

Bioavailability and mobility of arsenic, cadmium, and manganese in gold mine tailings amended with rice husk ash and Fe-coated rice husk ash

ABSTRACT

This study was conducted to determine the effects of rice husk ash (RHA) and Fe-coated rice husk ash (Fe-RHA) on the bioavailability and mobility of As, Cd, and Mn in mine tailings. The amendments were added to the tailings at 0, 5, 10, or 20% (w/w) and the mixtures were incubated for 0, 7, 15, 30, 45, and 60 days. The CaCl₂ extractable As, Cd, and Mn in the amended tailings were determined at each interval of incubation period. In addition, the tailings mixture was leached with simulated rain water (SRW) every week from 0 day (D 0) until day 60 (D 60). The results showed that both RHA and Fe-RHA application significantly decreased the CaCl₂-extractable Cd and Mn but increased that of As in the tailings throughout the incubation period. Consequently, addition of both RHA and Fe-RHA leached out higher amount of As from the tailings but decreased Cd and Mn concentration compared to the controls. The amount of As leached from the Fe-RHA-amended tailings was less than that from RHA-amended tailings. Application of both RHA and Fe-RHA could be an effective way in decreasing the availability of cationic heavy metals (Cd and Mn) in the tailings but these amendments could result in increasing the availability of anionic metalloid (As). Therefore, selection of organic amendments to remediate metal contaminated tailings must be done with great care because the outcomes might be different among the elements.

Keyword: Availability; Amendments; CaCl₂- extractable; Tailings; Incubation; RHA; Fe-RHA