

ผลของตัวแปรการทำงานที่มีผลต่อปฏิกิริยา โฟโตคะตะไลติกรีดักชันของ โครเมียม (VI)
โดยตั้งปฏิกรณ์แบบแผ่นหมุน



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EFFECT OF OPERATING PARAMETERS ON PHOTOCATALYTIC REDUCTION OF
CHROMIUM (VI) USING ROTATING DISC PHOTOCATALYTIC REACTOR (RDPR)

Miss Pattama Paksaharn

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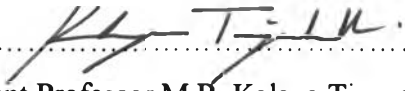
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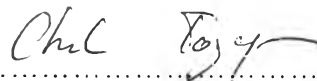
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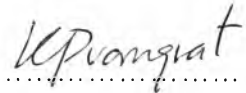
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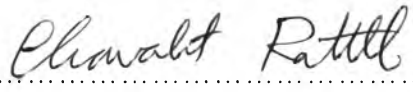
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ดั่งปฏิกิริยาโฟโตคะตะไลซิสรูปแบบใหม่ออกแบบเพื่อการบำบัดน้ำเสีย โดยมีลักษณะเป็นดั่งปฏิกิริยาโฟโตคะตะไลซิสแบบแผ่นหมุน ในการศึกษาได้ทำการเคลือบไททาเนียมไดออกไซด์ในรูปแบบของแผ่นฟิล์มบนแผ่นดิสก์สเตนเลส ด้วยวิธีการโซล-เจล ซึ่งภายในดั่งปฏิกิริยาประกอบด้วย แผ่นดิสก์สเตนเลสจำนวน 20 แผ่นและหลอดยูวีที่ความยาวคลื่น 380 นาโนเมตร โดยพารามิเตอร์ที่ทำการศึกษาประกอบด้วย พีเอชเริ่มต้นของน้ำเสีย, อัตราการไหลของน้ำเสีย, ความเร็วรอบในการหมุนแผ่นดิสก์, ปริมาณแผ่นฟิล์มไททาเนียมไดออกไซด์ที่เคลือบบนแผ่นดิสก์สเตนเลสและความเข้มข้นของน้ำเสียเริ่มต้น การศึกษาดั่งปฏิกิริยาโฟโตคะตะไลซิสนี้มุ่งเน้นที่จะแสดงถึงประสิทธิภาพในการกำจัดโครเมียมที่หลายความเข้มข้นและจากการศึกษาพบว่าที่สภาวะพีเอช 3 อัตราการเกิดปฏิกิริยาโฟโตคะตะไลซิสจะเพิ่มขึ้นและให้ประสิทธิภาพสูงสุดเมื่อความเร็วรอบในการหมุนแผ่นดิสก์เพิ่มขึ้นถึง 200 รอบต่อนาทีและอัตราการไหลน้ำเสีย 90 มิลลิตรต่อวินาที โดยที่ความเข้มข้นของน้ำเสียเริ่มต้นน้อยกว่า 150 มิลลิกรัมต่อลิตรปฏิกิริยาที่เกิดขึ้นเป็นปฏิกิริยาอันดับศูนย์และที่ความเข้มข้นของน้ำเสียเริ่มต้นมากกว่า 150 มิลลิกรัมต่อลิตรเป็นปฏิกิริยาอันดับหนึ่งซึ่งมีค่าคงที่ของแลงเมียร์-เฮนเชอร์วูดเป็น 0.3592 มิลลิกรัมต่อลิตรนาที และ 0.0482 ลิตรต่อมิลลิกรัม ในส่วนของการศึกษาเชิงกลศาสตร์ของปฏิกิริยาที่เกิดขึ้นภายในดั่งปฏิกิริยานั้นควรมีการศึกษาต่อไป ในการศึกษาครั้งนี้พบว่า ดั่งปฏิกิริยาโฟโตคะตะไลซิสแบบแผ่นหมุนมีคุณสมบัติเป็นอย่างมากในการนำตัวเร่งปฏิกิริยามาประยุกต์ใช้เพื่อการบำบัดน้ำเสียอุตสาหกรรมภายใต้การทำปฏิกิริยาของแผ่นบาง.

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ลายมือชื่อนิสิต..... P. Pattama
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 KEY WORD: ROTATING DISC PHOTOCATALYTIC REACTOR / TITANIUM
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 PATTAMA PAKSAHARN: EFFECT OF OPERATING PARAMETERS
 ON PHOTOCATALYTIC REDUCTION OF CHROMIUM (VI) USING
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A new photocatalytic reactor design for water treatment was characterized by the use of rotating disc photocatalytic reactor. In this study, TiO_2 was immobilized on stainless steel disc by sol-gel method. Experiments in a reactor containing 20 rotating disc with UV light irradiation at the wavelength of 380 nm were performed. The effect of the initial pH of wastewater, wastewater flow rate (Q_w), rotating disc speed (V_r) and amount of TiO_2 coating surface are on photocatalytic reduction of chromium (VI) over TiO_2 /stainless steel disc have been determined. The studied photoreactor has been shown to effectively reduce chromium (VI) concentration in a wide range and the rate of photocatalytic reduction increases with increase of flow rate, rotating speed and amount of TiO_2 coating surface area at the system condition pH 3. It was found that the maximum rotating speed at 200 rpm and the highest flow rate 90 ml/s provide highest kinetic coefficient rate. At initial concentrations of chromium (VI) less than 150 ppm, the kinetic behavior was followed the zero order pattern and changed to pseudo first order pattern at the initial concentration of chromium (VI) higher than 150 ppm. The intrinsic kinetic coefficients following the Langmuir-Hinshelwood were found as 0.3592 mg/L.min and 0.0482 L/mg. From this research, this type of reactor exhibited certain advantages, which are immobilization of the catalyst for industrial practical usage and high performance with the reaction in thin liquid film.

Field of study Environmental Management

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NOMENCLATURE

Cr (III)	=	trivalent chromium
Cr (VI)	=	hexavalent chromium
TiO ₂	=	titanium dioxide
RDPR	=	Rotating Disc Photocatalytic Reactor
ppm	=	part per million