

## **Title: Effect of simultaneous microwave-ultrasound irradiation on the synthesis of hydrotalcite-derived mixed oxides for As(III) removal**

**Authors: GARZÓN-PÉREZ, Amanda Stephanie, PAREDES-CARRERA, Silvia Patricia, VELÁZQUEZ-HERRERA, Franchesco Didier and ZARAZUA-AGUILAR, Yohuali**

Editorial label ECORFAN: 607-8695

BCIERMMI Control Number: 2022-01

BCIERMMI Classification (2022): 261022-0001

Pages: 23

RNA: 03-2010-032610115700-14

### **ECORFAN-México, S.C.**

143 – 50 Itzopan Street

La Florida, Ecatepec Municipality

Mexico State, 55120 Zipcode

Phone: +52 1 55 6159 2296

Skype: ecorfan-mexico.s.c.

E-mail: [contacto@ecorfan.org](mailto:contacto@ecorfan.org)

Facebook: ECORFAN-México S. C.

Twitter: [@EcorfanC](https://twitter.com/EcorfanC)

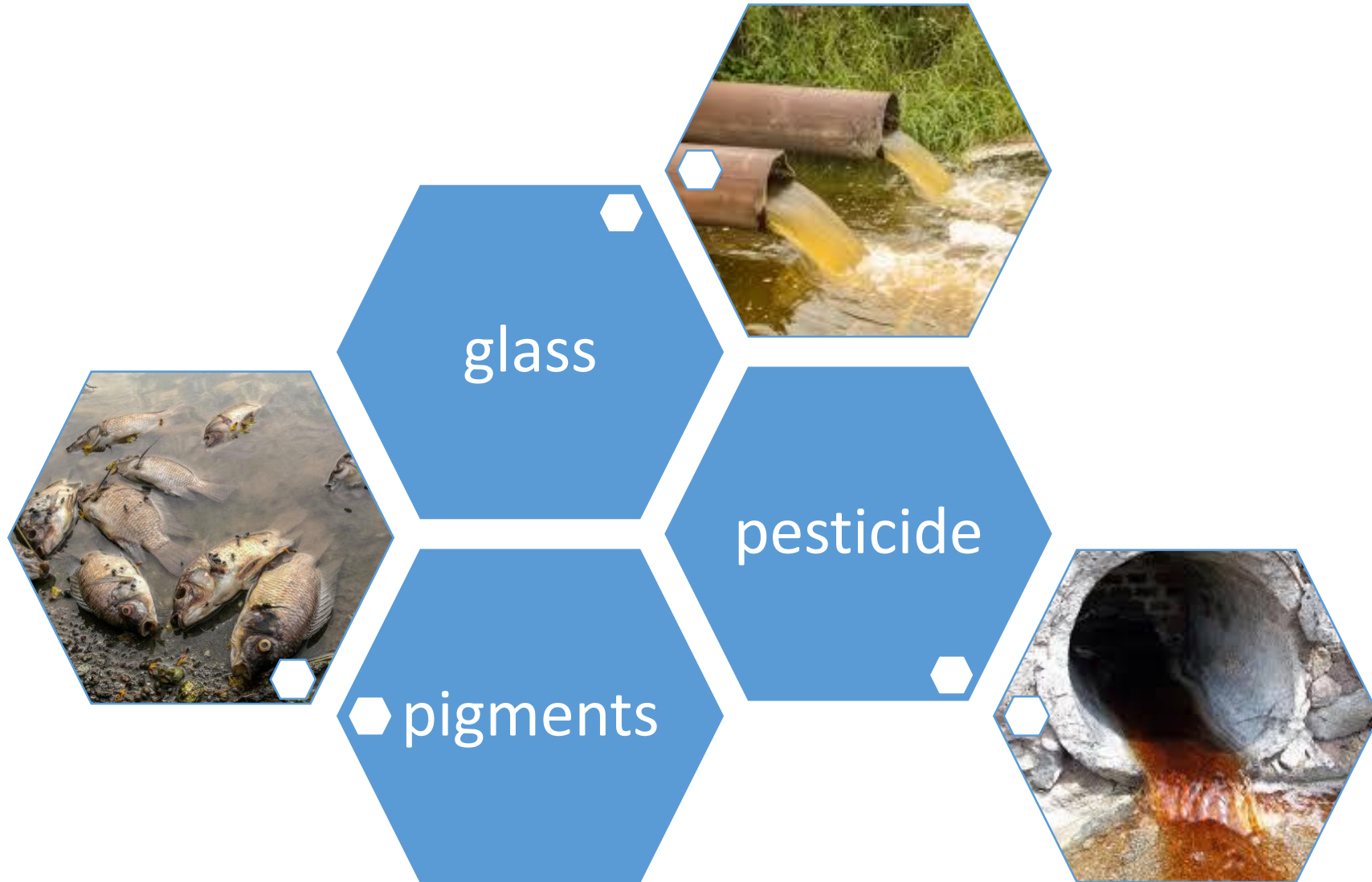
[www.ecorfan.org](http://www.ecorfan.org)

### **Holdings**

Mexico	Colombia	Guatemala
Bolivia	Cameroon	Democratic
Spain	El Salvador	Republic
Ecuador	Taiwan	of Congo
Peru	Paraguay	Nicaragua

