

# EQUILIBRIUM, KINETIC AND THERMODYNAMIC STUDIES ON LEAD REMOVAL FROM AQUEOUS SOLUTION BY *TECTONA GRANDIS L.F*

D. A. NAIDU<sup>1</sup>, P. KING<sup>2</sup>, NARAYANA SAIBABA K. V<sup>3</sup> & V. S. R. K. PRASAD<sup>4</sup>

<sup>1,2</sup>Environmental Pollution Control Engineering Laboratory, Department of Chemical Engineering, Andhra University,  
Visakhapatnam, Andhra Pradesh, India

<sup>3</sup>Department of Biotechnology, GIT, GITAM University, Visakhapatnam, Andhra Pradesh, India

<sup>4</sup>ANITS, Sangivalasa, Visakhapatnam, Andhra Pradesh, India

## ABSTRACT

Biosorption of lead was investigated using a biomass obtained from *Tectona grandis L.f.* The effects of contact time, initial metal ion concentration, pH, adsorbent dosage, temperature, adsorbent size were investigated. Optimization studies were carried out using batch biosorption studies. Pseudo second order model adequately described the kinetics of lead sorption with high correlation coefficients. The equilibrium data were analyzed using Freundlich, Langmuir, Redlich-Peterson and Temkin adsorption isotherms. Freundlich adsorption isotherm model gave a good fit to the experimental data. The results proved that *Tectona grandis L.f.* has good adsorption capacity. The maximum lead sorption capacity by Langmuir adsorption isotherm was obtained as 32.363 mg/g for 20 mg/L of initial lead concentration at pH 5 and temperature 30°C. Thermodynamic parameters, such as free energy change ( $\Delta G^{\circ}$ ), enthalpy change ( $\Delta H^{\circ}$ ) and entropy change ( $\Delta S^{\circ}$ ) were calculated using Langmuir adsorption equilibrium constants. Evidences from the experimental results hinted that lead adsorption on *Tectona grandis L.f.* was exothermic and spontaneous process.

**KEYWORDS:** *Tectona grandis L.f.*, Biosorption, Isotherm, Kinetics, Lead