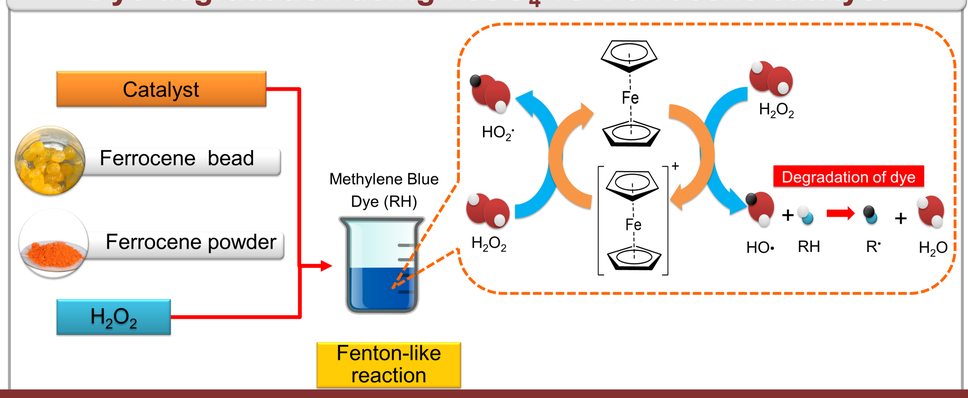
Investigation of Dye Degradation via a Ferrocene-Enhanced Fenton Reaction

Manussanan Thobwan[1], Kullapa Chanawanno[1,2]

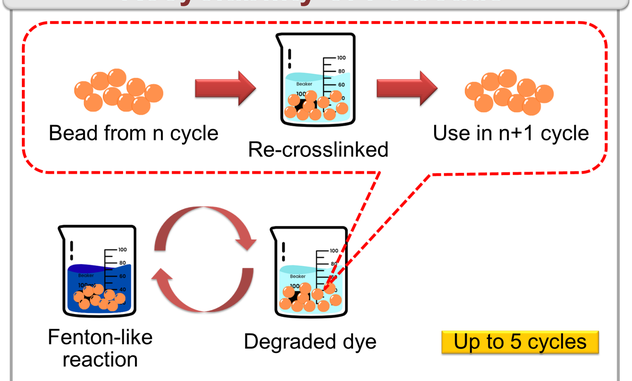
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Abstract

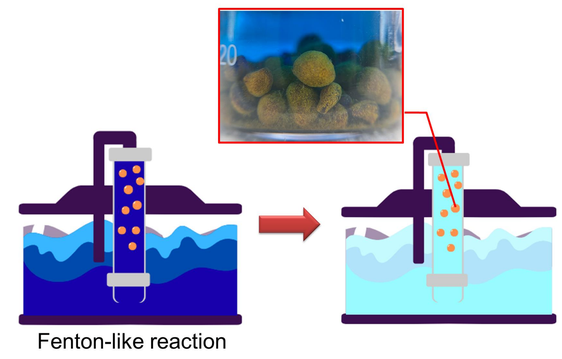
Dye degradation using $FeSO_4$ vs. Ferrocene catalyst



