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Heavy metals adsorption by residual soils of rhyolite, andesite and basalt from Pahang, Malaysia

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The adsorption tests of heavy metals were carried out on rhyolite residual soil from Lancang, residual andesite from Kuari Kampung Awah and residual basaltic soil from Kuantan, Pahang. Physical and chemical characteristics of the soil that would probably affect the levels of adsorption were firstl characterized. Grain size distribution, Atterberg limits, compaction, permeability, pH, compositions of organic content, capacity exchange cation (CEC) and specifi surface area (SSA) were conducted. Physico-chemical properties of soils showed that andesitic soil has high clay content, low pH value, high organic matter content, high capacity exchange cation and high specifi surface area. Heavy metals used in the adsorption study were Pb, Cu, Ni, Zn, Co and Cd. The sorption experiment was conducted using two main experiments namely high speed centrifuge mini column test and batch adsorption test. These tests were conducted to study the heavy metals adsorption by different types of soils. Heavy metals were analyzed using Flame Atomic Absorption Spectrophotometer (AAS). The centrifuge mini column data were presented using breakthrough curves. The results showed that andesitic soil has the highest retention capability on heavy metals compared to other residual soils. The equilibrium adsorption data from batch test were fitte to linear, Langmuir and Freundlich isotherm models. All three types of soil were found to adsorb higher amount of Pb compared to other heavy metals with the sorption selectivity of Pb > Cu > Zn > Co > Cd > Ni. Both tests discovered that andesite residual soil adsorbed highest heavy metals compared to rhyolite and basalt with the ranking for sorption as; residual andesite soil > residual basalt soil > residual rhyolite soil. The results of the study demonstrated that the residual amdesite soil has a better potential and a good candidate to be used as an effective, cheap, environmental friendly adsorbent for heavy metals.

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