# BIOSORPTIONOFTHORIUMUSINGJANIARUBENS-SACCHAROMYCES CEREVISIAE – SILICA GEL COMPOSITE BIOSORBENT

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Biosorption of toxic heavy metal contaminants from aqueous waste is a safe and cost-effective process for treatment of high volumes of low-concentration polluted solutions which could be combined with metal recovery. Biomass of brown marine macroalgae is a renewable biological resource, which is available in large quantities and can form a good base for the development of biosorbent material. Brown algae contain high concentrations of alginic acid and sulfated polysaccharides. It has been postulated that the function of these polysaccharides, which are absent in terrestrial plants, is to enable marine algae to selectively absorb metallic ions in a saline medium through ion exchange.

Biosorption of metals involves several mechanisms that differ qualitatively and quantitatively, according to the species used, the origin of the biomass, and its processing procedure. There are several chemical groups in biomass that can attract and sequester the metals: acetamido, amino, amido, sulfhydryl, sulfate, and carboxyl. Metal sequestration during biosorption follows complex mechanisms that include mainly ionic interactions and formation of complexes between metal cations and ligands contained in the structure of the cell wall biopolymers, as well as precipitation on the cell wall matrix. The binding characteristics of metallic cations during biosorption can partially be explained by Pearson's concept of hard and soft acid and base theory and by Irving–Williams series.

In this study, the adsorption of thorium from aqueous solutions on *jania rubens - saccharomyces cerevisiae* – silica gel composite biosorbent was investigated. The effect of pH, initial concentration of thorium, the contact time, temperature and volume/mass ratio on adsorption were examined by

batch technique. The morphological analysis of the composite biosorbent was performed by the scanning electron microscopy (SEM) and functional groups in the biosorbent were determined by FT-IR spectroscopy.

The sorption results have been subjected to different sorption isotherms, namely Freundlich, Langmuir and Dubinin-Radushkevich. Biosorption equilibrium better fit Langmuir equation than Freundlich equation, besides don't fit Dubinin-Radushkevich model. The thermodynamic parameters such as variation of enthalpy $\Delta H$, variation of entropy $\Delta S$ and variation of Gibbs free energy $\Delta G$ were calculated from the slope and intercept of $\ln K_d$ vs. $1/T$ plots. The results of this study showed that natural and cheap *Jania Rubens - Saccharomyces Cerevisiae* – Silica gel composite biosorbent can be successfully used for thorium removal from diluted aqueous solutions.