# Introduction

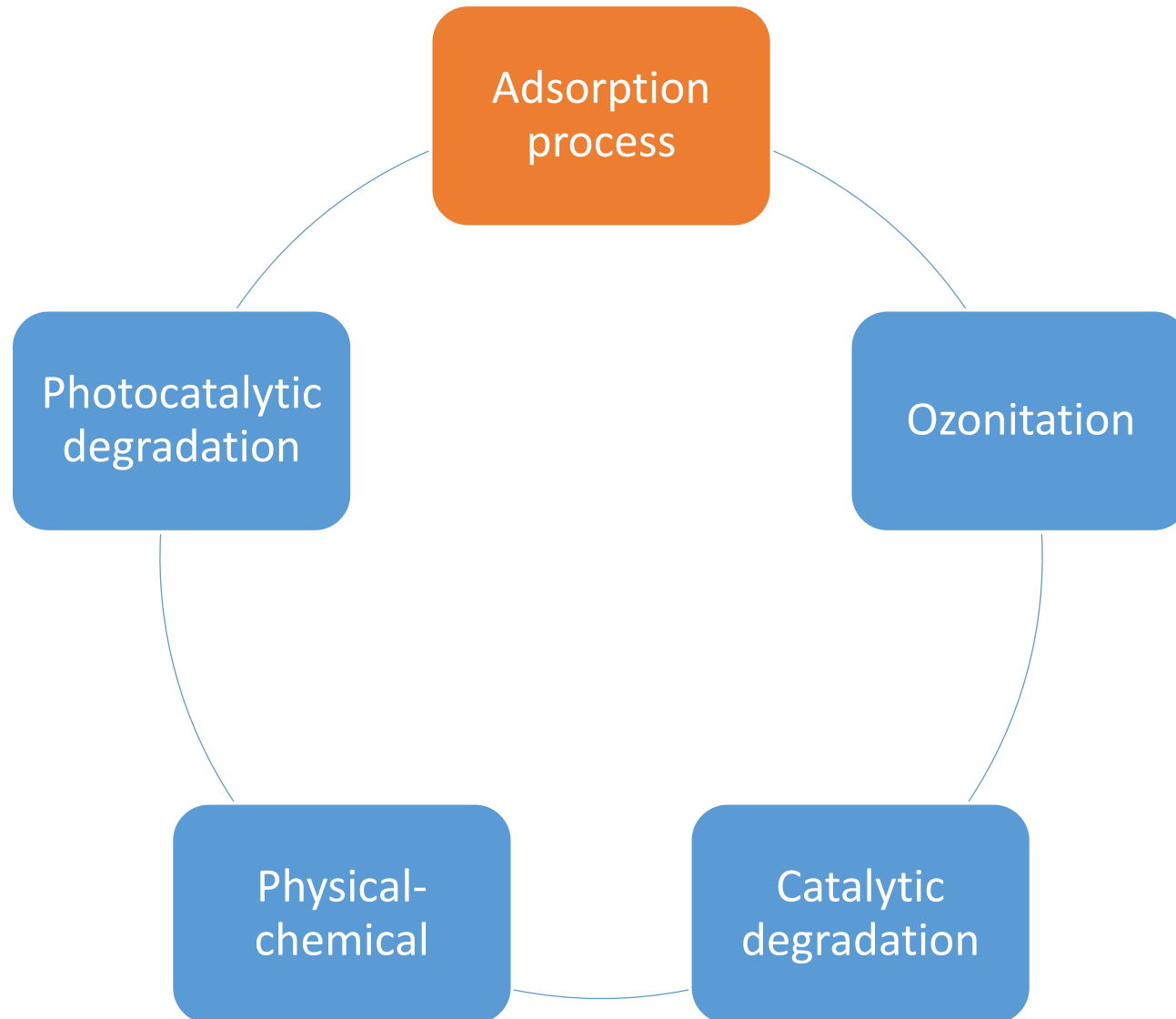
# Water contamination



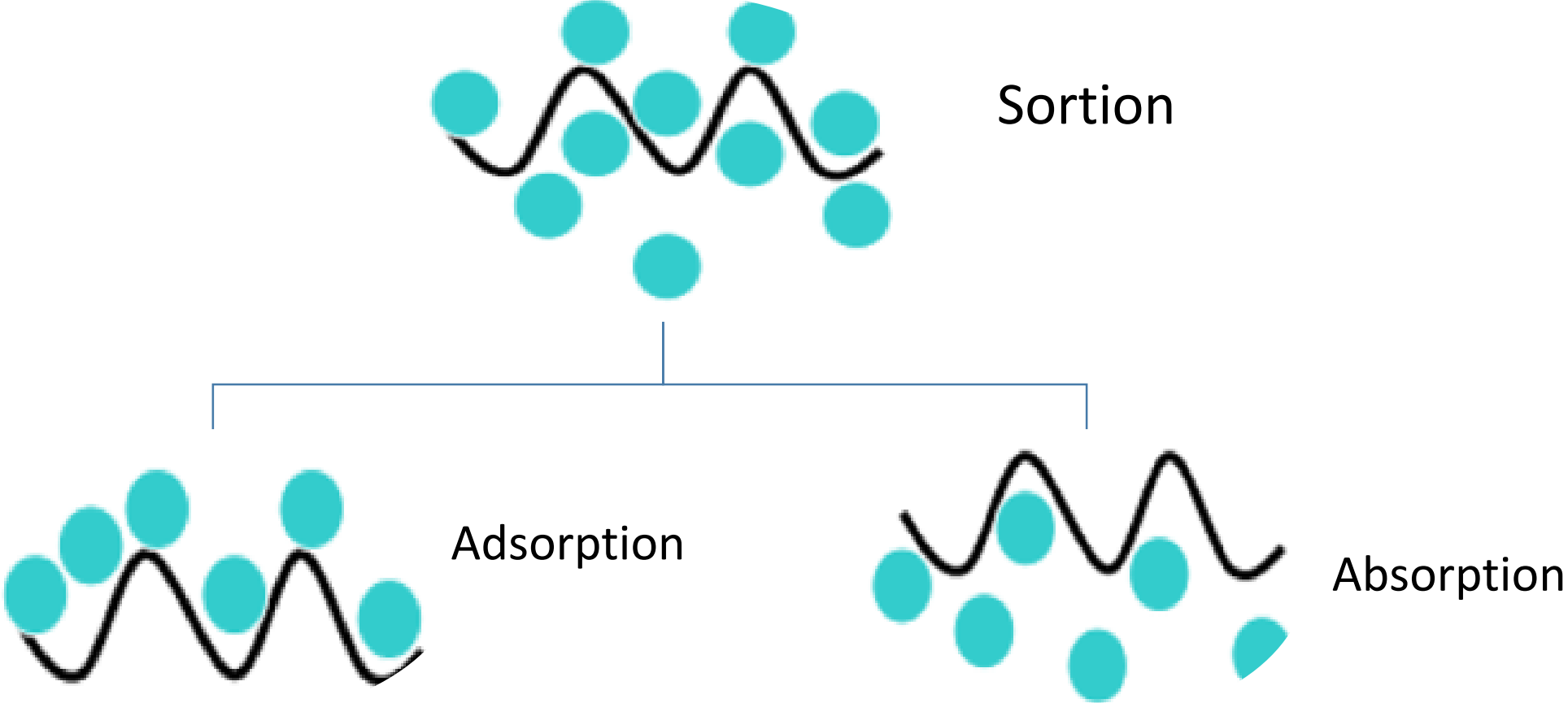


## Arsenic contamination

# Techniques for As(III) removal



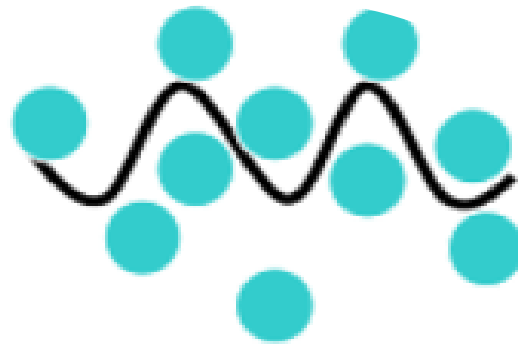
