ADSORPTIVE REMOVAL OF Fe(II) FROM AQUEOUS SOLUTION BY FUNCTIONALIZED SUGARCANE BAGASSE

A Dissertation Submitted to the Central Department of Chemistry
Tribhuvan University, Kirtipur
Kathmandu, Nepal

In Partial Fulfillment of Requirements for the
Master's Degree in Chemistry

By

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has been accepted as a partial fulfillment of the requirements for the Master's Degree in Chemistry

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FOREWORD

The dissertation entitled “ADSORPTIVE REMOVAL OF Fe(II) FROM AQUEOUS SOLUTION BY FUNCTIONALIZED SUGARCANE BAGASSE ” submitted by Mr. Mahendra Acharya for the M. Sc. degree in Chemistry of Tribhuvan University is carried out under my supervision in the academic year 2007-2009.

During the research period (April, 2009-Janurary, 2010), he has worked sincerely and satisfactorily to complete this dissertation. No part of this thesis has been submitted for any other degree.

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ABSTRACT

In the present study, adsorption of Fe(II) onto different biosorbents prepared from sugarcane bagasse, i.e, raw sugarcane bagasse, charred sugarcane bagasse and phosphoric acid modified charred sugarcane bagasse has been studied by batch equilibration method under different experimental conditions. Effects of pH, Fe(II) concentration, and contact time on the adsorption of divalent iron ion were investigated. The concentration of Fe(II) ion in the test solution was determined spectrophotometrically. Maximum adsorption was observed at pH 2.5 for all the adsorbents at the optimum contact time of 9 hour, 7 hour, and 4 hour respectively for RSB, CSB and PCSB. Maximum adsorption capacity (q_{max}) value for the RSB, CSB and PCSB was found to be 50.5, 111.4 and 175 mg/g respectively. Adsorption of the Fe(II) ion on all the adsorbents followed Langmuir isotherm more strictly than Freundlich isotherm. The results shows that studied adsorbents may be attractive low cost alternative for the treatment of wastewater in lower concentration of iron.

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ABBREVIATIONS

SB	Sugarcane Bagasse
RSB	Raw Sugarcane Bagasse
CSB	Charred Sugarcane Bagasse
PCSB	Phosphoric Acid Modified Sugarcane Bagasse
CDC	Central Department of Chemistry
q_{max}	Maximum adsorption capacity in mg/g
Fe(II)	Ferrous ion
ppm	Parts per million
λ_{max}	Maximum wavelength for absorption
AAS	Atomic Absorption Spectroscopy
et al.	And others
USEPA	United States Environmental Protection Agency
EPA	Environment Protection Agency
ηm	Nanometer
μm	Micrometer
R%	Removal percentage
meq/g	Milliequivalents per gram
HEPES	2-[4-(2-hydroxyethyl)-1-piperazinyl] ethane sulphonic acid
FTIR	Fourier Transform Infrared Spectroscopy
hr	Hour
g	Gram
mmol	Milimole
mg/L	Milligram per liter

V.F.	Volumetric Flask
g/L	Gram per liter
mg/g	Milligram per gram
ml	Milliliter
C_i	Initial concentration of metal ion in mg/L
C_t	Concentration of metal ion at time‘t’ in mg/L
q_t	Amount of metal ion adsorbed at time 't'
q_e	Amount of metal ion adsorbed at equilibrium time
b	Affinity of binding sites with metal ions
K	Adsorption capacity in L/g
n	Adsorption intensity
k_1	Pseudo first-order rate constant in L/mg
k_2	Pseudo second-order rate constant in g/mg min
k_2’	Second-order rate constant in g/mg min
υ_0	Initial adsorption rate in mg/g min
R^2	Correlation Coefficient