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PREPARATION OF TITANIUM DIOXIDE THIN FILM ON GLASS PLATE USING
SOL-GEL TECHNIQUE FOR PHOTOCATALYTIC REDUCTION
OF CHROMIUM (VI)

Miss Siriwan Pongpom

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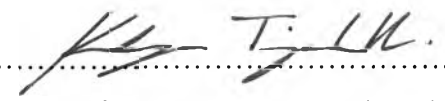
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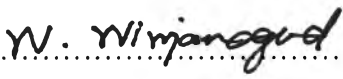
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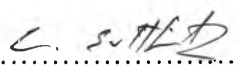
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ศิริวรรณ ป้อมป้อม : การเคลือบผิวฟิล์มบางไททาเนียมไดออกไซด์บนแผ่นแก้วด้วยวิธีโซลเจล
สำหรับการกำจัดโครเมียมด้วยวิธีโฟโตคะตะไลติกรีดักชัน.

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ในงานวิจัยนี้ได้ศึกษาถึงการเคลือบผิวฟิล์มบางไททาเนียมไดออกไซด์บนแผ่นแก้วด้วยวิธี
โซลเจลสำหรับการกำจัดโครเมียมด้วยวิธีโฟโตคะตะไลติกรีดักชัน โดยใช้ไททาเนียมบิวทอกไซด์เป็น
สารตั้งต้น เอทานอลเป็นตัวทำละลาย และกรดไฮโดรคลอริกเป็นสารเร่งปฏิกิริยา นอกจากนี้ยังใช้
อะซิโตนร่วมด้วยในการเคลือบผิว ซึ่งในการศึกษาครั้งนี้ได้ทำการศึกษาถึงสภาวะที่เหมาะสม
ในการเคลือบผิวฟิล์มบางไททาเนียมไดออกไซด์โดยใช้อัตราส่วนของสารตั้งต้น อุณหภูมิที่ใช้ในการ
อบเคลือบผิวและจำนวนรอบในการเคลือบผิวที่แตกต่างกัน โดยฟิล์มบางไททาเนียมไดออกไซด์ที่
เตรียมได้นั้นจะถูกนำไปศึกษาคุณสมบัติทั้งทางด้านกายภาพและเคมี ได้แก่ การยึดติดผิว การทนต่อ
การกัดกร่อน โครงสร้างผลึกของไททาเนียมไดออกไซด์และลักษณะพื้นผิวของฟิล์มบางเป็นต้น
จากการศึกษาพบว่าฟิล์มบางที่เตรียมได้จากอัตราส่วนของสารตั้งต้นเท่ากับ 1:30:0.5:1 อบเคลือบผิวที่
อุณหภูมิ 500 องศาเซลเซียสและทำการเคลือบผิวเป็นจำนวน 3 รอบนั้นมีประสิทธิภาพในการกำจัด
โครเมียมด้วยกระบวนการโฟโตคะตะไลซิสมากที่สุดถึง 98.88% เนื่องจากฟิล์มบางไททาเนียม-
ไดออกไซด์มีโครงสร้างผลึกในรูปอนาเทสมากที่สุด ซึ่งผลจากการวิจัยครั้งนี้สามารถนำไปใช้เป็น
ข้อมูลพื้นฐานสำหรับการเคลือบผิวฟิล์มบางไททาเนียมไดออกไซด์เพื่อประยุกต์ใช้ในการกำจัด
สิ่งปนเปื้อนออกจากรน้ำเสียในระบบโฟโตคะตะไลซิสขนาดใหญ่

สาขาวิชาการจัดการสิ่งแวดล้อม
ปีการศึกษา 2547

ลายมือชื่อนิสิต..... ศิริวรรณ ป้อมป้อม
ลายมือชื่ออาจารย์ที่ปรึกษา..... K. Puangrat

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SIRIWAN PONGPOM : PREPARATION OF TITANIUM DIOXIDE THIN FILM ON GLASS PLATE USING SOL-GEL TECHNIQUE FOR PHOTOCATALYTIC REDUCTION OF CHROMIUM(VI). THESIS ADVISOR : ASST. PROF. PUANGRAT KAJITVICHYANUKUL, Ph.D., 88 pp. ISBN 974-53-1119-7.