# Adsorption





Sorbent

Sorbato



Sorption

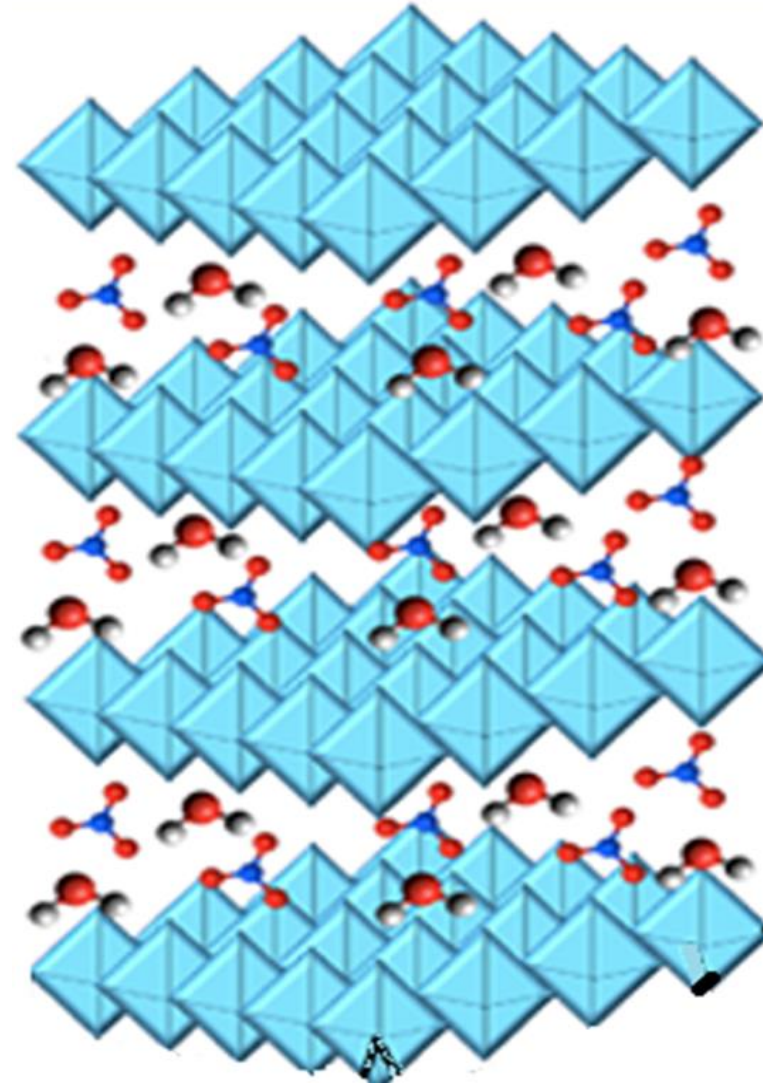
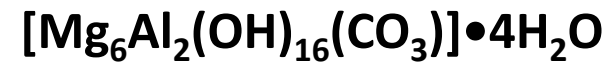
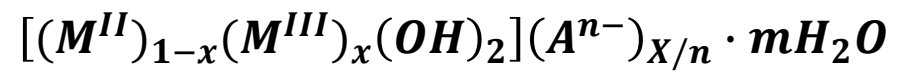


