



“Gheorghe Asachi” Technical University of Iasi, Romania



COMPETITIVE BIOSORPTION OF Pb(II), Cu(II), Cd(II) AND Zn(II) USING COMPOSTED LIVESTOCK WASTE IN BATCH AND COLUMN EXPERIMENTS

Mingliang Zhang^{1*}, Haixia Wang¹, Louis M. McDonald², Zhenqi Hu^{3*}

¹School of Resources and Environment, University of Jinan, Jinan, China, 250022

²Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV, USA, 26506

³Institute of Land Reclamation and Ecological Restoration, China University of Mining and Technology (Beijing), Beijing, China, 100083

Abstract

Composted livestock waste (CLW) was studied as one low-cost material to remove Pb(II), Cu(II), Cd(II) and Zn(II) from simulated acid mine drainage (AMD) by batch and column experiments. The adsorption isotherm data were well fitted by the Langmuir model. The maximum monolayer adsorption capacities were 0.5485 mmol/g for Pb(II), 0.4092 mmol/g for Cu(II), 0.2246 mmol/g for Cd(II), and 0.1879 mmol/g for Zn(II) at pH 4.0. Due to the competition effect, the adsorption capacity of the single metal ion decreased in the multiple metals system compared with single metal system. The removal equilibrium for Pb(II), Cu(II), Cd(II) and Zn(II) occurred at pH of 3.0-3.5, 4.0-4.5, 4.5-5.0 and 6.0-6.5, respectively. There was relatively high adsorption efficiency even in acid conditions (pH 2-4), especially for Pb(II). Breakthrough curves demonstrated the effectiveness of adsorption in column experiment for treatment of heavy metals in AMD. This study confirmed that CLW could be efficient for heavy metal ions removal from acid mine drainage or acidic coal refuse leachate.

Key words: competitive biosorption, composted livestock waste, heavy metal, isotherm

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* Author to whom all correspondence should be addressed: e-mail: stu_zhangml@ujn.edu.cn; Phone: +86 531 82769233