RH

(　　RH)　　　(　　RHA　　　　　　900 $^{\circ}$C

1　　　　　)　　　　　　NiSO$_4$　　　　　　Ni (II)

RH　　　　　　　　　　　　NiSO$_4$

500　900　1100 $^{\circ}$C　　　　2

RHA　　　　　　RH　RHA　　　　　　Langmuir

RH　　　Freundlich　　　　RH　1100°C　SiO$_2$　amorphous

(cristobalite)　　　　105 $^{\circ}$C　　　　　NiSO$_4$　　　500

1100 $^{\circ}$C　　　　SiO$_2$　　　　　　　　　Ni-O

Ni-Ni

Ni-O (　　　)　Ni-Ni (　　　)

XAS

Abstract

This study contains two parts: isothermal adsorption experiments of nickel by rice husk (denoted as RH) and rice husk ash (denoted as RHA, generated by heating RH at 900 ^{o}C for one hour); thermal treatment of RH that is spiked with nickel. The concentrations of nickel were measured by Flame Atomic Absorption Spectrophotometer (FAAS). Both Langmuir and Freundlich adsorption equations were applied to simulate the adsorption models of nickel. Nickel-sorbed RH was thermally treated at 500, 900, and 1100 ^{o}C for 2 hours. X-ray absorption spectroscopy (XAS), toxicity characteristic leaching procedure (TCLP), surface area (BET), scanning electron microscope (SEM), X-ray diffraction (XRD), and Fourier transform infrared spectroscopy (FTIR), and others were used to study speciation change of nickel.

The results indicate that RHA has a greater adsorption capacty of nickel than RH. Langmüir model was appropriate for nickel adsorption by RHA, and Freundlich model was appropriate for the RH.

The XRD results showed that the phase of SiO_2 of RH transformed from amorphous to cristobalite after heating at 1100 ^{o}C for 2 hours. The XANES results show that the nickel containingsamples formed Ni/SiO_2 composite compounds after heating at 500, 900, and 1100 ^{o}C for 2 hours. The Fourier transforms results show that the matrix of nickel containing samples is complicate after heating at 500, 900, and 1100 ^{o}C for 2 hours; whereby shortening the interationic distances of both in the environment and lead the first shell (Ni-O) and the second shell (Ni-Ni).

Keywords: nickel, rice husk, rice husk ash, adsorption, thermal treatment, plating wastewater, XAS