIST OF TABLES | ix |
| LIST OF APPENDICES | x |
| ABSTRACT | xi |
| INTISARI | xii |
| CHAPTER I INTRODUCTION | 1 |
| I.1 Background | 1 |
| I.2 Aims | 3 |
| I.3 Research Benefits | 4 |
| CHAPTER II LITERATURE REVIEW AND HYPOTHESIS FORMULATION | 5 |
| II.1 Literature Review | 5 |
| II.1.1 Natural zeolite | 5 |
| II.1.2 Cocamidopropyl betaine (CAPB) surfactant | 16 |
| II.1.3 Zeolite modified surfactant (ZMS) | 17 |
| II.1.4 Chemical oxygen demand (COD) | 19 |
| II.1.5 Adsorption | 20 |
| II.1.6 Adsorption kinetics | 21 |
| II.2 Hypothesis Formulations and Research Plans | 22 |
| II.2.1 Hypothesis formulation I | 22 |
| II.2.2 Hypothesis formulation II | 23 |
| II.2.3 Research planning | 23 |
| CHAPTER III RESEARCH METHODS | 24 |
| III.1 Materials | 24 |
| III.2 Equipments | 24 |
| III.3 Procedures | 24 |
| III.3.1 Natural zeolite preparation | 24 |
| III.3.2 Zeolite activation by using acidification method | 24 |

| | |
|--|----|
| III.3.3 Surfactant modified zeolite preparation (SMZ-CAPB)..... | 25 |
| III.3.4 Adsorbent characterization | 25 |
| III.3.5 Adsorption variation..... | 26 |
| CHAPTER IV RESULT AND DISCUSSION | 19 |
| IV.1 Preparation of Natural Zeolite..... | 19 |
| IV.2 Characterization of SMZ-CAPB | 20 |
| IV.2.1 Determination of Cation Exchange Capacity (CEC) | 20 |
| IV.2.2 FT- IR characterization | 21 |
| IV.2.3 XRD characterization..... | 23 |
| IV.2.4 SEM-EDX charaterization | 26 |
| IV.3 Study of Reduction COD Value in Wastewater..... | 28 |
| IV.3.1 Study of the effect of contact time and adsorption kinetics | 29 |
| IV.3.2 Study of the effect of weight variation and adsorption kinetics | 31 |
| CHAPTER V CONCLUSIONS AND SUGGESTION..... | 35 |
| V.1 Conclusions | 35 |
| V.2 Suggestion | 35 |
| REFERENCES | 36 |
| APPENDICES | 40 |