

REMOVAL OF ANTIBIOTICS BY “GREEN” CLAY SORBENTS

A. V. Dordio* ^{1,2}, Susana Miranda ¹, A. J. Palace Carvalho ^{1,3}

¹ *Dept. Química, Universidade de Évora, Rua Romão Ramalho 59, 7000-671 Évora, Portugal.*

² *IMAR, Universidade de Évora, Portugal.*

³ *CQE, Universidade de Évora, Portugal.*

* *E-mail: avbd@uevora.pt*

Contamination of water resources with pharmaceuticals has been one of the top concerns of environmental sciences in the latest years [1], the matter having received very significant media coverage recently [2]. Antibiotics in particular have been gathering considerable attention and are amongst the most serious worries due to the development of antibiotic resistant bacteria as result of prolonged exposure [1, 2].

Because most wastewater treatment plants were only designed for removing bulk pollutants, many other more specific pollutant types that are present in low concentrations in the wastewaters are often inefficiently treated and end up being released into receiving water bodies. Although in many cases these contaminants are detected only at small concentrations in environmental samples, the large variety of such compounds and the high potential for adverse interactions with living organisms (due to the nature of their action) is a matter of serious concern.

Several advanced technologies have been evaluated as options to treat these contaminants, e.g. advanced oxidative processes or membrane filtration, but despite the sometimes high removal efficiencies attained, these technologies are too expensive to be considered as viable solutions on a large scale. Adsorption, alone or as part of a more complex water or wastewater treatment process, has been seen as playing a very important role in the removal of many organic xenobiotic pollutants [3]. In this regard, the choice of adsorbent materials is crucial. However, pollutants removal efficiency is not the sole selection criterion, as the cost of the materials may provide or preclude economic viability of the water/wastewater treatment system. Therefore, the quest for efficient adsorbents that are widely available, and do not require expensive processing in order to be used (thereby allowing lower production costs) is a very important aspect of research aimed to manage this environmental problem.

In this work we present the study of sorption properties of clay materials (LECA and vermiculite) for the removal of some pharmaceuticals two antibiotics (sulfametoxanol and oxytetracycline) from water. The dependence of removal efficiencies on pollutants initial concentrations, contact time with the adsorbents and other system/environment conditions was assessed. The two clay materials were compared in terms of their more balanced performance towards the removal of the pharmaceuticals tested and the materials are suggested as a useful component of a water or wastewater treatment system designed for the removal of pharmaceutical contaminants.

References

- [1] K. Fent, A.A. Weston, D. Caminada, *Aquat. Toxicol.* 76 (2006) 122-159; C. Miège, J. M. Choubert, L. Ribeiro, M. Eusèbe, M. Coquery, *Environ. Pollut.* 157 (2009) 1721-1726.
- [2] T. Brodin, J. Fick, M. Jonsson, J. Klaminder, *Science* 339 (2013) 814-815.
- [3] A.V. Dordio, J. Teimão, I. Ramalho, A.J.P. Carvalho, A.J.E. Candeias, *Sci. Total Environ.* 380 (2007) 237-246; A.V. Dordio, A.J.E. Candeias, A.P. Pinto, C.T. da Costa, A.J.P. Carvalho, *Ecol. Eng.* 35 (2009) 290-302.