Evaluation of Alizarin red sulphonate dye adsorption by Waste Chinese Medicine

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Abstract

The pollution of water resources by synthetic dyes is a severe environmental issue, particularly because of their negative influence and bioaccumulation in wildlife. Dyes are toxic, might cause cancer, have mutagenic effects on flora, fauna, and human beings. Adsorption is a suitable technique for the remediation of wastewater. Activated carbon is the most broadly used adsorbent to remove dyes from dye ingunit effluents. Adsorption is a suitable technique for the remediation of wastewater. Activated carbon is the most broadly used adsorbent to remove dyes from dye ingunit effluents. However, activated carbon is not cheap due to its regeneration and reactivation. Thus, there is the requirement for alternative adsorbents which are produced by low-cost and commonly available materials so that the adsorption process becomes economically practical. Thus, the use of Chinese medicine wastes as biosorbent is an attractive alternative from both economical and environmental viewpoint. Nowadays, a small number of investigations has been deciphered about the application of Chinese medicine as available and economic biosorbent to eliminate heavy metals (Cu, Pb, Ni, Cd, Hg) and dyes (ARS, C₁₄H₇NaO₇S·H₂O). Modified waste Chinese medicine by heat treatment were used as adsorbent for removal of alizarin red aqueous solution. The use of Chinese medicine wastes as biosorbent is an attractive alternative from both economical and environmental viewpoint. CongoRed, C₃₂H₂₂Na₆O₆S₂, Methyl Violet, C₂₄H₂₈N₆Cl, Crystal Violet, C₂₅H₃₀ClN₃ from their aqueous solutions. The parameters involved in the study such as adsorbent dosage, pH, stirring speed, and temperature. Furthermore, the isotherm model has been applied and process kinetic model such as pseudo first order and pseudo second order was investigated. Medicinal plants, like other medicines and crops, have been exploited globally. The factors affecting adsorption behavior including contact time, temperature, initial concentration of alizarin red and adsorbent dosage were investigated. The best adsorption parameters were determined as pH was 3.0, the adsorption dosage was 0.4 g when the adsorption time was 30 min. The adsorption removal rate could reach 98.22% with the best adsorption amount 255.75 mg·g⁻¹. Thermodynamics analysis revealed that the adsorption process was spontaneous and exothermic. It is concluded that the modified...
waste tea could be an important sorbent in the removal of alizarin red dye solution from dyeing wastewater.