

**“A STUDY ON UTILIZATION OF GROUNDNUT SHELL AS
BIOSORBENT FOR HEAVY METALS REMOVAL”**

PROJECT REPORT

(Sponsored by KSCST- 35S0770)

*In partial fulfillment of the requirements for the
award of the degree of*

**“BACHELOR OF ENGINEERING
IN
ENVIRONMENTAL ENGINEERING”**

Submitted by



BLESSEN GEORGE THOMAS
(4AI07EV002)

SHRUTHI.K.M
(4AI08EV014)

TAHERA TASNEEM
(4AI08EV016)

MANOJ.V
(4AI08EV017)

Under the guidance of

Mrs. DIVYA.M.N., M.Sc.,
Mr. KIRAN.B.M., M.Tech., (Ph.D).,

DEPARTMENT OF ENVIRONMENTAL ENGINEERING

Adichunchanagiri Institute of Technology
(Affiliated to Visvesvaraya Technological University)

CHIKMAGALUR-577102

2011-2012

ABSTRACT

The discharge of heavy metals into aquatic ecosystems has become a matter of concern in India over the last few decades. These toxic heavy metals are generated from operations involved in mining, sludge disposal, refining ores, metal plating, battery industries etc.

The effective removal of heavy metals from aqueous solutions is among the most important issues for many countries. Removal of lead (II) and copper (II) from aqueous solutions is being compared for the efficiency variations between waste biosorbents like groundnut shell.

Batch adsorption experiments were performed as a function of pH, contact time, solute concentration and adsorbent dosage. Experimental equilibrium adsorption data were tested for the Langmuir and Freundlich equations/isotherms. Maximum removal of Cu (II) was achieved at pH 5 ± 0.01 , whereas Pb (II) had an optimum pH of 5 ± 0.02 . At pH higher than 6.5 for both metals precipitation occurred, due to this reason biosorption was not studied beyond pH of 6.5.

The Freundlich isotherm parameters k_f and n were obtained. The k_f values determined were found to be 2.738 and 1.03 for Cu (II) and Pb (II) respectively and the n values determined were found to be 7.69 and 2.78 for Cu (II) and Pb (II) respectively. The Langmuir isotherm parameters a and b were obtained. The values of a were found to be 15.994 and 40.61 for Cu (II) and Pb (II) respectively and the values of b were found to be 0.13 and 0.07 for Cu (II) and Pb (II) respectively. The Lagergren first order and pseudo second order kinetic models were applied to obtain the biosorption kinetics for Cu (II) and Pb (II). The correlation coefficient (R^2) values for Cu (II) were 0.943 and 0.830 for Lagergren first order and pseudo second order respectively, thus best fitted in first order kinetic model. Whereas the correlation coefficient (R^2) values for Pb (II) were 0.943 and 0.993 for Lagergren first order and pseudo second order respectively. Thus the plot best fitted and followed pseudo second order kinetic model. The removal efficiency for Cu (II) and Pb (II) using groundnut shell powder as biosorbent are 68.2% and 77.8% respectively. The optimum dosage for maximum copper (II) and lead (II) are 50 g and 30 g respectively.

Keywords: Biosorption, heavy metals, biosorbents, equilibrium isotherms, groundnut shell, biosorption kinetics.