

Title : Investigation of dye degradation via a ferrocene-enhanced Fenton reaction

Author(s) : 1. Manussanan Thobwan Student ID : 650515018
2. Student ID :
3. Student ID :

Major : Environmental Science

Advisor(s) : 1. Assistant Professor Dr. Kullapa Chanawanno
2.
3.

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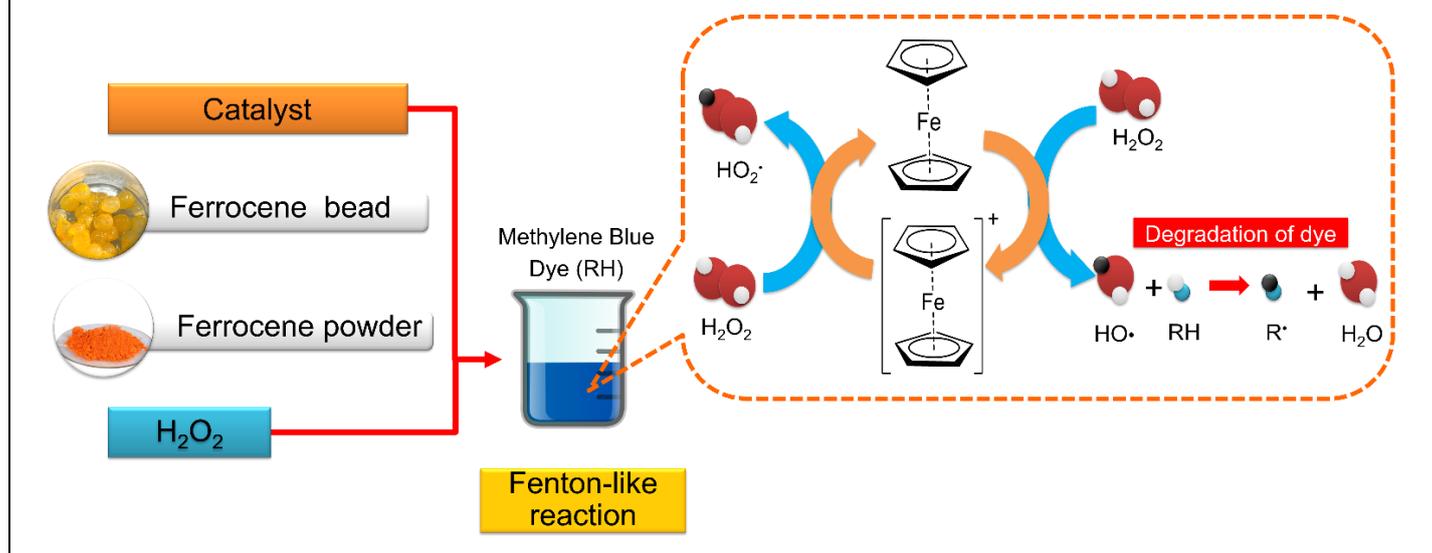
ABSTRACT

The use of dyes in industrial and manufacturing processes has a significant environment impacts. The Fenton reaction is widely used advance oxidation process (AOPs), and is based on the reaction between hydrogen peroxide (H₂O₂) and ferrous ions (Fe²⁺) to generate hydroxyl radicals (OH•) for pollutant degradation. However, homogeneous Fenton reaction generates ferric sludge, and possess challenges in Fe²⁺ ions recovery from treated wastewater. This study aims to reduce sludge generation by replacing the homogeneous catalyst with a heterogeneous Fenton system using ferrocene (Fc). The performance of ferrocene-based Fenton and conventional Fenton systems was investigated, and the reaction kinetics of dye degradation were evaluated. FeSO₄ and Fc were employed in both powder and alginate bead forms. FeSO₄ exhibited faster reaction rates, whereas Fc powder showed higher degradation efficiency at low catalyst concentrations. Although Fc beads exhibited slower degradation than the powdery Fc, they offered the advantage of easier catalyst recovery. The performance of the system strongly depended on the ratio of catalyst H₂O₂. The Fc beads recyclability was up to five cycles, with re-immersion in calcium chloride solution between each cycle. Reusability tests revealed a gradual decline in dye degradation efficiency, which is attributed to physical damage to the bead structure and possible ferrocene

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leaching. Furthermore, large-scale experiments conducted in a fluidized-bed reactor using Fc beads achieved high dye removal efficiency; however, bead stability remains a key challenge for practical application.



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Associate Professor	รองศาสตราจารย์
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Assistant Professor	ผู้ช่วยศาสตราจารย์
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Chemistry	เคมี
Industrial Chemistry	เคมีอุตสาหกรรม
Materials Science	วัสดุศาสตร์
Physics	ฟิสิกส์
Computer Science	วิทยาการคอมพิวเตอร์
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