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The use of exopolysaccharide - producing cyanobacteria as biosorbents to remove copper from industrial waste - waters

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The accumulation of heavy metals in water bodies represent a widespread cause of pollution, and poses the need to develop novel technologies to remove metals at the source, abating the costs of the commonly used chemical and physio-chemical methods. The use of cyanobacteria as biosorbents has been acknowledged as a promising alternative, due to their charged polysaccharidic envelopes which have affinity for metal ions. Nonetheless, the reseach must move towards: i) assessing the effectiveness of the process towards complex wastewater solutions which contain chemical species that can interfere with the sorption process, also considering the characteristics of the used strains, and ii) developing novel devices that support biomass growth and use, in order to achieve a scaling up of the process. We compared the specific removal of three cyanobacteria, Cyanothece 16 Som 2, Cyanothece ET5 and Cyanospira capsulata, towards Cu2+ contained, with various other metals, in two industrial effluents (one at pH 1.26 and one at pH 10.26). The strains were selected due to their previously assayed affinity toward Cu2+ in pure solutions (De Philippis et al. 2011). Acid or basic pretreatments (respectively for the acid and the basic effluent) were performed in the tentative to increase the specific removal. Metal concentration in solution, before and after the contact with the biomasses, was determined by atomic absorption spectrometry. Specific removals resulted different to those obtained towards pure metal solutions, likely due to the presence of other competing ions. Cyanothece 16 Som 2 showed the highest Cu2+ specific removal towards both the effluents. The pretreatment was effective only in the case of the basic effluent. Results proved the capacity of Cyanothece 16 Som 2 to act as a selective Cu2+ sorbent even in the presence of complex solutions. A novel prototype device is being projected in order to support the growth and the immobilization of the cyanobacterial biomass for its use in industrial field.

De Philippis et al. 2011. Applied Microbiology and Biotechnology 92, 697-708.