

Distribution of heavy metals fractionation in gold mine tailing amended with non-coated and iron-coated rice husk ash

ABSTRACT

The determination of heavy metals fractionation in the environment is necessary to predict their mobility and bioavailability. This study was carried out to evaluate the effects of rice husk ash (RHA) and iron-coated rice husk ash (Fe-RHA) on As, Cd, Cr, Cu, Mn, Pb and Zn fractionation in gold mine tailings. The tailings were amended with either 0%, 5%, 10%, and 20% (w/w) of RHA or Fe-RHA and the samples were incubated at 60% of field capacity for 80 days. The amount of metals in different fractions at different intervals was determined using a sequential extraction procedure. The results showed that the addition of RHA increased the pH of tailings. The highest pH (9.09) was recorded in samples treated with 20% RHA. However, the addition of Fe-RHA reduced the pH values at all rates and incubation period, compared to the control. The lowest pH (7.17) was recorded in samples treated with 20% Fe-RHA. Both RHA and Fe-RHA increased the easily exchangeable As in the tailings from 17.564% to 25.820% at samples treated with 20% RHA and 21.070% at Fe-RHA samples but decreased the carbonate-bound and organic fractions. However, the opposite results were observed for Cd (60.940% to 43.250%), Cr (2.214% to 1.560%), Cu (3.106% to 1.312%), Mn (62.149% to 43.740%), and Zn (9.853% to 1.325%) when tailings amended with 20% RHA. The results suggest that the addition of RHA or Fe-RHA can reduce the availability of cationic heavy metals in the tailings but will increase the availability of anionic metalloids such as As.

Keyword: Mine tailings; Heavy metals; Rice husk ash; Fractionation; Sequential extraction