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สำหรับการกำจัดโครเมียมด้วยวิธีโฟโตคะตะไลติกที่ระดับ



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PREPARATION OF TiO_2 THIN FILM ON STAINLESS STEEL PLATE USING
SOL-GEL TECHNIQUE FOR PHOTOCATALYTIC REDUCTION OF CHROMIUM (VI)

Miss Parichart Amornchat

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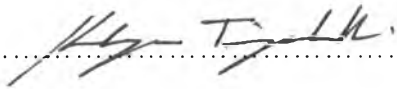
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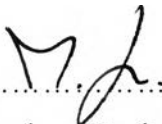
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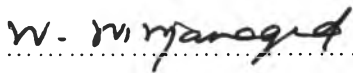
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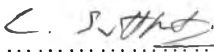
THESIS COMMITTEE


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..... Thesis Advisor
(Assistant Professor Puangrat Kajitvichyanukul, Ph.D.)


..... Member
(Associate Professor Wanpen Wirojanagud, Ph.D.)


..... Member
(Assistant Professor Jarurat Voranisarakul)


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(PREPARATION OF TiO_2 THIN FILM ON STAINLESS STEEL PLATE USING SOL-GEL TECHNIQUE FOR PHOTOCATALYTIC REDUCTION OF CHROMIUM(VI))

อ. ที่ปรึกษา : ผศ. ดร. พวงรัตน์ ขจิตวิษยานุกูล, 93 หน้า. ISBN 974-53-1089-1.

ในงานวิจัยนี้ ได้เน้นในส่วนการเคลือบฟิล์มบางไทเทเนียมไดออกไซด์บนแผ่นสแตนเลสด้วยวิธีโซลเจล โดยมีจุดมุ่งหมายในการศึกษาตัวแปรต่างๆ ที่มีผลต่อลักษณะของฟิล์มบาง ได้แก่ อัตราส่วนเอทานอล และสารอินทรีย์ต่อไทเทเนียมเริ่มต้น, อุณหภูมิที่ใช้ในการอบเคลือบ และจำนวนรอบในการเคลือบผิว สารอินทรีย์ที่ใช้ในการทดลองนี้ ได้แก่ โพลีเอธิลีนไกลคอล และ ไดเอธิลีนไกลคอล ซึ่งมีหน้าที่เพิ่มความแข็งแรงของฟิล์ม รวมทั้งทำให้ฟิล์มที่ได้มีความคงทนต่อการกัดกร่อนด้วยกรด และด่าง นอกจากนี้สารอินทรีย์ยังมีส่วนช่วยให้ฟิล์มมีพื้นที่ผิวมากขึ้น เป็นผลทำให้มีประสิทธิภาพในการกำจัดโครเมียมด้วยกระบวนการโฟโตคะตะไลติกเพิ่มมากขึ้น การเพิ่มอุณหภูมิในการอบเคลือบและจำนวนรอบในการเคลือบผิว มีส่วนสำคัญในการเพิ่มปริมาณนาเทส ซึ่งทำให้ประสิทธิภาพในการบำบัดโครเมียมเพิ่มมากขึ้นเช่นกัน ทั้งนี้ฟิล์มบางไทเทเนียมที่ได้จากอัตราส่วนโดยโมลของไทเทเนียม:เอทานอล:โพลีเอธิลีนไกลคอล:ไดเอธิลีนไกลคอล ที่ 1:20:0.5:0.5 โดยใช้อุณหภูมิในการอบเคลือบ 500 องศาเซลเซียส เป็นจำนวน 5 รอบ มีประสิทธิภาพในการบำบัดโครเมียมสูงสุดที่ 36.04% ซึ่งผลการทดลองที่ได้สามารถใช้เป็นข้อมูลเบื้องต้นในการเตรียมฟิล์มบางไทเทเนียมเพื่อใช้ในการบำบัดน้ำเสียในระดับอุตสาหกรรมต่อไป

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PARICHART AMORNCHAT: PREPARATION OF TiO₂ THIN FILM ON
STAINLESS STEEL PLATE USING SOL-GEL TECHNIQUE FOR
PHOTOCATALYTIC REDUCTION OF CHROMIUM(VI).

THESIS ADVISOR: ASST. PROF. PUANGRAT KAJITVICHYANUKUL,
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In this research, the main focus was to coat titanium dioxide thin films on stainless steel plate using the sol-gel method. The aims of this work were to investigate the factors influencing the film properties including molar ratio of ethanol and chemical additives, calcination temperature, and coating cycle. Polyethylene glycol with molecular weight 600 g/mol (PEG600) and diethylene glycol (DEG) were used as chemical additives. The results showed that these additives played an important roles in improving film adherence, corrosive resistance, and increasing film surface areas, resulting in high photocatalytic activity for chromium(VI) removal. Moreover, increase in calcination temperature and coating cycle provided high amount of anatase caused the highest activity for chromium(VI) removal. The TiO₂ thin films prepared with the mole ratio of titanium precursor:ethanol:PEG600:DEG at 1:20:0.5:0.5 and calcination at 500°C with 5-coating cycles exhibited the highest efficiency in photoreduction of chromium(VI) with 36.04% removal. The obtained results provided the fundamental information in TiO₂ thin film synthesis which can be applied for full-scale reactor used industrial waste water treatment.

Field of study Environmental Management

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Student's signature.....*Panchart A.*

Advisor's signature.....*KPuangrat*

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NOMENCLATURE

Cr(III)	=	trivalent chromium
Cr(VI)	=	hexavalent chromium
TiO ₂	=	titanium dioxide
TTiP	=	titanium tetraisopropoxide
PEG600	=	polyethylene glycol with molecular weight 600 g/mol
DEG	=	diethylene glycol