Arsenic and Lead Decontamination Level Identification Through the Toxic Metal Biosorption Technique Using Vegetable Residues

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The purpose of the research work is to eliminate toxic metals As and Pb from the Tacna water supply using vegetable residues for the Biosorption process. The biomass used is composed of olive pits, banana peels and orange peels. The first two have lignin content while the third has a high pectin content. Additionally, olive peels are sourced as a residue from this region. The treatment of biosorbents includes: washing, drying and sieving. The aqueous solutions of Pb(NO3)2 and Na3AsO3 were adjusted to a pH of 4 - 6, in which the Biosorbents were placed. Then it was subjected to magnetic stirring for 3 hours, finally the sample was filtered and sent to the analysis of lead and arsenic by Atomic Absorption Spectroscopy. The results obtained portray a better response of the biosorbents with respect to lead as the charged metal generates electrostatic attraction and/or the formation of coordinated bonds with the oxygen found within the functional groups present in the biomass; unlike arsenite ions found in its oxyanion form. These approaches were reinforced by computational calculations where the lignin-Pb and lignin-AsO2- interaction was optimized using a B3LYP level of calculation with the LanL2DZ as its basis, where coordination can be observed between the phenolic group of lignin and lead, unlike arsenite that only generates a hydrogen bridge interaction. We conclude that, in an aqueous lead solution, the orange peels have a greater removal capacity (99%); while for the case of arsenic the banana peels show the best result with 5% arsenic removal.

Awards Won:
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