Removal of pharmaceutical contaminants by hydrotalcite-like compounds synthesized from aluminium saline slag wastes

L. Santamaría[1], F. Devred[2], E. M. Gaigneaux[2], M.A. Vicente[3], S.A. Korili[1], A. Gil[1]

[1]INAMAT, Science Department, Public University of Navarra, Pamplona, Spain
[2]IMCN, UCLouvain, 1348, Louvain-la-Neuve, Belgium
[3]GIR-QUESCAT, Inorganic Chemistry Department, University of Salamanca, Salamanca, Spain
Keywords: hydrotalcite, aluminium industrial waste valorization, pharmaceutical contaminants
Presenting author email: leticia.santamaria@unavarra.es

In the secondary aluminium melting process, hazardous materials in the form of aluminium saline slags are generated. Due to their heterogeneous composition, which varies depending on the materials used for the recycling treatment, they have limited application. On another note, the increase consumption of drugs has generated awareness on the need for an effective operating procedure concerning the disposal and control of pharmaceutical waste. There is an increasing presence of emerging contaminants and, particularly, non-steroidal anti-inflammatory drugs (NSAIDs) in the aquatic environment.

In this study, aluminium from saline slags was extracted with a NaOH aqueous solution and used as an alternative aluminium source to form hydrotalcite-like compounds. The aluminium was combined with solutions of cobalt, zinc, nickel and magnesium, and sodium carbonate by the co-precipitation method, aged for 24 h, centrifuged and washed with distilled water until the excess NaOH was removed, dried at 60 ºC for 16 h and calcined at 400 °C for 4 h. The hydrotalcites were synthetized in order to test their salicylic acid and diclofenac removal capacity. The effect that several operational parameters, such as pHs, initial concentration of drugs, mass of adsorbents and contact time, may have on the sorption behavior was evaluated. The kinetic data were fitted to several adsorption models. The equilibrium adsorption data were analyzed using the Freundlich, Langmuir and Toth isotherm equation models.

Acknowledgements: This work was funded by the Spanish Ministry of Economy and Competitiveness (MINECO) and the European Regional Development Fund (ERDF) through the project MAT2016-78863-C2-R.

References:

1. A. Gil, Ind. Eng. Chem. Res. 44 (2005) 8852-8857.
2. A. Gil, Environ. Eng. Sci. 24 (2007) 1234-1244.
3. A. Gil, S.A. Korili, Chem. Eng. J. 289 (2016) 74-84, 2016.
4. A. Gil, S. Albeniz, S.A. Korili, Chem. Eng. J. 251 (2014) 43-50.
5. A. Gil, E. Arrieta, M.A. Vicente, S.A. Korili, Chem. Eng. J. 334 (2018) 1341-1350.
6. A. Gil, E. Arrieta, M.A. Vicente, S.A. Korili, ACS Omega 3 (2018) 18275-18284.
7. L. Santamaria, M.A. Vicente, S.A. Korili, A. Gil, Environ. Technol. (in press).