ICWAS 2024
"International Conference on Water Innovation and Smart Irrigation"
25 - 27 September 2024, University Cadi Ayyad Marrakesh, Morocco
https://icwas.uca.ma

SLUDGE-BASED BIOCHARS AS SUSTAINABLE MATERIALS FOR ANTIBIOTIC REMOVAL FROM URBAN WASTEWATER

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Abstract:
The release of pharmaceutical compounds, and in particular antibiotics, into the environment represents a serious problem for ecosystems and human health. The wastewater treatment plants (WWTPs) do not completely degrade these chemicals, and it is estimated that 10-60% of the influent pollutants are released into receiving water bodies. Adsorption techniques may play a significant role in pharmaceutical removal from WWTP effluents, since they are generally considered effective and do not produce by-products. In this context, biochar has recently attracted interest as a cheap and environmentally sustainable alternative to activated carbon (AC), the latter considered as the material of choice for micropollutant adsorption. Based on this consideration, in this study two biochars from co-pyrolysis of (i) a mixture of sawdust and biological sludge (70/30, w/w) (BC1) and (ii) 100% biological sludge (BC2) were obtained. Based on the European Standards (EN 12915-1:2009) for materials intended for water treatment (i.e., ash content, water leachable polycyclic aromatic hydrocarbons and elements), as well as specific surface area, biochars were analysed for their product characteristics and environmental compatibility. Materials were tested for the removal of antibiotics trough kinetics and isotherm tests, in comparison with AC. For this purpose, a model group of 8 antibiotics (log Kow at pH=7 from -3.05 to 1.24), belonging to different classes, was selected on the basis of the Watch Lists defined by the European Community. Isotherm data were fitted using the Langmuir model which showed maximum adsorption values (Qm) for most target analytes 1.4 – 6.4 times and 1.5 – 5 times lower than those of AC, for BC1 and BC2, respectively. Even higher Qm values were found in BC than AC for Clarithromycin, Azithromycin and Ofloxacin highlighting promising sorption performances for the proposed materials.

Keywords: *Antibiotics, adsorption kinetics studies and isotherms, LC-MS/MS analysis, sewage sludge, wastewater*

Biography:

Giulia Bonaccorso is a PhD student at the Analytical Department of Chemistry "Ugo Schiff" in Florence (Italy). She graduated in Chemistry at the University of Florence in 2021. Her main research interests include the development and application of innovative, high-throughput analytical platforms for the identification and quantification of different types of analytes in liquid and solid environmental matrices, using chromatographic techniques coupled with mass spectrometry.