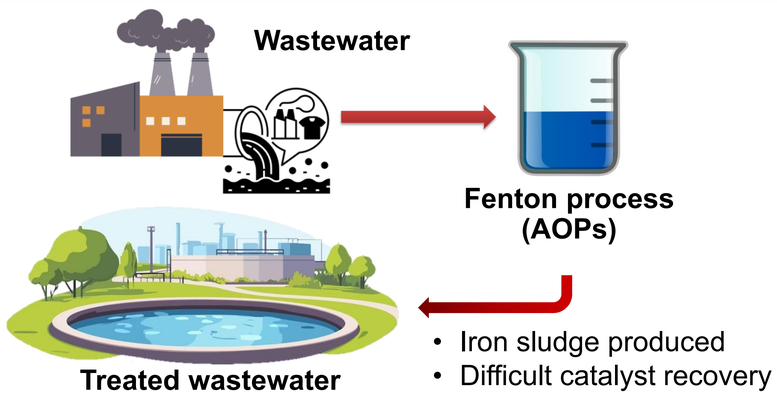
Recyclability of Fc beads



Fc beads application in fluidized bed reactor



Introduction

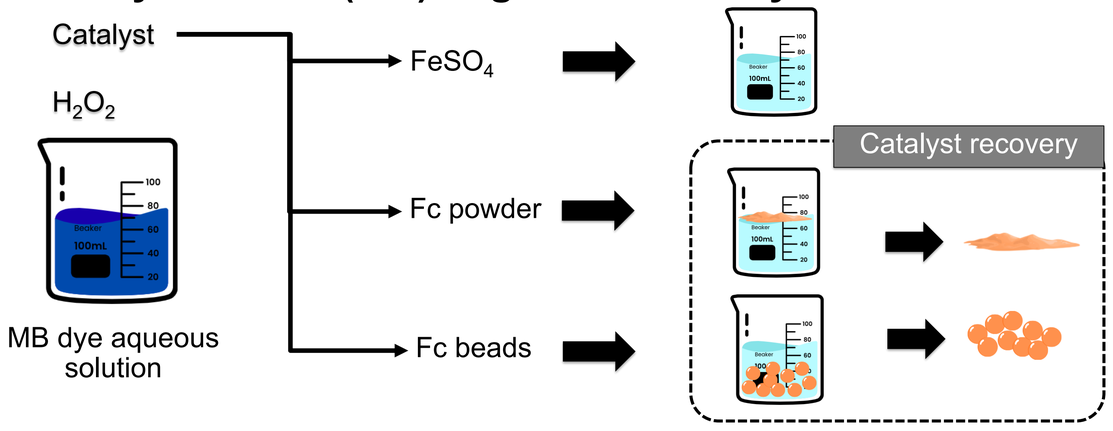


Objective

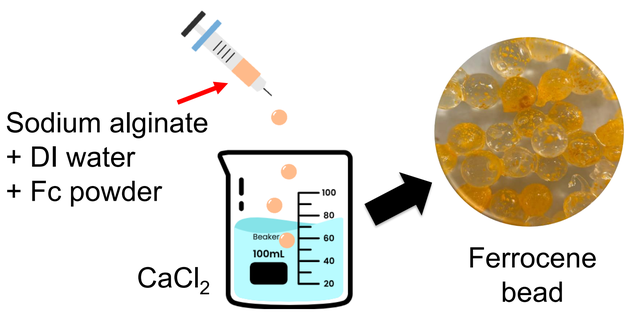
- Study for catalytic properties of ferrocene-based Fenton and conventional Fenton
- Investigation of encapsulated Fc catalyst usage
- Methylene blue (MB) degradation kinetics study

Method

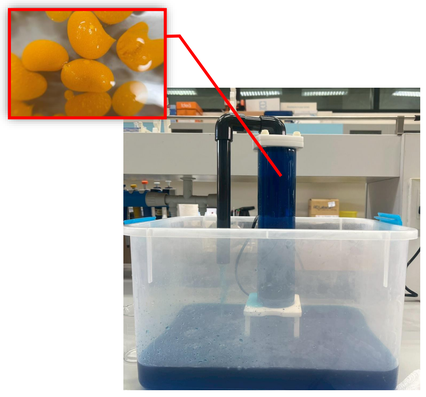
1. Methylene blue (MB) degradation study



2. Fc bead preparation



3. Fc bead application in reactor



Conclusion

- Both powder and bead forms of the Fc catalyst showed effective degradation of MB through a Fenton-like reaction.
- Crosslinked alginate beads enable Fc recyclability for up to five cycles, with 25–85% dye degradation.

Acknowledgement

- Department of Chemistry, Faculty of Science, Chiang Mai University
- Environmental Science Research Center, Faculty of Science, Chiang Mai University
- Ms. Pornthip Onthong

References

- Q. Wang, S. Tian, J. Cun, and P. Ning, Degradation of methylene blue using a heterogeneous Fenton process catalyzed by ferrocene, *Desalin. Water Treat.*, 2013, 51, 5821–5830.
- N. Jorge, A. R. Teixeira, L. Marchão,P. B. Tavares, M. S. Lucas, and J. A. Peres, Application of Ferrocene in the Treatment of Winery Wastewater in a Heterogeneous Photo-Fenton Process, *Mater. Proc.*, 2022, 9(1), 12.

