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***FOR THE REMOVAL OF***  
***EMERGING POLLUTANTS***

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***BOOK OF ABSTRACTS***

## Removal of antibiotic compounds by adsorption using glycerol-based carbon materials

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In the recent past few years, antibiotics have raised a significant concern from the research community, due mainly to the antibiotic resistance generated by metabolites and the continuous release of these drugs to the environment. Adsorption, since it is a non-destructive tertiary technology, has been revealed as one of the most advantageous technique in wastewater treatment processes. Commercial activated carbons usually show high affinity to hundreds of organic and inorganic compounds, since the use of commercial materials is associated to high operation and regeneration costs. So, the preparation of activated carbons from crude glycerol, an abundant feedstock of the biodiesel production, consists of an interesting research focus.

The aim of this study is to explore several glycerol-based carbon materials synthesized by partial carbonization in concentrated sulfuric acid solution and further thermal activation for the removal of the antibiotics flumequine (FLQ) and tetracycline (TCN) from water.

### *Synthesis procedure of glycerol-based carbon materials*

Glycerol-based carbon materials were prepared adapting the procedure described in the work of Ribeiro et al. [1]. Briefly, a mixture of glycerol (10 g) and concentrated (95-97 wt.%) sulfuric acid (40 g) was gently heated to 180 °C and left at that temperature for 20 min to allow *in situ* partial carbonization. The resulting material was ground in a ceramic mortar to obtain particle size in the range 0.425-0.600 mm and further calcined in a tube furnace under a nitrogen flow (100 cm<sup>3</sup>.min<sup>-1</sup>) at 120 °C, 400 °C and 600 °C during 60 min at each temperature, and finally at 800 °C for 240 min, defining a heating rate of 2 °C.min<sup>-1</sup>. The as-calcined material (GBCM) was thermally activated in a tube furnace under oxidative atmosphere (air flow of 100 cm<sup>3</sup>.min<sup>-1</sup>) during 60 min at different temperatures, 200 °C, 300 °C and 350 °C, resulting in carbons with different textural and chemical properties. The carbon materials were labelled as GBCM followed by a subscript number corresponding to the activation temperature; e.g., GBCM<sub>200</sub>, GBCM<sub>300</sub> and GBCM<sub>350</sub>.

### *Characterization of glycerol based-carbon materials*

Textural characterization of the activated carbons was obtained from N<sub>2</sub> adsorption-desorption isotherms at -196 °C, using a Micromeritics ASAP 2020 apparatus. Chemical surface characterization was performed by Fourier transformed infrared spectrum (FTIR), recorded in the range 400-4000 cm<sup>-1</sup> and using a Thermo Nicolet FTIR spectrophotometer. Raman analysis of the samples was conducted by Ntegra Spectra (NT-MDT) micro-Raman equipment, equipped with a CCD Andor iDus detector. Samples were focalized by using an Olimpus BXFM microscope. X-ray Photoelectron Spectroscopy (XPS) spectra were recorded with a Perkin Elmer PHI 5400 spectrometer equipped with a concentric hemispherical analyzer. The incident radiation used was generated by a monochromatic Al K<sub>α</sub> X-ray source (1486.6 eV) and the pressure level in the analysis chamber was about 10<sup>-9</sup> mbar. The isoelectric point (pH<sub>IEP</sub>) was measured in a Zetasizer Nano ZS equipment, using 0.05 g of sample suspended in 20 mL of deionized water, the pH being adjusted with either 0.1 M HCl or 0.1 M NaOH