

**ADSORPTION OF LEAD (II) IONS USING  
CHEMICALLY MODIFIED BANANA STEM  
FIBERS AS A LOW COST ADSORBENT**

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## Abstract

Sorption of Lead (II) ions from aqueous solution on to banana stem fibers modified with citric acid treatment were investigated with respect to pH, contact time, initial metal ion concentration, adsorbent dosage, agitation speed and particle size which are the factors that affect the adsorptive capacity. Effects of different citric acid concentrations on the modification of banana stem fibers were also determined in this study.

Adsorption was found to be effective, which was 99.5% at an optimum pH of 4.5, where, the initial concentration used was 2 ppm. It took 90 minutes of contact time to achieve equilibrium with an effective agitation speed of 180 rpm. The effective particle size and the adsorbent dosage were found to be below 63  $\mu\text{m}$  and 3.0 g respectively. Citric acid concentration used in the modification was also found to be an important factor which affects the adsorption capacity. Final Lead (II) ions concentrations were measured by using Atomic adsorption spectrophotometer.

FT-IR analysis showed that banana stem fibers consist of functional groups such as hydroxyl and carboxylic groups which play a major role in the adsorption process. It was observed that with the citric acid modification the peaks' intensity was a little higher compared to that of unmodified banana stem fibers. Langmuir isotherm model fitted well with the results obtained with a  $R^2$  value of 0.992 and  $q_{\text{max}}$  of 20.12  $\text{mg g}^{-1}$ , while Freundlich isotherm model did not describe the process well.

Regeneration capability of used banana stem fibers for the re-utilization was found out to be very effective under desorption studies carried out where, HCl concentration was kept constant while varying the contact time. The optimum desorption results obtained was approximately 85% in 90 minutes of contact time in 0.1 M HCl.

The results obtained from the study suggests that banana stem fibers modified with citric acid can be used as an effective low cost, eco-friendly adsorbent for the removal of Lead (II) ions from aqueous solution compared to unmodified banana stem fibers.