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Biomass as a metal bio-concentrator for metal recovery

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PURPOSE OF THE ABSTRACT

The exponential development of industrialization, urbanization and civilization is pressuring the natural and essential reserves of metals.[1] The current rate of metal exploration is likely to cause the depletion of some metals, resulting in severe industrial supply and demand limitations and subsequent price inflation. Exploring secondary metal sources such as wastewaters, electrical and electronic waste and acid mine drainage waters as alternative metal-rich sources may help to overcome this issue. This work intends to develop an alternative approach for the recovery of metals from wastewaters resorting to bioremediation. Bioremediation is a naturally occurring process that can be used to preconcentrate metals present in effluents. The metal-rich solution can then be integrated into extraction systems enabling the separation and purification of metals. The sorption capacity of eleven varieties of biomass, including cyanobacteria, macroalgae and microalgae, was evaluated in multi-elemental solutions of Co, Cu, Ni and Zn aiming to find the most promising bio-concentrators. From the initial screening, the best cyanobacteria, macro- and microalgae were selected to further optimize the process. Parameters such as pH, initial metal concentration, the metal counterion and the sorption kinetics were evaluated to optimize the process. Ion exchange between transition metals and soft metals (as Ca2+ and K+) was evaluated aiming to find a correlation between this parameter and sorption capacity. Fourier-transform infrared spectroscopy (FTIR) and elemental analysis were performed on all varieties of biomass aiming to correlate the structure of the biomass with its sorption capacity.

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FIGURES

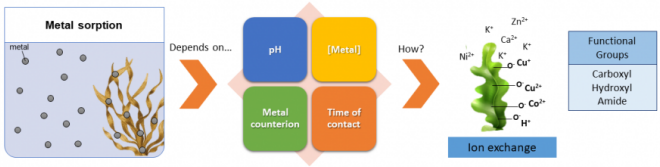

FIGURE 1

Biomass as a metal bio-concentrator for metal recovery

Parameters influencing the bioremediation process.

FIGURE 2

KEYWORDS

Bioremediation | Alternative process | Bioconcentrators | Metal recovery

BIBLIOGRAPHY

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