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TITULO DE LA PONENCIA

Bio-Functionalization of Magnetic Nanoparticles for Mercury Remediation: A Sustainable Approach Using Regional Biomass

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Estilo preferido

ESTILO DE PRESENTACIÓN

- Poster

Categoría del resumen

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Ambiente y sociedad

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Resumen

PALABRAS CLAVE

Nanoparticles, Thiols, Fruits, mercury, adsorption, magnetite

CONTENIDO DEL RESUMEN

The population growth of the last decades and the increase in anthropogenic activities have led to technological industrial development, however, these factors have also been the main cause of the increase in environmental pollution in different ecosystems. Water is a vital resource, it makes up 70% of the planet earth, and it is one of the main ones affected by the different sources of pollution, thereby putting its different ecosystems and species, including humans, at risk. The contamination of water sources by heavy metals is one of the most worrying issues, due to its high impact on human health, with mercury receiving special attention since even in

low concentrations it is highly harmful (1).
In Colombia, mercury contamination in water is a significant environmental concern in, where artisanal and unregulated mining has intensified this problem and contribute to the highest per capita mercury presence globally, resulting in increasing mercury concentrations that bioaccumulate in living organisms and impact the food chain (2,3). Despite numerous remediation efforts, such as oxidation, reduction, and ionization processes, challenges persist in terms of high costs, low efficiency, and difficulty in large-scale implementation. Being a developing country, it requires effective and profitable solutions that allow combating this problem, this call for the implementation of new solutions, thus, there is a pressing need for more sustainable and cost-effective solutions.
This study proposes the use of local fruits and their residual biomass as raw material for thiols extraction for functionalization of magnetic based nanoparticles, targeting of develop a sustainable adsorbent of mercury dissolved in water. Considering that Colombia has abundant and perennial fruit production. This approach not only reduces the cost of functionalization but also promotes environmental sustainability by utilizing agricultural waste, and circular economy. Finally, combined the experimental goals with computational modelling of mercury species with the thiols to understand the adsorption interaction.
Functionalizing magnetic nanoparticles with thiols is expected to enhance mercury removal due to the strong affinity between sulphur and mercury (4), iron-based magnetic nanoparticles were chosen as the main study material, due to the presence of some attributes for adsorption, such as their affinity to the compound of interest, high surface area, small size, easy recovery using magnetic fields (5). Specifically, it is proposed to work with nanoparticles of magnetite, Fe3O4, given their low cost, low toxicity and zero impact on the environment. In addition, more favourable results have been obtained by coating nanoparticles with silica, giving the material greater stability, biocompatibility, and versatility in surface modification, generating better performance in its adsorbent functions (6).

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