Adsorption



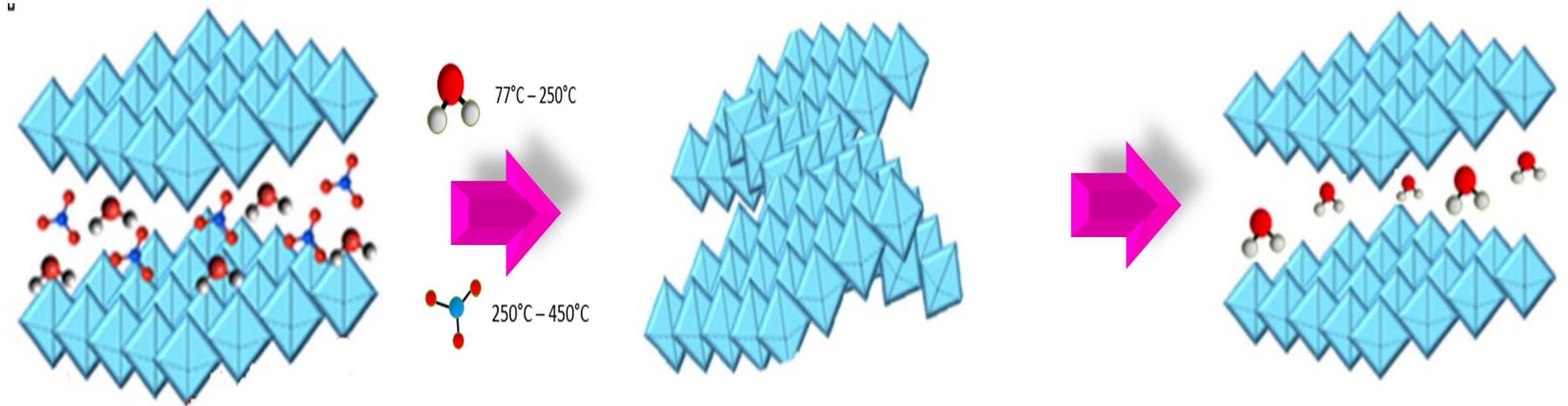
Absorption

# Hidrotalcite

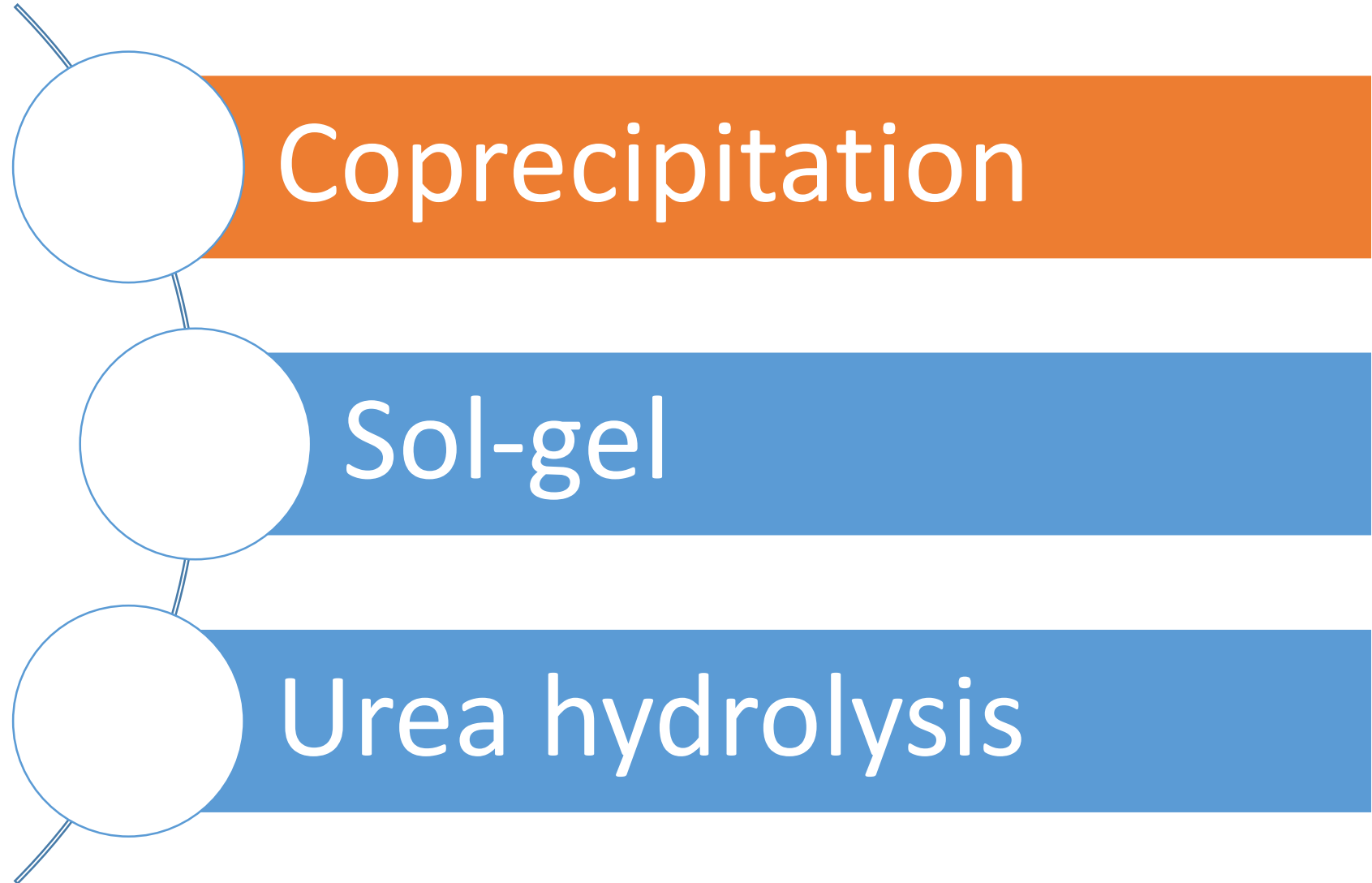




# Mixed oxides



# Synthesized