Geophysical Research Abstracts
Vol. 20, EGU2018-2768, 2018
EGU General Assembly 2018

Tannic acid and hydrochloric acid for removing cadmium, arsenic and zinc from contaminated soil

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Soil washing is one of the most appropriate pollution control techniques for removing heavy metal contaminated soil. In this work, tannic acid (TA) and hydrochloric acid (HCl) were used as the initial leachants to remove Cd, As and Zn from polluted soil in an industrial area of Hubei province. The soil washing experiments were performed in single or mixed solution. Concentration, leaching time and liquid-solid ratio of TA and HCl were chosen to research the optimal conditions, the pH and removal rate of Cd, As and Zn were analyzed in this experiment. The results showed that the removed efficiency increased with time. Best removal rate was obtained at 24h, and the mobilization of heavy metal was improved by double washing. The best removal rate of Cd, As and Zn separately ranged from 29.9% to 63.03%, 24.88% to 55.16%, 34.10% to 68.69% with 0.03 mol/L TA, 96.9% to 99.92%, 80.63% to 94.75%, 83.22% to 97.24% with 0.1 mol/L HCl. Double washing caused the pH decreased from 4.4 to 4.1 by 0.03 mol/L TA, 1.1 and 0.62 by 0.1 mol/L HCl. The effect of HCl on the removal of heavy metals is better than TA. However, in view of the effect of HCl on soil pH. The compound eluent of HCl and TA is the best option to repair heavy metal contaminated soil. The remove experimented by composite leaching of TA and HCl, and the optimum concentrations was 0.03 mol/L TA and 0.1 mol/L HCl respectively. When the soil was leached by compound leachate (v(HCl):v(TA)=1:1) for 12h, the removal rates of Cd, As and Zn can be up to 98.3%, 97.7%, 99.6%. In this condition, the pH of the leaching solution rose to 2.8 and the removal rate was decreased with the passage of time. In this study, Cd, As and Zn was almost completely removed. Above all, the TA and HCl co-leaching reagent might be used potentially to remove Cd, As and Zn from contaminated soils.