ADVANCED OXIDATION PROCESS FOR WASTEWATER TREATMENT

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ABSTRACT

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Industrial wastewater treatment is important for removing pollutants before the wastewater is released into the environment. Advanced oxidation process (AOP) based on the generation of highly reactive hydroxyl radicals is an important method employed in wastewater treatment. There are various types of AOP such as air/H_2O_2, Fenton, and photo-Fenton. In this study, an aqueous solution of 1% ethanol and 0.2% isopropanol was used as the simulated wastewater generated from a polyethylene plant. Fenton/air and Fenton processes were selected as treatment methods. Various parameters that affect AOP were studied. The concentrations of simulated pollutants and TOC were reduced along the time-on-stream and reduced even further when higher air flow rates and concentrations of H_2O_2 were used. A mathematical model combining the effects of evaporation and chemical oxidation was adapted and improved from a previous work. The proposed mathematical model for the Fenton process gave a closely fit with the experimental data, however, the model prediction for the Fenton/Air process did not fit. The enormous over-prediction of the Fenton/Air model was probably due to the assumption of evaporation.

บทคัดย่อ

อภิพงศ์ จิตต์วโรดม: การบำบัดน้ำเสียด้วยกระบวนการแอดวานซ์ออคซิเดชั่น (Advanced Oxidation Process for Wastewater Treatment) อ. ที่ปรึกษา ดร. กิติพัฒน์ สีมานนท์ ดร. ศิริรัตน์ จิตการค้า และ ดร. วิวรรณ ธรรมมงคล 59 หน้า ISBN 974-17-2273-7

การบำบัดน้ำเสียจากอุตสาหกรรมมีความ เพื่อกำจัดสารที่เป็นมลพิษเป็นสิ่งที่สำคัญก่อนที่จะปล่อยน้ำทิ้งไปสู่สิ่งแวดล้อม กระบวนการแอดวานซ์ออกซิเดชั่นโดยใช้หลักการสร้างไฮดรอกซิลเรดิคอล ที่มีความไวทางปฏิกิริยาสูงเป็นวิธีสำคัญในการบำบัดน้ำทิ้ง กระบวนการนี้แบ่งออกเป็นหลายประเภท เช่น กระบวนการที่ใช้อากาศกับไฮโดรเจนเปอออกไซด์ กระบวนการเฟนตัน และโฟโตเฟนตัน ในงานวิจัยนี้ น้ำเสียจำลองจากโรงงานโพลีเอทิลีนที่ใช้ในการศึกษาประกอบด้วย เอทานอล 1 เปอร์เซนต์โดยน้ำหนัก และ ไอโซโพรพานอล 0.2 เปอร์เซนต์โดยน้ำหนัก กระบวนการเฟนตันกับอากาศ และเฟนตัน เป็นวิธีบำบัดน้ำทิ้งเพื่อศึกษาตัวแปรที่ส่งผลกับระบบกำจัดน้ำเสีย ผลการศึกษาพบว่าความเข้มข้นของสารมลพิษจำลอง และค่าTOCภายในสารไฮโดรคาร์บอนและในน้ำเสียมีปริมาณลดลงเมื่อใช้เวลามากขึ้นและเมื่อเพิ่มอัตราการไหลของอากาศและความเข้มข้นของไฮโดรเจนเปอร์ออกไซด์ นอกจากนี้ แบบจำลองทางคณิตศาสตร์จากงานที่แล้วถูกสร้างขึ้นโดยรวมผลกระทบของการระเหยและปฏิกิริยาออกซิเดชั่น เพื่อนำไปพัฒนาและประยุกต์ใช้ในงานต่อไป ผลของการจำลองทางคณิตศาสตร์ของกระบวนการเฟนตันพบว่ามีผลใกล้เคียงกับผลที่ได้จากการทดลอง แต่สำหรับกระบวนการเฟนตันกับอากาศมีความแตกต่างจากผลการทดลอง ซึ่งอาจจะเป็นผลมาจากการสมมติฐานในกระบวนการระเหย

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