

**DEGRADATION OF AZO DYE IN WASTEWATER USING MESOPOROUS-
ASSEMBLED $\text{SrTi}_x\text{Zr}_{1-x}\text{O}_3$ ($x = 0-1$) NANOCRYSTAL PHOTOCATALYSTS**



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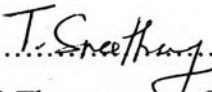
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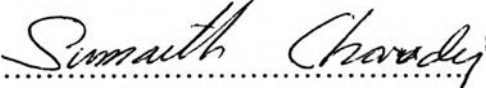
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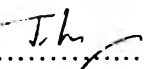
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ABSTRACT

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Pattharin Khunrattanaphon: Degradation of Azo Dye in Wastewater Using Mesoporous-Assembled $\text{SrTi}_x\text{Zr}_{1-x}\text{O}_3$ ($x = 0-1$) Nanocrystal Photocatalysts

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An azo compound is a synthetic dye comprising one or more azo groups (-N=N-) linked between aromatic rings. The release of this coloring agent unavoidably causes wastewater treatment problems. Photocatalysis is an effective method that uses sunlight as the energy source to degrade the azo dye under ambient conditions. This research focused on the improvement of photocatalytic activity of mesoporous-assembled $\text{SrTi}_x\text{Zr}_{1-x}\text{O}_3$ nanocrystal photocatalysts for Acid Black (AB) diazo dye degradation by varying the Ti-to-Zr molar ratio, calcination temperature and time, and platinum (Pt) loading content. All of the photocatalysts were synthesized by a sol-gel process with the aid of a structure-directing surfactant. The experimental results showed that the mesoporous-assembled $\text{SrTi}_x\text{Zr}_{1-x}\text{O}_3$ nanocrystal with a Ti-to-Zr ratio of 0.9:0.1 calcined at 700 °C provided a better degradation rate constant than others. Pt loading with an optimum content on the mesoporous-assembled $\text{SrTi}_{0.9}\text{Zr}_{0.1}\text{O}_3$ nanocrystal was found to increase the degradation rate constant of the AB diazo dye. Furthermore, the calcination temperature was found to significantly affect the degradation rate constant.

บทคัดย่อ

พัชรธรินทร์ คุณรัตนภรณ์ : การสลายตัวของสีข้อมประเภทเอโซที่ปนเปื้อนในน้ำเสียโดยใช้ตัวเร่งปฏิกิริยาแบบใช้แสงร่วมสตรอนเทียมไททาเนียมเซอร์โคเนตที่มีขนาดอนุภาคผลึกและรูพรุนในระดับนาโนเมตร (Degradation of Azo Dye in Wastewater Using Mesoporous-Assembled $\text{SrTi}_x\text{Zr}_{1-x}\text{O}_3$ ($x = 0-1$) Nanocrystal Photocatalysts) อ. ที่ปรึกษา : ผศ.ดร. ธรรมบุญศรีทะวงศ์, รศ.ดร. สุเมธ ชวเดช 80 หน้า

สีข้อมประเภทเอโซเป็นสารในกลุ่มสีสังเคราะห์ซึ่งประกอบด้วยกลุ่มของเอโซ (-N=N-) ตั้งแต่หนึ่งกลุ่มหรือมากกว่าหนึ่งกลุ่มต่อกับวงสารอะโรมาติกส์ การปล่อยสารให้สีเหล่านี้สู่สภาวะแวดล้อมทำให้เกิดปัญหามลพิษน้ำเสียอย่างหลีกเลี่ยงไม่ได้ ปฏิกิริยาแบบใช้แสงร่วมเป็นวิธีที่มีประสิทธิภาพวิธีหนึ่งซึ่งใช้แสงอาทิตย์เป็นแหล่งกำเนิดพลังงานในการย่อยสลายสีข้อมประเภทเอโซภายใต้อุณหภูมิห้องและความดันบรรยากาศ ในงานวิจัยนี้มุ่งเน้นศึกษาการปรับปรุงและพัฒนาความสามารถในการย่อยสลายสีข้อมแอซิดแบล็ค (สีข้อมชนิดไดเอโซ) ของตัวเร่งปฏิกิริยาแบบใช้แสงร่วมสตรอนเทียมไททาเนียมเซอร์โคเนตที่มีขนาดอนุภาคผลึกและรูพรุนในระดับนาโนเมตร โดยการเปลี่ยนแปลงตัวแปรต่างๆ ได้แก่ อัตราส่วนเชิงโมลของไททาเนียมและเซอร์โคเนียม, อุณหภูมิและเวลาที่ใช้ในการเผา, และปริมาณแพลทินัมที่ใส่ลงบนตัวเร่งปฏิกิริยาดังกล่าว ในการทดลองนี้ตัวเร่งปฏิกิริยาแบบใช้แสงร่วมถูกสังเคราะห์ขึ้นโดยกระบวนการโซล-เจลร่วมกับการใช้สารลดแรงตึงผิวเป็นตัวกำหนดโครงสร้าง จากผลการทดลองพบว่าตัวเร่งปฏิกิริยาแบบใช้แสงร่วมสตรอนเทียมไททาเนียมเซอร์โคเนต ที่ประกอบด้วยอัตราส่วนของไททาเนียมและเซอร์โคเนียมเท่ากับ 0.9:0.1 ซึ่งถูกเผาที่อุณหภูมิ 700 องศาเซลเซียส ให้ผลในการย่อยสลายสีข้อมดีกว่าตัวเร่งปฏิกิริยาสตรอนเทียมไททาเนียมเซอร์โคเนตตัวอื่น การใส่แพลทินัมในปริมาณที่เหมาะสมบนตัวเร่งปฏิกิริยาดังกล่าวพบว่า อัตราการย่อยสลายของสีข้อมมีค่าเพิ่มขึ้น นอกจากนี้ยังพบว่า อุณหภูมิที่ใช้ในการเผามีผลกระทบเป็นอย่างมากต่ออัตราการย่อยสลายสีข้อม

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