This study was aimed to prepare titanium dioxide thin film on glass plate using sol-gel technique for photocatalytic reduction of chromium(VI). Titanium(IV) butoxide, ethanol, hydrochloric acid, acetylacetone were used as initial substrate, solvent, acidic catalyst and additive substrate, respectively. Mole ratio of precursor solution, calcination temperature, and coating cycles were studied for optimum condition to prepare a thin film as indicated by adherence and corrosive properties, TiO₂ molecular structure and surface morphology of thin film. The mole ratio of titanium(IV) butoxide : ethanol : hydrochloric acid : acetylacetone as 1:30:0.5:1 with 500°C calcination temperature and 3 coating cycles provided the best thin film properties with highest of anatase peak resulting highest efficiency in chromium(VI) removal approximately 98.88%. Findings from this research are beneficial for an application of TiO₂ thin film in environmental aspects.

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Student's signature... *Siriwan Pongpom*
Advisor's signature... *KPuangrat*

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CONTENTS

| | Page |
|---|------|
| ABSTRACT IN THAI..... | iv |
| ABSTRACT IN ENGLISH..... | v |
| ACKNOWLEDGEMENTS..... | vi |
| CONTENTS..... | vii |
| LIST OF TABLES..... | xi |
| LIST OF FIGURES..... | xiii |
| NOMENCLATURE..... | xv |
| | |
| CHAPTER I INTRODUCTION..... | 1 |
| 1.1 Research background and motivation..... | 1 |
| 1.2 Research objectives..... | 2 |
| 1.3 Hypothesis..... | 3 |
| 1.4 Scopes of work..... | 3 |
| 1.5 Advantage of this work..... | 3 |
| | |
| CHAPTER II BACKGROUNDS AND LITERATURE REVIEW..... | 4 |
| 2.1 Photocatalysis process..... | 4 |
| 2.1.1 General information..... | 4 |
| 2.1.2 Principle of photocatalysis process..... | 5 |
| 2.2 Titanium dioxide (TiO ₂) | 6 |
| 2.3 Sol-Gel Technique..... | 8 |
| 2.3.1 General principles of sol-gel processing..... | 8 |
| 2.3.2 Parameters influencing thin film property..... | 9 |
| 2.3.2.1 Type of precursor..... | 9 |
| 2.3.2.2 Type of solvent..... | 11 |
| 2.3.2.3 Additive substance (acetylacetone)..... | 12 |
| 2.3.2.4 Influence of calcination temperature..... | 13 |
| 2.3.2.5 Influence of coating cycles..... | 13 |
| 2.4 Application of photocatalysis on environmental abatement..... | 14 |
| 2.5 Chromium..... | 15 |

