The knowledgement of metal chemical speciation is of paramount importance on removing and recovering metals from industrial effluents

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One major prerequisite in the treatment procedures of matrix containing metals is the knowledge of metal chemical binding forms in solution and their impact on water technology.
With the aim to develop a clean (without residues) and low cost process for removing metals from real electroplating effluents followed by a selective recovery of metals (copper, chromium, nickel and zinc), a multistage process, which combines biosorption and chemical methodologies, was implemented. Under this context, the knowledge of metal chemical speciation on (i) removing metals from the effluent using flocculent cells of *Saccharomyces cerevisiae* and (ii) recovering selectively metals from the ashes of the contaminated biomass was of fundamental importance.
The influence of the real matrix of effluents on the removal of heavy metals by bioremediation with *Saccharomyces cerevisiae* was evaluated by analysing metals chemical speciation and validated through the bioremediation of a real electroplating effluent. From this work, we concluded that (i) carbonates, chlorides, fluorides, phosphates and nitrates in effluents do not compete with biomass for copper, nickel and zinc ions; (ii) sulphates can compete with biomass for nickel and (iii) high concentrations of fluorides, phosphates and sulphates can reduce the efficiency of bioremediation of effluents with chromium, at pH 6.0. Additionally, the importance of metal chemical speciation on the optimization of the treatment of real effluents was also demonstrated. Several guidelines for modelling the best experimental conditions for bioremediation of real effluents containing multi-elements (copper, chromium, nickel and zinc) will be presented and discussed during the communication.
Additionally, the selective recovery of the three metals was achieved, with high yield and purity, from the ashes of the contaminated biomass after acid digestion of the ashes followed by the electro deposition of Cu and then alkalinisation of the solution: (i) metallic copper (recovery: 99.9%; purity: 99.7%) (ii) nickel as nickel hydroxide (recovery: 99.98%; purity: 80.6%) and (iii) zinc as tetrahydroxozincate (recovery: 95.7%; purity: 99.98%). Here, again, the knowledge of metal chemical speciation was fundamental for designing the best experimental conditions for selective recovery of nickel and zinc.

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