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BOOK OF ABSTRACTS

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MAGNETICALLY RESPONSIVE IRON-CARBON COMPOSITES FOR MICRO-ORGANIC CONTAMINANTS ADSORPTION

Vânia Calisto[1], Luciana Rocha[1], Érika Sousa[1], María V. Gil[2], João A.B.P. Oliveira[1], Gonzalo Otero-Irurueta[3], María J. Hortigüela Gallo[3], Marta Otero[1], Valdemar I. Esteves[1]

[1]University of Aveiro & Centre for Environmental and Marine Studies, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal. vania.calisto@ua.pt
[2]Instituto de Ciencia y Tecnología del Carbono, INCAR-CSIC, 33011 Oviedo, Spain
[3]Centre for Mechanical Technology & Automation, University of Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal

The use of highly porous carbon materials, in particular powdered activated carbon (PAC), is an interesting option for advanced wastewater treatment, being the focus of significant attention mainly due to the ability of these materials to efficiently adsorb micro-organic contaminants. Yet, the generalized application of PAC in wastewater treatment plants (WWTP) is hampered by some relevant drawbacks: i) common use of non-renewable resources for PAC production; ii) difficult separation of exhausted materials from the treated aqueous phase; iii) difficult regeneration of spent PAC for reutilization, limiting their life-cycle. In order to surpass the referred disadvantages, a biomassic industrial waste was used in this work to produce magnetically responsive iron-oxide functionalized PAC, which can be efficient in the adsorption of micro-organic contaminants from wastewater, easily recovered from treated aqueous phase and further reutilized. The composite material was produced by *in-situ* iron oxide co-precipitation onto a previously prepared waste-based PAC. Optimal production conditions were selected by a multivariable process optimization through a fractional factorial design, allowing to assess the effect of production variables on the properties of the resulting materials. Based on the statistical analysis of the results, the material that best conciliated high saturation magnetization with adequate physico-chemical and adsorptive properties was chosen for application studies. For such evaluation, pharmaceuticals were considered as models of recalcitrant micro-organic contaminants, with special emphasis on the non-steroidal anti-inflammatory diclofenac. The kinetic and equilibrium adsorptive performance of the selected material was then tested in different matrices (ultrapure water and real WWTP effluents). Finally, the exhausted adsorbent was magnetically retrieved and subjected to a microwave-assisted regeneration and subsequently reutilized, being evident that its magnetic and adsorptive properties remained unchanged. The chemical composition of virgin, exhausted and reutilized composites was assessed by X-Ray photoelectron spectroscopy. The obtained results demonstrated the viability of producing waste-derived iron-carbon composites that simultaneously combine high efficiency for diclofenac removal with easy retrievability and successful regeneration/ reutilization.

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