methods

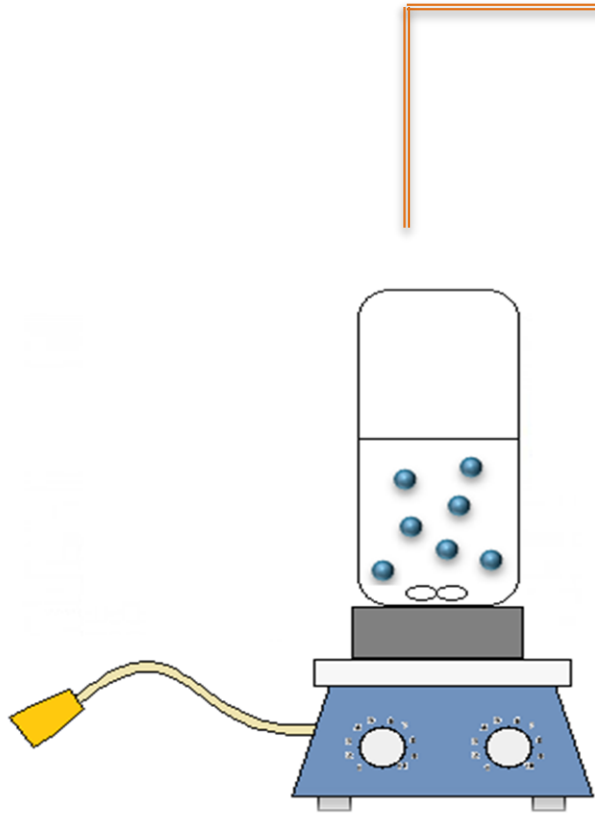


# Methodology

# Hidrotalcite synthesis

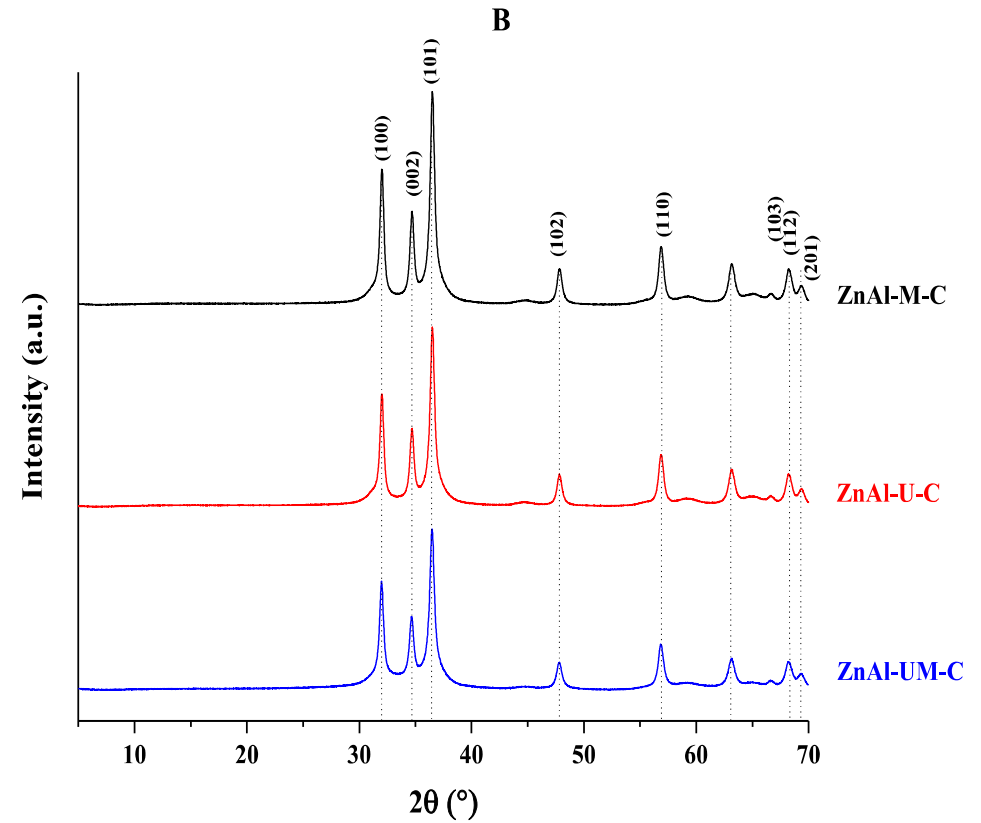
