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Comparison of chemical modification approaches for the improvement of copper(II) ions bioremoval

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The prevalence of heavy metals and organic pollutants as a consequence of the industrial development and population growth has always been a scientific concern. Different approaches have been utilized to eliminate heavy metal ions including electrodeposition, coagulation, oxidation, micro precipitation, ultracentrifugation and osmosis. Adsorption by biomaterials has demonstrated positive results on the removal of organic and inorganic contaminants. According to the prior results, the affinity resides on highly polar functional groups such as carboxyl, amino and hydroxyl. Lignocellulosic materials such as spent tea leaves have reported good adsorption percentage towards copper metal ions. In this project, amination and carboxylation of cellulose were carried out to enhance the adsorption capacity of Green Tea(GT). Amination was conducted via tosylation and nucleophilic substitution with a diamine. Carboxylation was achieved by treating the tea samples with oxygen plasma. Modified adsorbents were characterized by FTIR, SEM and TGA, showing that the chemical modification produced small changes on the morphology, thermal resistance and texture of the adsorbents. FTIR demonstrated that the functional were successfully added to the cellulosic structure. Adsorption tests indicate that the adsorption of copper(II) ions have a strong pH-dependence in the presence of the native and chemically-modified adsorbents, showing a maximum adsorption of pH 5 and 6. The adsorption percentages follow the trend Aminated GT > Native GT > Carboxylated GT, with %ADS of 47%, 29% and 23%, respectively. It is hypothesized that nucleophilicity of amino groups play an important role on the uptake of copper ions. On the other hand, oxygen plasma treatment might damage polysaccharide structures that are crucial for the housing of metal ions. Further studies are being currently conducted to explore the adsorption mechanism as well as equilibrium and kinetics parameters that are important for scaled-up adsorption processes.

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Synthesis and antimicrobial activity of benzoxazole derivatives

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Benzoxazoles are a large chemical family used as antimicrobial agents against a wide spectrum of microorganisms. The high therapeutic activity of the related drugs has encouraged the medicinal chemists to synthesize a large number of novel chemotherapeutic agents. The reaction of 2-aminophenol and p-amino benzoic acid yielded 2-(4-aminophenyl)benzoxazole in the presence of polyphosphoric acid which was further condensed with different aromatic aldehydes offered Schiff bases. The compounds were synthesized in good yield and the chemical structures of the compounds were elucidated by their TLC, IR and 1HNMR. Their antibacterial activity against *Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa, Bacillus subtilis* and antifungal activity against *Aspergillus niger, Candida albicans* were investigated. The results showed that all of the newly synthesized compounds (G-2- to G-8) have exhibited significant antimicrobial activity.

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