| | Page |
|---|------|
| 2.5.1 Properties of Chromium..... | 15 |
| 2.5.2 Toxicology..... | 15 |
| 2.5.3 Chromium removed using photocatalysis process..... | 16 |
| | |
| CHAPTER III METHODOLOGY..... | 18 |
| 3.1 Chemicals..... | 18 |
| 3.2 Preparation of TiO ₂ thin films on glass plate for Cr(VI) photoreduction..... | 18 |
| 3.2.1 Preparation of TiO ₂ precursor solutions..... | 18 |
| 3.2.2 Preparation of TiO ₂ thin films..... | 19 |
| 3.2.3 Experimental procedure..... | 19 |
| 3.2.4 Characterization of TiO ₂ thin films..... | 20 |
| 3.2.4.1 Weighing by scale..... | 21 |
| 3.2.4.2 Adhesive test (ASTM D3359-95a)..... | 21 |
| 3.2.4.3 Corrosive test..... | 21 |
| 3.2.4.4 Scanning Electron Microscopy (SEM)..... | 21 |
| 3.2.4.5 X-ray diffraction (XRD) | 21 |
| 3.3 Investigation of Cr(VI) photoreduction using lab-made TiO ₂ thin films prepared under various conditions..... | 22 |
| 3.3.1 Synthesis wastewater..... | 22 |
| 3.3.2 Photochemical reactor..... | 22 |
| 3.3.3 Experimental procedure..... | 23 |
| 3.3.4 Analytical measurement..... | 24 |
| 3.4 Experimental chart..... | 25 |
| | |
| CHAPTER IV RESULTS AND DISCUSSION..... | 27 |
| 4.1 Role of solvent in preparations of TiO ₂ thin film..... | 27 |
| 4.1.1 Weighing by scale..... | 27 |
| 4.1.2 Adhesive test and corrosive test..... | 28 |

| | |
|---|----|
| 4.1.3 Surface morphology by SEM (Scanning Electron Microscopy) | 29 |
| 4.1.4 Crystal structures of TiO ₂ thin films by XRD (X-ray diffraction) | 32 |
| 4.1.5 Photocatalytic activity..... | 33 |
| 4.2 Role of acidic catalyst in preparations of TiO ₂ thin film..... | 35 |
| 4.2.1 Weighing by scale..... | 35 |
| 4.2.2 Adhesive test and corrosive test..... | 36 |
| 4.2.3 Surface morphology by SEM (Scanning Electron Microscopy) | 37 |
| 4.2.4 Crystal structures of TiO ₂ thin films by XRD (X-ray diffraction) | 39 |
| 4.2.5 Photocatalytic activity..... | 40 |
| 4.3 Role of additive substance in preparations of TiO ₂ thin film..... | 42 |
| 4.3.1 Weighing by scale..... | 42 |
| 4.3.2 Adhesive test and corrosive test..... | 43 |
| 4.3.3 Surface morphology by SEM (Scanning Electron Microscopy) | 43 |
| 4.3.4 Crystal structures of TiO ₂ thin films by XRD (X-ray diffraction) | 45 |
| 4.3.5 Photocatalytic activity..... | 47 |
| 4.4 Effect of calcination temperature on preparations of TiO ₂ thin film... | 48 |
| 4.4.1 Weighing by scale..... | 48 |
| 4.4.2 Adhesive test and corrosive test..... | 49 |
| 4.4.3 Surface morphology by SEM (Scanning Electron Microscopy) | 50 |
| 4.4.4 Crystal structures of TiO ₂ thin films by XRD (X-ray diffraction) | 52 |
| 4.4.5 Photocatalytic activity..... | 53 |

| | |
|---|----|
| 4.5 Effect of coating cycles on preparations of TiO ₂ thin film..... | 54 |
| 4.5.1 Weighing by scale..... | 54 |
| 4.5.2 Adhesive test and corrosive test..... | 55 |
| 4.5.3 Surface morphology by SEM (Scanning Electron Microscopy) | 55 |
| 4.5.4 Crystal structures of TiO ₂ thin films by XRD (X-ray diffraction) | 57 |
| 4.5.5 Photocatalytic activity..... | 58 |
| | |
| CHAPTER V CONCLUSIONS AND RECOMMENDATIONS..... | 61 |
| 5.1 Conclusions..... | 61 |
| 5.2 Recommendations..... | 62 |
| | |
| REFERENCES..... | 64 |
| APPENDICES..... | 71 |
| APPENDIX A..... | 72 |
| APPENDIX B..... | 74 |
| APPENDIX C..... | 76 |
| APPENDIX D..... | 83 |
| BIOGRAPHY..... | 88 |

