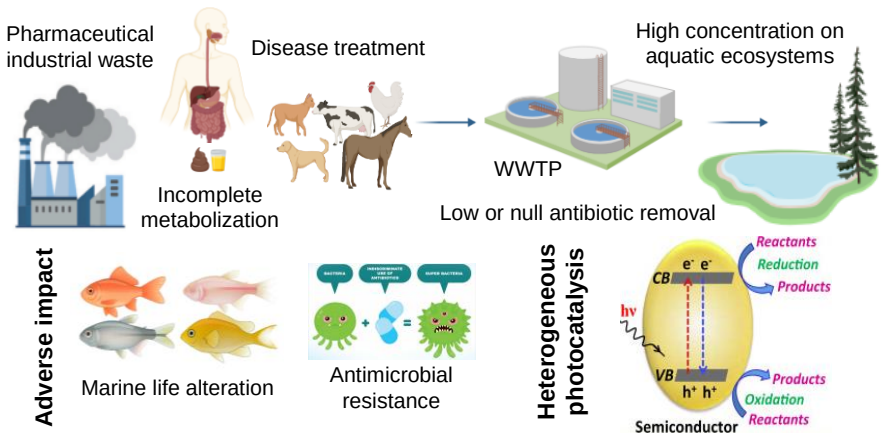
COMPARATION BETWEEN MEROPENEM AND LEVOFLOXACIN DEGRADATION UNDER SIMULATED SOLAR RADIATION BY Fe-Mn/ZnO

UNESCO-IWRA ONLINE CONFERENCE 17-19 JANUARY 2023 3rd IN THE IWRA ONLINE CONFERENCE SERIES

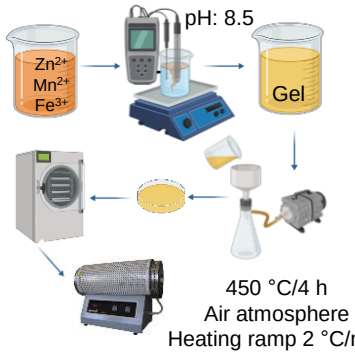
INTRODUCTION

"PRIORITY" EMERGING POLLUTANTS IN THE HYDROCYCLE: MICROPLASTICS, NANOMATERIAL, PFAS AND PPCPS

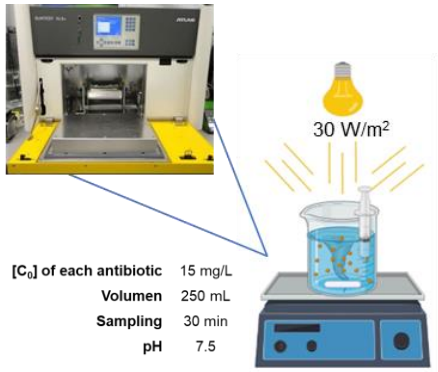


This work aims to assess the activity of Fe_x-Mn_x/ZnO in meropenem and levofloxacin degradation under simulated solar radiation.

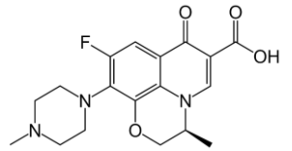
Sol-gel synthesis



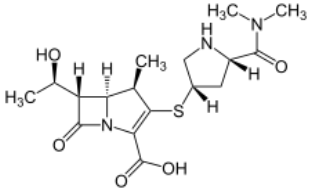
Heterogeneous photocatalysis test



EXPERIMENTAL



Levofloxacin (LVF)



Meropenem (MER)

According to a previous experimental design, the best material for LVF degradation was Fe0.2-Mn0.2/ZnO while for MER degradation was Fe0.6-Mn0.6/ZnO.

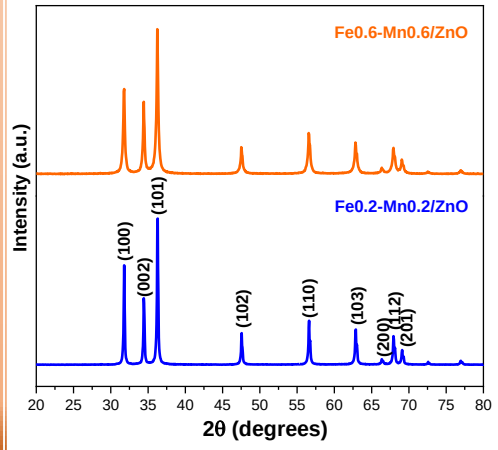


Figure 1. Diffractograms of Fe_x-Mn_x/ZnO.

