Optimization of Xanthation And It's Application For Al(III) And Fe(III) Removal Onto Apple Waste

A Dissertation Submitted to the Central Department of Chemistry

Tribhuvan University, Kirtipur

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In Partial Fulfillment of Requirements for the

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By

Binod Nepal

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Foreword

The dissertation entitled "**Optimization of Xanthation And It's Application For Al(III) And Fe(III) Removal Onto Apple Waste**" submitted by Mr. Binod Nepal for the M. Sc. degree in Chemistry of Tribhuvan University is carried out under my supervision in the academic year 2005-2007.

During the research period (October, 2007-Janurary, 2008), 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

Novel xanthated apple waste derivative were prepared by chemical modification of apple waste using carbon disulphide (CS_2) under different alkaline condition *i.e.* 5%, 10%, 15% and 20% NaOH concentration. The optimization of NaOH concentration in the xanthation process was evaluated by the adsorption of Fe^{3+} ions and subsequently by the evaluation of the total exchangeable protons by titration method. The total exchangeable protons were found to be 3, 4, 6 and 6 mole/kg for four types of xanthated apple waste (XAW), xanthated at 5%, 10%, 15% and 20% NaOH concentration, respectively. Similarly, the maximum absorption capacity (q_{max}) value for the adsorption of Fe(III) were found to be 73.5, 105.26, 196.07 and 196.07 mg/g on four types of XAW xanthated at 5%, 10%, 15% and 20% NaOH concentration, respectively. The experimental results showed that the optimal condition of NaOH concentration for the xanthation of apple waste was 15%. The q_{max} value for the adsorption of Al(III) onto the optimized XAW at optimum pH 4 was found to be 181.81 mg/gm. Kinetics and isotherm studies revealed that for both metals Langmuir isotherm fitted well and adsorption mainly followed pseudo-second order kinetics.

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Abbreviations

Fe(III)	Ferric iron
Al(III)	Alluminium
h	Hour
mg/L	Milligram per liter
g/L	Gram per liter
mg/g	Milligram per gram
A%	Adsorption efficiency
V	Volume in milliliter
W	Mass of the adsorbent in gram
ml	Milliliter
C_i	Initial concentration of metal in mg/L
C_t	Concentration at time‘t’ in mg/L
q_t	Amount of metal ion adsorbed at time 't' in mg/g
q_e	Amount of metal ion adsorbed at equilibrium time
D	Distribution ratio
q_m	Amount of metal to form monolayer coverage in mg/g
b	Energy of adsorption in L/mg
K	Adsorption capacity in L/g
n	Adsorption intensity
mmol	Milimole
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
XAW	Xanthated Apple waste
R^2	Coefficient of determination
A.C	Activated carbon

R.H	Rice husk
ppm	parts per million
ppb	parts per billion
XAW(5%)	Xanthated apple waste xanthated with 5% NaOH
XAW(10%)	Xanthated apple waste xanthated with 10% NaOH
XAW(15%)	Xanthated apple waste xanthated with 15% NaOH
XAW(20%)	Xanthated apple waste xanthated with 20% NaOH
USEPA	United States Environment Pollution Assesment
ICP	Inductively Coupled Plasma
AAS	Atomic Absorption Spectrophotometer