LIST OF TABLES

| Table | | Page |
|-------|---|------|
| 2.1 | Properties of rutile and anatase..... | 7 |
| 2.2 | Common alkoxides for sol-gel processing..... | 10 |
| 4.1 | Amount of TiO ₂ thin film after coating with different mole ratios of titanium(IV) butoxide : ethanol..... | 28 |
| 4.2 | Results of adhesive and corrosive tests of TiO ₂ thin film at different ratios of titanium(IV) butoxide : ethanol..... | 29 |
| 4.3 | Crystallite size of TiO ₂ films prepared from different mole ratios of titanium(IV) butoxide : ethanol..... | 33 |
| 4.4 | Reaction rate constants for chromium(VI) photocatalytic removal using different thin film TiO ₂ | 35 |
| 4.5 | Amount of TiO ₂ thin film after coating with different mole ratios of titanium(IV) butoxide : ethanol : HCl..... | 36 |
| 4.6 | Results of adhesive and corrosive tests of TiO ₂ thin film at different ratios of titanium(IV) butoxide : ethanol : HCl..... | 36 |
| 4.7 | Crystallite size of TiO ₂ films prepared from different mole ratios of titanium(IV) butoxide : ethanol : HCl..... | 40 |
| 4.8 | Reaction rate constants for chromium(VI) photocatalytic removal using thin film TiO ₂ derived from different mole ratios of titanium(IV) butoxide : ethanol : HCl..... | 41 |
| 4.9 | Amount of TiO ₂ thin film after coating with different mole ratios of titanium(IV) butoxide : ethanol : HCl : acetylacetone..... | 42 |
| 4.10 | Results of adhesive and corrosive tests of TiO ₂ thin film at different ratios of titanium(IV) butoxide : ethanol : HCl : acetylacetone..... | 43 |
| 4.11 | Crystallite size of TiO ₂ films prepared from different mole ratios of titanium(IV) butoxide : ethanol : HCl : acetylacetone..... | 46 |
| 4.12 | Reaction rate constants for chromium(VI) photocatalytic removal using thin film TiO ₂ derived from different mole ratios of titanium(IV) butoxide : ethanol : HCl : acetylacetone..... | 48 |
| 4.13 | Amount of TiO ₂ thin film derived from different calcination temperatures. | 49 |

| Table | Page |
|---|------|
| 4.14 Results of adhesive and corrosive tests of TiO ₂ thin film derived from different calcination temperatures..... | 49 |
| 4.15 Crystallite size of TiO ₂ films prepared from different calcination temperatures..... | 53 |
| 4.16 Reaction rate constants for chromium(VI) photocatalytic removal using thin film TiO ₂ derived from different calcination temperatures..... | 54 |
| 4.17 Amount of TiO ₂ thin film derived from several coating cycles..... | 55 |
| 4.18 Results of adhesive and corrosive tests of TiO ₂ thin film derived from several coating cycles..... | 55 |
| 4.19 Crystallite size of TiO ₂ films prepared from several coating cycles..... | 58 |
| 4.20 Reaction rate constants for chromium(VI) photocatalytic removal using thin film TiO ₂ derived from several coating cycles..... | 60 |
| D-1 Photoreduction of Cr(VI) using TiO ₂ thin film obtained from titanium(IV) butoxide : ethanol ratio at 1:20 and 1:30..... | 83 |
| D-2 Photoreduction of Cr(VI) using TiO ₂ thin film obtained from titanium(IV) butoxide : ethanol : HCl ratio at 1:30:0, 1:30:0.5, 1:30:1 and 1:30:2..... | 84 |
| D-3 Photoreduction of Cr(VI) using TiO ₂ thin film obtained from titanium(IV) butoxide : ethanol : HCl : acetylacetone ratio at 1:30:0.5:0, 1:30:0.5:1, 1:30:0.5:2 and 1:30:0.5:2..... | 85 |
| D-4 Photoreduction of Cr(VI) using TiO ₂ thin film obtained from different calcination temperatures..... | 86 |
| D-5 Photoreduction of Cr(VI) using TiO ₂ thin film obtained from several coating cycles..... | 87 |