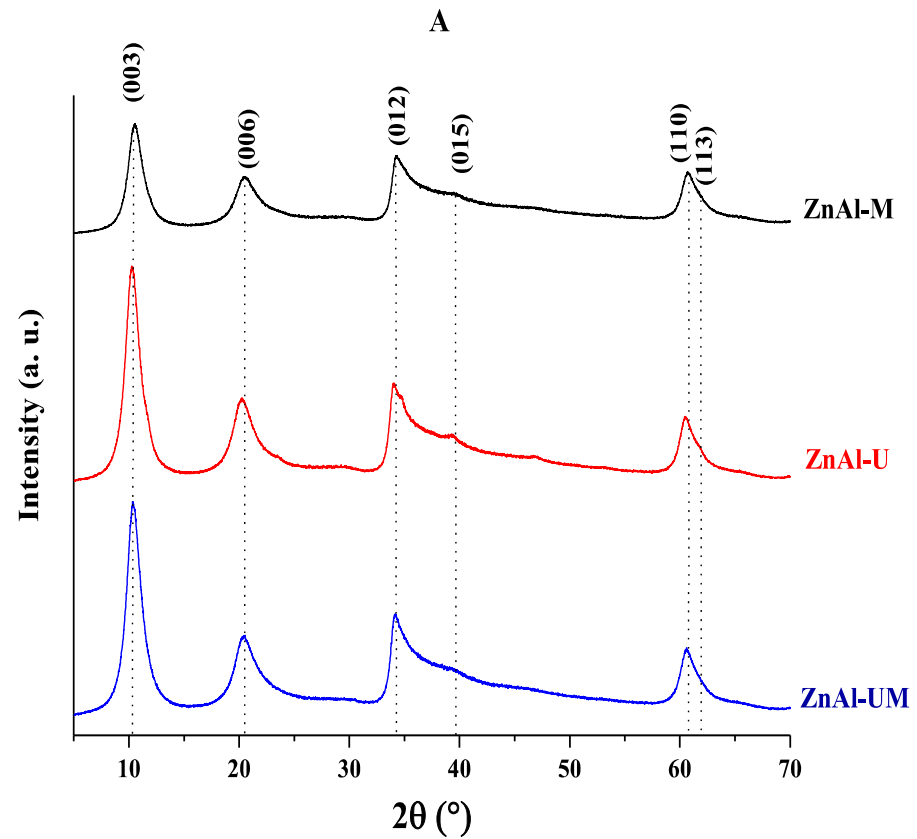


# ***Adsorption evaluation***



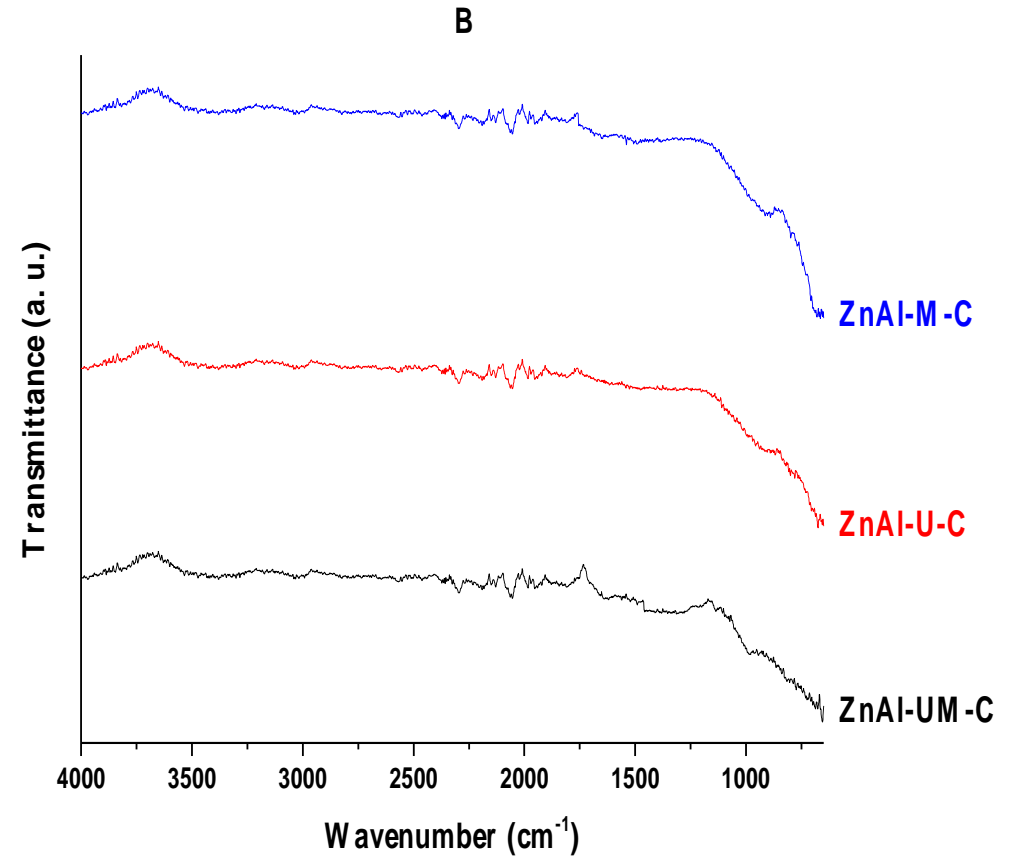
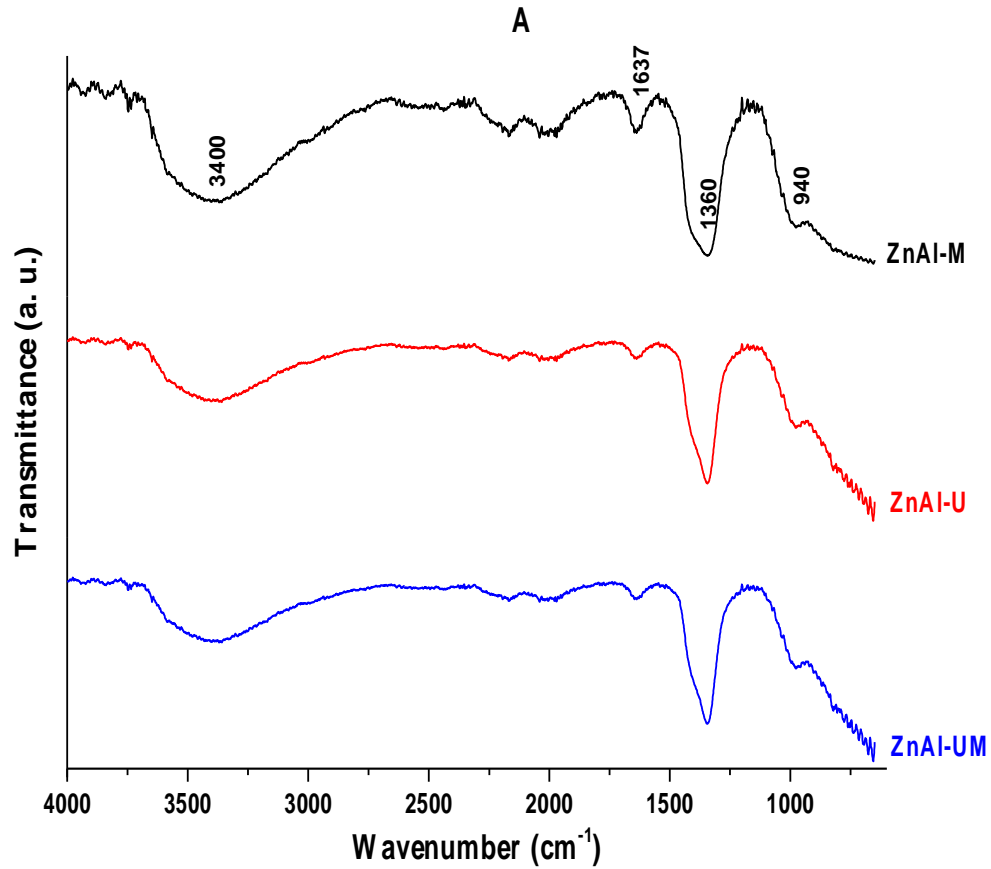
# Results