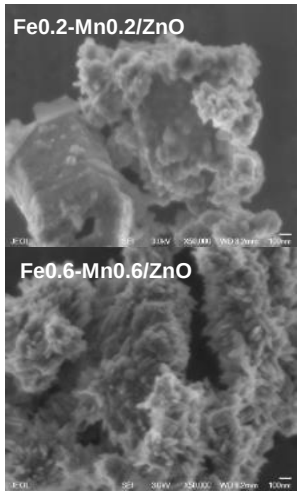


Figure 2. SEM images of Fe_x-Mn_x/ZnO.

Table 1. Properties of Fe_x-Mn_x/ZnO materials.

Material	Crystallite size (nm)	Eg (eV)	BET surface area (m^2/g)	BJH pore size (nm)
Fe0.2-Mn0.2/ZnO	28.21	3.30	7.51	13.73
Fe0.6-Mn0.6/ZnO	21.04	3.29	16.26	11.96

Table 2. Fe and Mn content of Fe_x-Mn_x/ZnO.

Material	Fe experimental* (% wt.)	Mn experimental* (% wt.)
Fe0.2-Mn0.2/ZnO	0.25 ± 0.002	0.20 ± 0.003
Fe0.6-Mn0.6/ZnO	0.65 ± 0.003	0.60 ± 0.002

*n = 6
*± = SD

Complete degradation of MER was achieved in 30 min with a mineralization of 18 % using the material Fe0.6-Mn0.6/ZnO (1.0 g/L), while LVF showed 90 % de degradation with mineralization of 6 % in 300 min with the Fe0.2-Mn0.2/ZnO catalyst (1.5 g/L).

RESULTS AND DISCUSSION

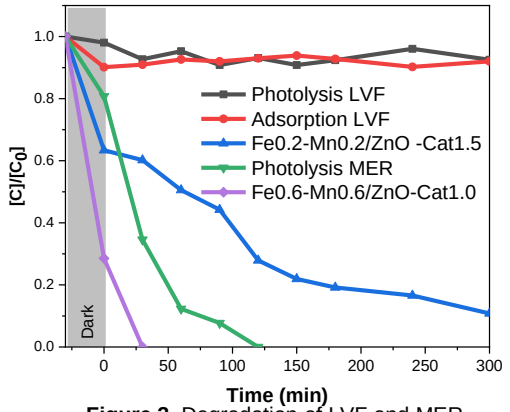


Figure 3. Degradation of LVF and MER.

CONCLUSIONS

The incorporation of Fe and Mn showed that the Fe_x-Mn_x/ZnO catalyst is a suitable alternative for the treatment of water contaminated with meropenem and levofloxacin by heterogeneous photocatalysis.

REFERENCES

[1] M. Photocatalytic efficiencies of Ni, Mn, Fe and Ag doped ZnO nanostructures synthesized by hydrothermal method: The synergistic/antagonistic effect between ZnO and metals. *J. Photochem. Photobiol. A Chem.* **341**, 39–50 (2017).

[2] Ciciliati, M. A. *et al.* Fe-doped ZnO nanoparticles: Synthesis by a modified sol-gel method and characterization. *Mater. Lett.* **159**, 84–86 (2015).

ACKNOWLEDGMENTS

The authors gratefully acknowledge the financial support by grants: CONACYT (Master scholarship) and PAICYT-UANL (No. CE1702-21 y 256-CE-2022).

Blanca Yulissa Bazaldua-Bazaldua, Aracely Hernández-Ramírez, Raisa Núñez-Salas, Jorge Guzmán-Mar, Laura Hinojosa-Reyes, Lourdes Maya-Treviño*
Universidad Autónoma de Nuevo León, Facultad de Ciencias Químicas, Av. Universidad s/n, San Nicolás de los Garza, N.L., C.P. 66455, México.
*maria.mayatv@uanl.edu.mx