INNOVATIVE RECOVERY OF WINEMAKING WASTE FOR EFFECTIVE LEAD REMOVAL FROM WASTEWATER

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Agricultural industry together with food and beverage manufacturing are very polluting industries, generating large quantity of wastes with a high organic load and easy microbiological contamination. The transport, treatment, and storage of these wastes inevitably lead to price increase of the final product. The valorization of these agri-food industrial wastes represents a very good opportunity to develop new useful bioproducts in the frame of a circular bioeconomy and a sustainable waste utilization. However, the waste biomass resulting from fruit and vegetable processing industry possesses large quantities of fibres and bioactive ingredients as polyphenols, vitamins, enzymes, oils, carotenoids, which requires reconsideration of the strategy of using this food waste. But the extractions of the active components conduct to a series of completely depleted residues, which could be further valorized. Landfilling or incineration of these wastes only worsens the pollution problem, even if at first glance they may seem as low-priced and fast solutions. In recent years, studies explored the possibility of using agri-food industrial wastes, which are easily available all over the world, as biosorbents with different applications. Adsorption represents a procedure with a low cost, highly efficient, with possible metal recovery and adsorbent regeneration, and minimum sludge production.

The present research investigates the performance of an eco-friendly adsorbent derived from grape marc, in raw form and after biorefining, for the adsorptive removal of lead from contaminated effluents. Heavy metals are found in nature (soil, water, or wastewaters), coming from natural sources or human activities (mining, industry, agriculture). But independently of their source, heavy metals have an extremely high level of toxicity to living organisms, In particular, lead is a tremendously toxic contaminant, resulting from lead-acid batteries production, paints, pigments, glass, chemicals, or pesticides industries and it has really serious implications for human health like memory loss, head-ache, gastrointestinal diseases, injuries at the central nervous system, and kidney problems. The aim of present study is i) preparation of grape marc derived bio-sorbents; ii) batch mode experiments to test their Pb removal capacities (by finding the optimum pH conditions, the best liquid-solid ratio, and the influence of the initial ad-sorbent dosage, as well as the effect of initial pollutant concentration and the time required to reach the equilibrium. The assays are conducted with synthetic effluents simulating lead contaminated wastewater, but also a real effluent is tested. To the best of our knowledge, the grape marc is studied for the first time as heavy metal adsorbent for environmental bioremediation.

Keywords: grape marc; agri-food industrial wastes; water treatment; heavy metals; biomaterials; bioremediation

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