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ABSTRACTS

Heavy metals removal from reclaimed water in a laboratory column using a granitic residual soil

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1. Introduction – Heavy metals are one of the most relevant groups of chemical pollutants in the context of water reuse. Consequently, the practice of artificial aquifer recharge with reclaimed water should be strictly controlled and monitored. The porous media in a soil is a relevant factor for the evaluation of the pollutant reduction during water infiltration (through the called soil aquifer treatment - SAT) [1]. The purpose of this work was to show that the granitic residual soil from a site selected using GIS tools (Quinta de Gonçalo Martins, Guarda, Portugal) (Image 1-a), presents favourable characteristics for removing five heavy metals (Cr, Cu, Ni, Pb and Zn) present in reclaimed water by using a soil laboratory column (Image 1-b).

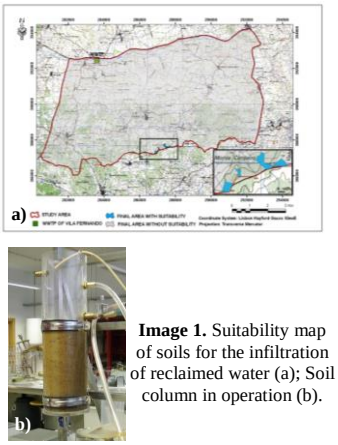

Image 1. Suitability map of soils for the infiltration of reclaimed water (a); Soil column in operation (b).

2. Experimental – Before and after the column experiments the physical, chemical and mineralogical properties of the soil were determined. The column were operated in a fed-batch and continuous mode (for 35 days, 10 cycles of operation) with a synthetic solution of the five heavy metals. The theoretical concentration of each metal was 5 mg L^{-1} [2].

3. Results and Discussion – The residual soil has about 4.94% of clay (≈ 60% of kaolinite). In the continuous column experiments, there were observed removal efficiencies of 54.85% for Cr, 75.93% for Cu, 92.42% for Ni, 98.53% for Pb and of 98.80% for Zn. The heavy-metals removal occurred by sorption with higher rates than the ones observed in fed-batch tests for the same soil [2].

4. Conclusions - The soil has reactive properties that allows a good capability for removing Cu, Ni, Pb and Zn by sorption mechanisms, with much lower efficiencies for Cr, allowing it to act as a barrier to the contamination of groundwater during infiltration with reclaimed water.

5. References

[1] H. Marecos do Monte y A. Albuquerque, *Wastewater Reuse*, Technical Guide no.14, ERSAR, Lisbon, Portugal, (2010) p. 339 (in Portuguese).
[2] F. Silva, "Evaluation of the reactive capacity of residual soils used for the infiltration of treated wastewater". PhD Thesis in Civil Engineering, University of Beira Interior, Covilhã, Portugal, 2015, p. 490 (in Portuguese).

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