

Influence of Type and Amount of Organic Matter on the Sorption Capacity of Iron in the Management of Acid Mine Drainage Using Constructed-Wetlands

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Abstract

Acid mine drainage (AMD), with a low pH and relatively high concentration of heavy metals, is an environmental problem in mining activities. Constructed wetlands is one of the AMD management methods, in which organic matter (OM) plays very vital role in reducing the concentration of heavy metals in AMD through absorption and precipitation processes. Three types of OM (empty bunches of oil palm, chicken manure and water hyacinth) and 5 levels of OM (0, 10, 20, 30 and 40 Mg ha⁻¹) were applied to reclaimed-mining soils (RMS) in an incubation study. A batch experiment was then carried out to quantify the effect of OM application on the maximum sorption capacity (Q_{max}) of iron (Fe) from the AMD onto mixed soil-OM. The application of OM resulted in increases in soil pH, carboxylic groups, and total functional groups, in which these increases varied based on the types and amounts of OM application. The application of OM increased Q_{max} values for Fe from 2077 to 2348–3259 mg Kg⁻¹ (water hyacinth), to 2607–3635 mg Kg⁻¹ (chicken manure), and to 2219–2992 mg Kg⁻¹ (empty bunches of oil palm). Increasing these Q_{max} values may ascribe to increasing functional groups of the RMS with OM application. Results of this study demonstrate that importance of different types and amounts of OM in controlling the sorption of Fe from AMD onto soils.

Keywords: decomposition; negative charge; adsorption; functional groups; metal removal.