LIST OF FIGURES

| Figure | Page |
|--|------|
| 2.1 Schematic of the photocatalysis process..... | 5 |
| 2.2 Structure of rutile and anatase TiO ₂ | 7 |
| 2.3 Diagram of sol-gel process..... | 9 |
| 3.1 Sketch of photochemical reactor..... | 23 |
| 3.2 Experimental chart of TiO ₂ thin film preparation..... | 25 |
| 3.3 Experimental chart of photocatalytic reduction of Cr(VI) | 26 |
| 4.1 (a)-(f) SEM photographs of the TiO ₂ coating films derived from different mole ratios of titanium(IV) butoxide : ethanol..... | 31 |
| 4.2 XRD patterns of TiO ₂ thin films deposited on microscopy glass plates..... | 32 |
| 4.3 Photocatalytic reduction of Cr(VI) on TiO ₂ thin film derived from different mole ratios of titanium(IV) butoxide : ethanol..... | 34 |
| 4.4 (a)-(d) SEM photographs of the TiO ₂ coating films derived from different mole ratios of titanium(IV) butoxide : ethanol : HCl..... | 38 |
| 4.5 XRD patterns of TiO ₂ thin films derived from different mole ratios of titanium(IV) butoxide : ethanol : HCl..... | 40 |
| 4.6 Photocatalytic reduction of Cr(VI) on TiO ₂ thin film derived from different mole ratios of titanium(IV) butoxide : ethanol : HCl..... | 41 |
| 4.7 (a)-(d) SEM photographs of the TiO ₂ coating films derived from different mole ratios of titanium(IV) butoxide : ethanol : HCl : acetylacetone..... | 45 |
| 4.8 XRD patterns of TiO ₂ thin films derived from different mole ratios of titanium(IV) butoxide : ethanol : HCl : acetylacetone..... | 46 |
| 4.9 Photocatalytic reduction of Cr(VI) on TiO ₂ thin film derived from different mole ratios of titanium(IV) butoxide : ethanol : HCl : acetylacetone..... | 47 |
| 4.10 (a)-(d) SEM photographs of the TiO ₂ coating films derived from different calcination temperatures..... | 51 |
| 4.11 XRD patterns of TiO ₂ thin films derived from different calcination temperatures..... | 52 |
| 4.12 Photocatalytic reduction of Cr(VI) on TiO ₂ thin film derived from different calcination temperatures..... | 53 |

| Figure | Page |
|--|------|
| 4.13 SEM photographs of TiO ₂ thin film with multistep coating cycles (a) 1 cycle and (b) 3 cycles (c) 5 cycles..... | 57 |
| 4.14 XRD patterns of TiO ₂ thin films derived from several coating cycles..... | 58 |
| 4.15 Photocatalytic reduction of Cr(VI) on TiO ₂ thin film derived from several coating cycles..... | 59 |
| C-1 Schematic illustration of Scanning Electron Microscope (SEM)..... | 77 |
| C-2 Principles of X-Ray Diffraction (XRD)..... | 79 |
| C-3 Example of XRD analysis graph..... | 80 |
| C-4 Directions of UV spectrum..... | 81 |
| C-5 Electronic transitions of electron..... | 81 |
| C-6 Schematic of UV-Vis spectrophotometer..... | 82 |

NOMENCLATURE

| | | |
|-------------------|---|------------------------------|
| AOPs | = | advanced oxidation processes |
| Cr(III) | = | trivalent chromium |
| Cr(VI) | = | hexavalent chromium |
| $O_2^{\bullet -}$ | = | super oxide anion radical |
| OH^{\bullet} | = | hydroxyl radical |
| OH^- | = | hydroxide ion |
| TiO_2 | = | titanium dioxide |
| UV | = | ultraviolet |