Results

Conventional Fenton ($FeSO_4$) vs ferrocene performance

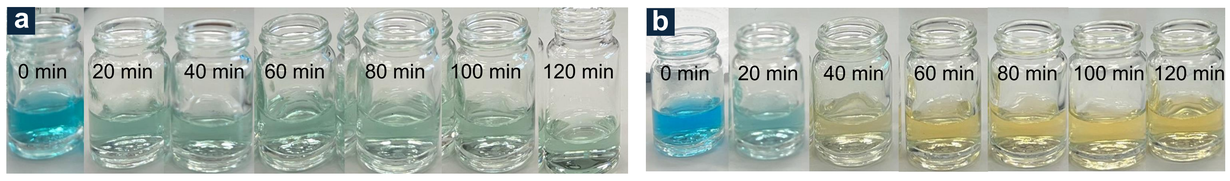


Fig 1. (a) MB degradation using $FeSO_4$ (b) MB degradation using Fc

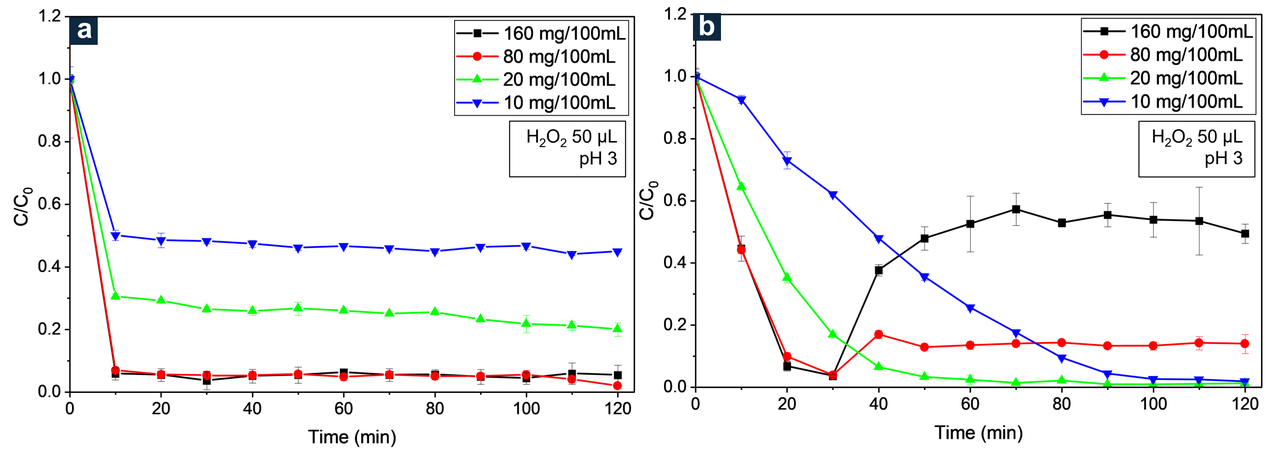


Fig 2. (a) MB degradation using $FeSO_4$ (b) MB degradation using Fc powder

H_2O_2 amount optimization

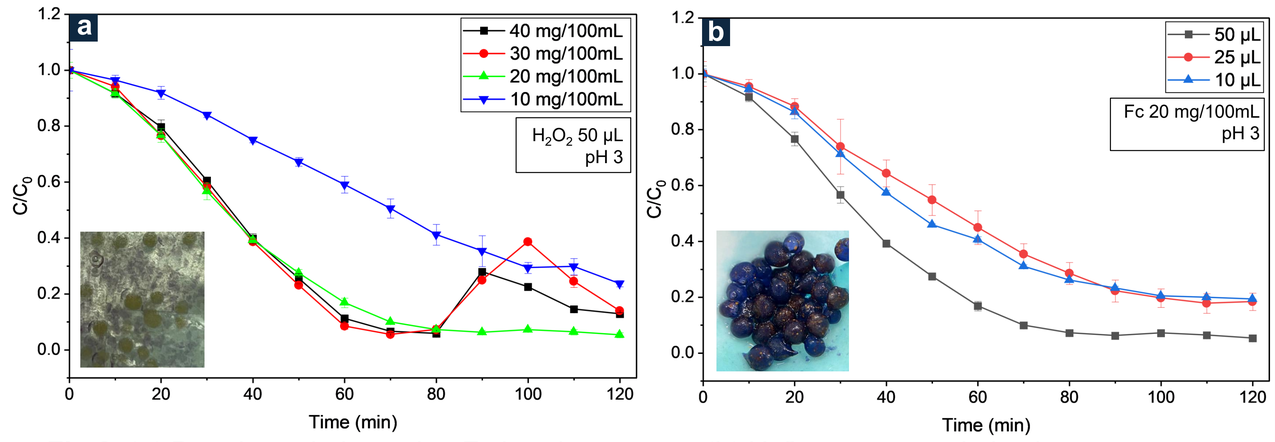


Fig 3. (a) Dye degradation using Fc bead (b) H_2O_2 amount optimization

