# Valuation of banana peels as biosorbents to remove low concentration Hg(II) from different aqueous solutions

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**1. Introduction –** The toxic metals are the mainly responsible for water pollution. Mercury is classified by the ATSDR [1] as the third most hazardous substance based on its frequency, toxicity, and potential for exposure. Sorption processes are widely used in wastewater treatment displaying many advantages such as high efficiency and low operational costs. Agricultural wastes are lignocellulosic biomasses, especially attractive to sorb Hg(II) due to their availability in abundance and no commercial value. In this line, batch experiments were carried out using banana peels to eliminate mercury(II) from different aqueous solutions. In order to investigate the applicability of this solid, six water matrices were used with the increased complexity from natural waters to a real wastewater. Despite the several studies published applying biosorbents, only a few of them use relevant low mercury(II) concentrated solutions. This work intends to encourage the valuation of this promising biosorbent under a realistic environmental application.

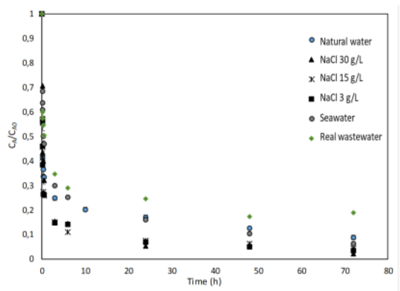


**Image 1.** Normalized Hg(II) concentration ($C_A/C_{A0}$) along time for different aqueous solutions

**2. Experimental -** The solutions were prepared with Hg(II) initial concentration of 50 µg $L^{-1}$in natural waters, at 295±1K, pH 6.3, magnetically stirring at 800 rpm and biosorbent mass of 0.5 g $L^{-1}$. Different doses of NaCl were added to obtain the salinity solutions, seawater was collected from the Portuguese coast and the real wastewater was kindly provided by ISQ - Instituto de Soldadura e qualidade (Welding and Quality Institute) and diluted until the same concentration of 50 µg $L^{-1}$. The biosorbent used in this study was freeze-drying, milled, sieved and the particles with size <1 mm were selected for the experiments.

**3. Results and Discussion** - The normalized Hg(II) concentration along time for all the studied streams are presented in Image 1. All the curves are characterized by a faster decrease at the beginning of the sorption followed by a section where the process turn out to be slower towards the equilibrium. This behaviour is ascribed to the large driving force between the metal in solution and the biosorbent initially free of mercury. As sorption occurs, the sites become occupied and the residual Hg(II) concentration is lower, therefore the driving force is not strong enough to promote more metal removal. Banana peels presented an excellent removal capacity, being able to remove more than 90% of Hg(II) from all the solutions studied except in the case of the real effluent which presented a contaminant elimination of 81%. According to the Hg(II) speciation, the salts presence lead to a removal reduction, since this metal is majority in a form of chloro-complexes, which are more stable and difficult to sorb. However, the results shows high removal performances even in salinity waters, what suggest that probably the functional groups on the banana peels surface are interacting with these complexes in solution.

**4. Conclusions –** The results exhibited the great affinity of the banana peels with the contaminant, even when applied in more complexes matrices. The environmental realistic conditions studied in this work, highlight their potential usage as biosorbents in water remediation processes.

**5. References**

[1] ATSDR 2017. Priority List of Hazardous Substances in https://www.atsdr.cdc.gov/spl/index.html.