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Metals sorption and partitioning coefficients in all matrices of the Torres Vedras SBR WWTP, Portugal

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The literature review concerning the issue of metals behaviour and fate throughout WWTPs shows that, although relevant data have been published in recent decades, results are not consensual and more studies are needed, particularly from data obtained in full scale WWTPs [1]. Specifically, there are few published works reporting experimental values of metals sorption and partitioning coefficients (k_{sor} and K_D, respectively) from full scale WWTPs, and they do not usually distinguish between the different matrices [1][2]. Metals partitioning in the unit processes is a key point when intending to approach a model describing the fate and transport of metals in a WWTP; upon knowing this information together with that of solids generation/removal, the metal concentrations in the effluent and the metal removal efficiency can be estimated [3]. However, for each metal, it is required to differentiate k_{sor} and K_D according to the type of matrix, at least for the activated sludge, raw wastewater and final effluent, once they may be quite different due to the different physicochemical characteristics of the matrices [4]. In this context, the experimental results obtained within the present work aim to contribute with more in-depth data concerning this issue.

This work is part of a larger one concerning Torres Vedras WWTP (SBR, low load, F/M=0.08 d^{-1}, SRT=8.7 d) (*Águas do Tejo Atlântico*), carried out with the final aim of establishing a simulation model that allows predicting the behaviour and fate of eight metals along the treatment system. Experimental data were obtained from two sampling campaigns (Spring/Summer and Autumn/Winter) involving an exhaustive collection of composite samples in all flows of the liquid and solid phases of the treatment system. Metals (total and soluble) determinations in the matrices were conducted according to in-house accredited methods at LNEG, carefully followed by actions of validation and quality control.

This communication presents the ksor obtained for As, Cd, Pb, Cu, Cr, Hg, Ni and Zn, in all the matrices along the treatment system, and highlights the possible meaning arising from its relative comparison, and in relation to the amount and nature of the suspended solids present. These results, together with the obtained K_D (table 1), allow to estimate metals concentrations and partitioning through the WWTP.

Table 1. Partitioning coefficients, **K_D (L/kg) = {M_S}/{SS})/[M_d]**, obtained from experimental data along Torres Vedras treatment system; {M_s}: sorbed metal (µg); {SS}: Suspended Solids (kg); [M_d]: dissolved metal concentration (µg/L)

	log K_D (L/kg)							
Matrices	**As**	**Cd**	**Pb**	**Cu**	**Cr**	**Hg**	**Ni**	**Zn**
Raw Wastewater	2.9		4.1	4.6	3.7	2.0	2.8	3.5
Pre-treatment Effluent	2.8	3.8	4.1	4.8	3.7	3.6	3.4	3.6
Returned liquor from Thickening	3.6	3.3	4.5	5.1	4.2	3.2	3.7	4.2
Returned liquor from Dewatering	3.0		3.3	4.7	4.0	3.1	3.2	3.8
Biological Reactor (**SBR**)	3.6	3.3	4.1	5.0	4.6	3.0	3.7	4.2
Final Effluent	3.6		4.5	5.1	4.2	4.4	3.6	3.0
Sludge purge from SBR	3.5	3.5	4.1	5.0	4.5	3.2	3.8	4.4

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