# X-ray diffraction patterns of A) Hydrotalcites and B) Mixed oxides

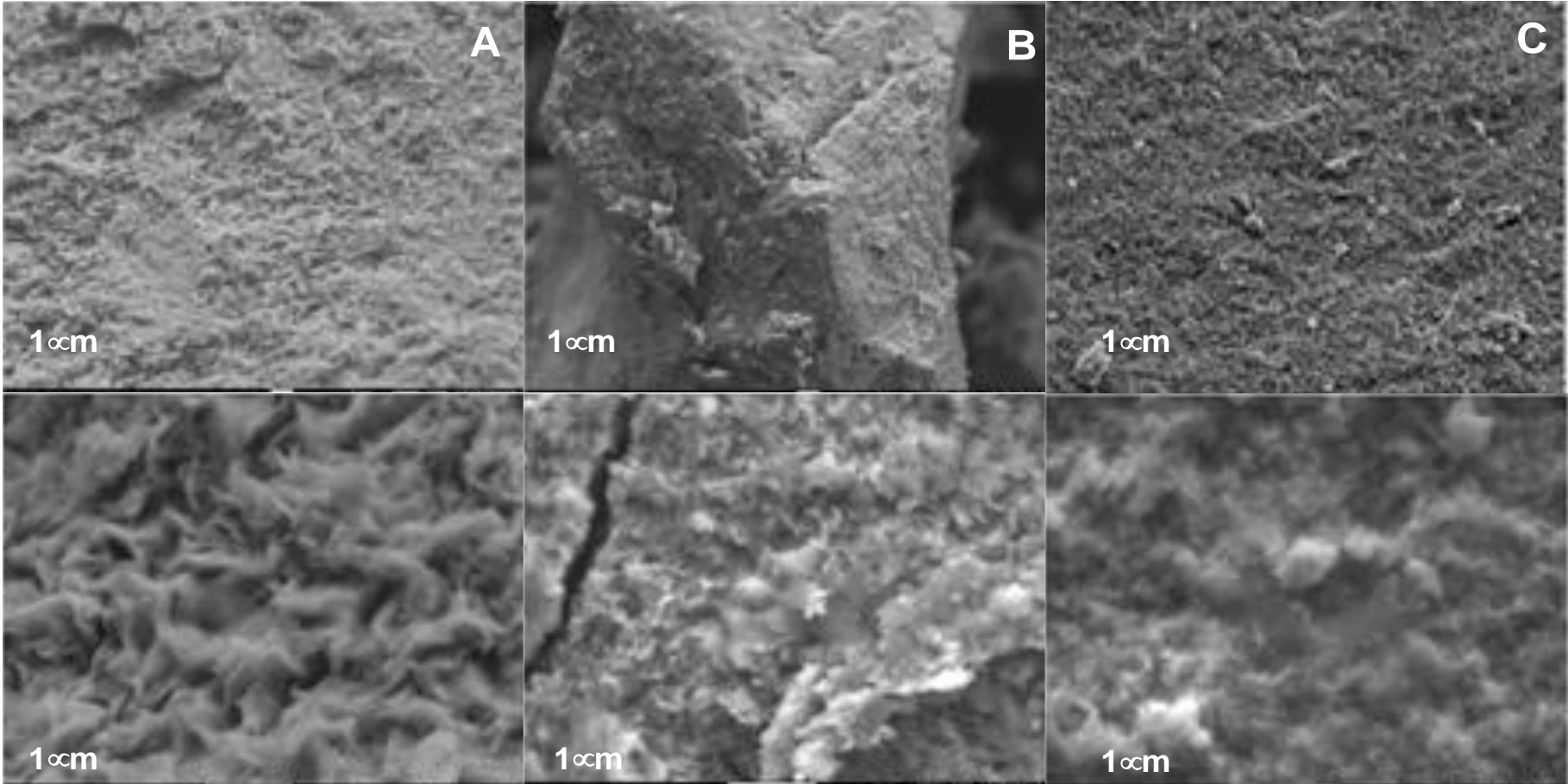




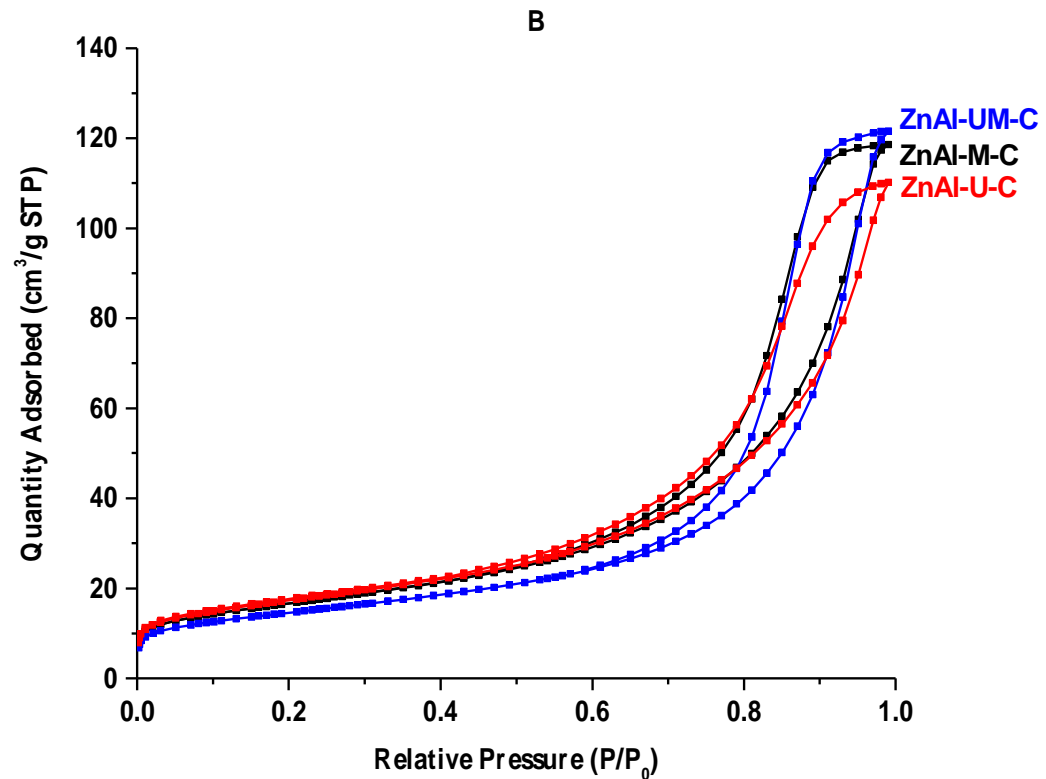
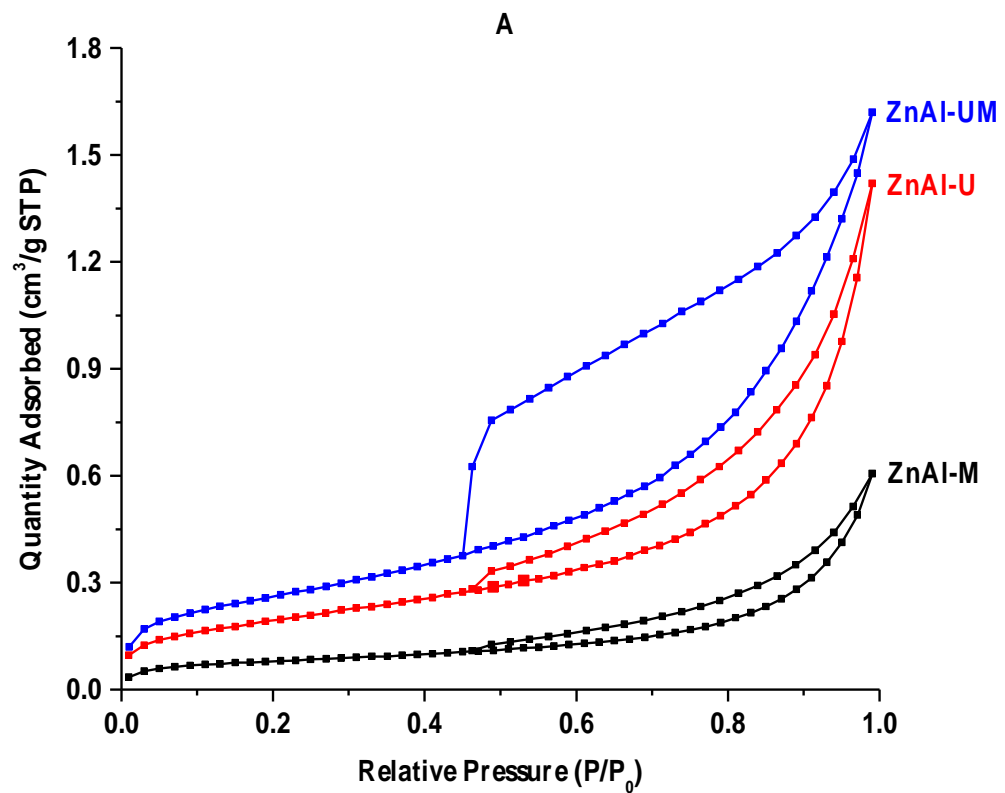
# FTIR spectra of the synthesized samples. A. Hydrotalcites and B. Mixed oxides