Recyclability of Fc bead

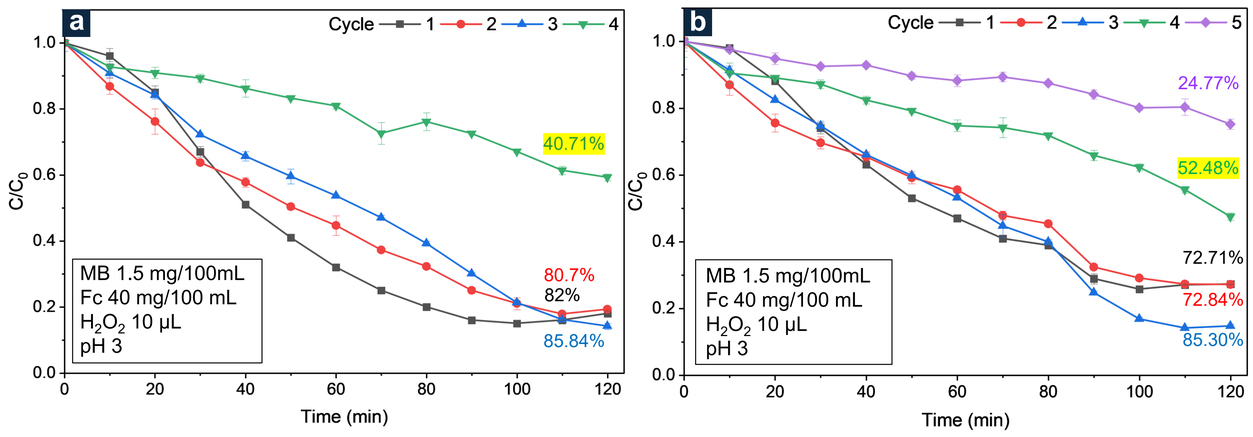
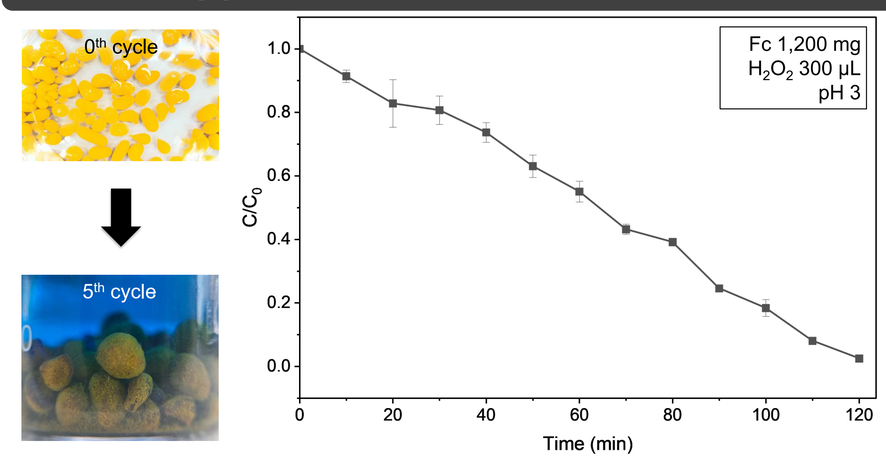


Fig 4. (a) Performance of Fc bead recyclability without $CaCl_2$ (b) Performance of Fc bead recyclability with $CaCl_2$

Application of Fc bead in fluidized bed reactor



Future Plan

- Improvement of Fc encapsulation methods
- Expansion of more pollutant degradation study