

# Effluent treatment by heterogeneous photo-Fenton using copper-doped magnetic biochar from rice husk

Maria Eduarda Pereira de Sousa<sup>1</sup>, Jany Hellen Ferreira de Jesus<sup>1</sup>

<sup>1</sup>University of Sao Paulo (*Institute of Chemistry, Department of Fundamental Chemistry*)

*e-mail: m.duda.psousa@usp.br*

Biochar can be produced through the pyrolysis of biomass and offers a sustainable solution for waste reduction [1]. Due to its attractive adsorptive properties, the effectiveness of a new magnetic biochar from rice husk (RHB-(Fe<sub>0.85</sub>Cu<sub>0.15</sub>)Fe<sub>2</sub>O<sub>4</sub>-450) as a photo-Fenton catalyst on degrading the dye indigo carmine (InC) as a model organic compound was evaluated at pH = 6.5. The catalyst was prepared by the coprecipitation method of Cu-doped magnetite in rice husk, followed by pyrolysis at 450 °C and properly characterized. Zeta Potential analysis showed RHB-(Fe<sub>0.85</sub>Cu<sub>0.15</sub>)Fe<sub>2</sub>O<sub>4</sub>-450 exhibited a negatively charged surface at pH 6.5, which can facilitate the electrostatic interaction between most organic contaminants and the catalyst's surface. The XRD patterns showed an amorphous profile, with diffraction peaks at 35; 57 e 62°, revealing the presence of magnetite phase in the material. Also, no outsider diffraction peak related to other phase composition emerged. Thermogravimetric curve presented the first mass loss proceeded up to 250 °C due to dehydration and the second mass loss is attributed to the overlapping decomposition of hemicellulose and cellulose. Organic matter kept decomposing progressively until the end of the run. Photo-Fenton process was carried out under artificial UVA irradiation with hydrogen peroxide as oxidant and samples were withdrawn at specific time intervals followed by InC analysis. Adsorption, photocatalysis, Fenton, photolysis and hydrolysis control experiments were performed to evaluate the contribution of each process. After 30 minutes of photo-Fenton process, 90% InC degradation was achieved, demonstrating the high catalytic activity of the magnetic biochar, compared to 20% for the undoped material, even at a lower pH (5.5.). The contribution of other processes, evaluated by the control experiments, did not exceed 12%, demonstrating the efficiency of RHB-(Fe<sub>0.85</sub>Cu<sub>0.15</sub>)Fe<sub>2</sub>O<sub>4</sub>-450 as a photo-Fenton catalyst at circumneutral conditions.

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## References

[1] M. Ahmad and Y. Ok, *Chemosphere* vol.99, 19–33 (2014)