SOME INVESTIGATIONS ON COPPER(II) AND CADMIUM(II) DECONTAMINATION OF WASTE WATERS BY RICE HULL ASH

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by

M.D.J.S.Saparamadu B.Sc.(Hons), Sri Lanka

Department of Chemistry,
University of Colombo,
Sri Lanka.

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ABSTRACT

Heavy metal adsorption characteristics of rice hull ash were investigated by batch equilibration method with respect to initial metal concentration (10μ M - 100μ M), pH (3-10), ionic strength (0.001M - 0.1M $NaNO_3$) and ash content (0.1g/l - 1g/l). The adsorption of Cu^{2+} and Cd^{2+} consists of fast kinetics followed by slow uptake. The fractional adsorption was dependent on pH but independent of the initial metal concentration, indicating the presence of excess amount of active sites. 50% adsorption of Cu^{2+} occurred at pH=6.2 and >95% adsorption was possible at pH > 8. For Cd^{2+}, 50% and >90% adsorption occurred at pH 7.9 and pH > 9.5 respectively. However, removal of Cu^{2+} and Cd^{2+} from solution at pH values greater than 6.6 and 8.9 respectively appeared to occur mainly by precipitation as hydroxy species. There was no significant effect of the ionic strength on adsorption suggesting that the chemical nature of Cu^{2+} and Cd^{2+} adsorption on rice hull ash to be innersphere type complexation. The optimum ash concentration required for total metal removal was slightly higher than 1.0g/l . The adsorption data fitted well with Langmuir isotherm for both Cd^{2+} and Cu^{2+}. There was a significant effect of Cu^{2+} on Cd^{2+} uptake, but Cd^{2+} was non competitive on simultaneous adsorption of Cu^{2+} indicating greater stability of Cu^{2+}/rice hull ash complex. Rice hull ash can be used to remove Cu^{2+} and Cd^{2+} to achieve tolerance limit for coastal waters. At low pH values metal removal occurs purely by adsorption onto rice hull ash but at high pH, hydroxide precipitation becomes the dominant process of metal removal. Thus the use of rice hull ash as a metal adsorbent is limited to a certain pH range depending on the metal.