Biological Wastes as Efficient Biosorbents for Metal Recovery from Liquid Waste Streams

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Biological wastes such as agroforestry residues have been used as efficient biosorbents for the removal of toxic metals from wastewater. However, the paradigm of waste treatment has changed into a resource recovery approach, in which metal containing wastes are used as a mining opportunity rather than just discarded. In this context, selectivity and reusability of biosorbents are still challenges to overcome for the efficient application of biosorption for metal recovery and recycling.

The aim of this work is to study biosorbents for metal recovery, with emphasis on understanding the conditions under which metal selectivity can be achieved. A suite of biosorbents was obtained from different biological waste materials, including biochars from the pyrolysis of residues from agriculture, wood processing industry, municipal wastewater treatment, etc. These biosorbents were screened for the removal and recovery of valuable metals and metalloids such as Cu, Ni, Zn, Co, Cr, Pt, Se and Sb from liquid streams.

Some biochars tested showed a remarkably high sorption efficiency and selectivity in specific conditions. This initial work has shown the potential of biosorbents for selective metal recovery. However, multiple variables such as pH, metal concentration, competing ions, solid to liquid ratio, etc. affect metal selectivity. In a next stage, a high-throughput automated platform is developed and applied to be able to test more biomaterials and process conditions, in order to maximize the different combinations tested and reach optimal operation parameters.

Keywords: metal recovery, biochar, biosorption, selectivity