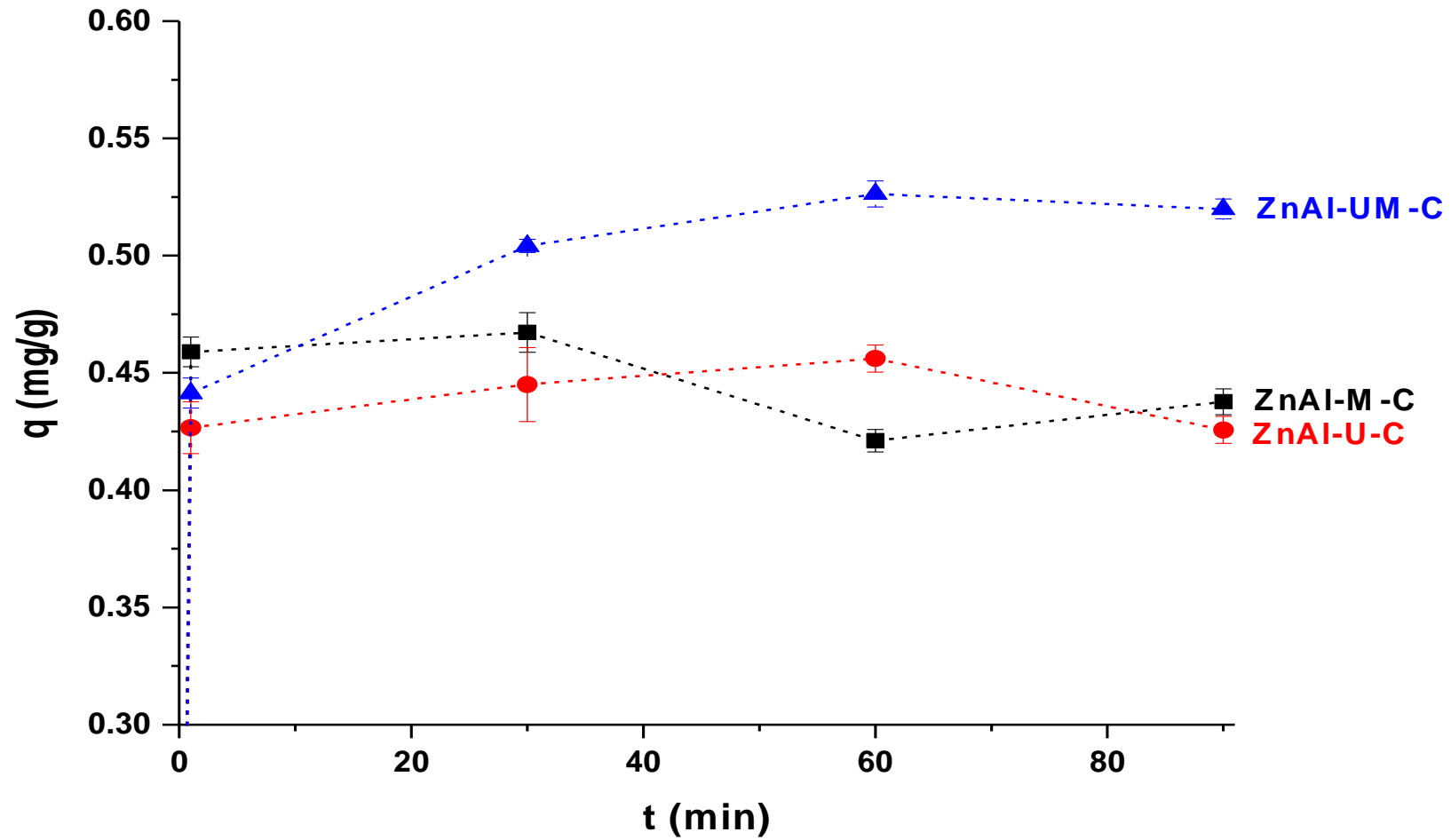
# SEM images of synthesized samples



# Nitrogen adsorption-desorption



# As (III) adsorption



# Conclusions

- As(III) removal process resulted from a contribution of particle size, surface adsorption, and the crystallization method (microwave, ultrasound, and simultaneous irradiation).
- Microwave irradiation promotes a compact uniform arrangement of particles that increase the specific surface area BET through the improvement of cation diffusion within hydrotalcite lamellae.
- Ultrasound generates a distortion in the hydrotalcite lamellae promoting an irregular arrangement of particles that decreases the specific surface area BET, which originated by the cavitation phenom.
- Synchronous irradiation, microwave/ultrasound, enhances the effect of both irradiations, generating two phases of particles within the agglomerate, which increases the specific surface area BET. This improvement allows obtaining superior materials for the As(III) adsorption process, with which adsorptions of up to 0.52 mg/g in 30 min.

# References

- Aryanto, D., Marwoto, P., Sudiro, T., Wismogroho, A. S., & Sugianto. (2019). Growth of a  $c$ -axis-oriented Al-doped ZnO thin film on glass substrate using unbalanced DC magnetron sputtering. *Journal of Physics: Conference Series*, *1191*, 012031. <https://doi.org/10.1088/1742-6596/1191/1/012031>
- Bergadà, O., Vicente, I., Salagre, P., Cesteros, Y., Medina, F., & Sueiras, J. E. (2007). Microwave effect during aging on the porosity and basic properties of hydrotalcites. *Microporous and Mesoporous Materials*, *101*(3), 363–373. <https://doi.org/10.1016/j.micromeso.2006.11.033>
- Blanch-Raga, N., Palomares, A. E., Martínez-Triguero, J., Puche, M., Fetter, G., & Bosch, P. (2014). The oxidation of trichloroethylene over different mixed oxides derived from hydrotalcites. *Applied Catalysis B: Environmental*, *160–161*(1), 129–134. <https://doi.org/10.1016/j.apcatb.2014.05.014>
- Cavani, F., Trifirò, F., & Vaccari, A. (1991). Hydrotalcite-type anionic clays: Preparation, properties and applications. *Catalysis Today*, *11*(2), 173–301. [https://doi.org/10.1016/0920-5861\(91\)80068-K](https://doi.org/10.1016/0920-5861(91)80068-K)
- Conterosito, E., Gianotti, V., Palin, L., Boccaleri, E., Viterbo, D., & Milanesio, M. (2018). Facile preparation methods of hydrotalcite layered materials and their structural characterization by combined techniques. *Inorganica Chimica Acta*, *470*, 36–50. <https://doi.org/10.1016/j.ica.2017.08.007>





**ECORFAN®**

© ECORFAN-Mexico, S.C.

No part of this document covered by the Federal Copyright Law may be reproduced, transmitted or used in any form or medium, whether graphic, electronic or mechanical, including but not limited to the following: Citations in articles and comments Bibliographical, compilation of radio or electronic journalistic data. For the effects of articles 13, 162,163 fraction I, 164 fraction I, 168, 169,209 fraction III and other relative of the Federal Law of Copyright. Violations: Be forced to prosecute under Mexican copyright law. The use of general descriptive names, registered names, trademarks, in this publication do not imply, uniformly in the absence of a specific statement, that such names are exempt from the relevant protector in laws and regulations of Mexico and therefore free for General use of the international scientific community. BCIERMMI is part of the media of ECORFAN-Mexico, S.C., E: 94-443.F: 008- ([www.ecorfan.org/booklets](http://www.ecorfan.org/booklets))