

Investigation of the source, behavior, toxicity, mobility and speciation of arsenic in soil

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Heavy metals contamination to the terrestrial environment long exists due to the natural weathering of the parent rocks in which causing metal precipitation in the system. The widely observed increase trace element concentrations in agricultural soil due to various human activities such as liming would lead to potential harmful effects on mankind. Natural reduction in lime status for most soils would increase soil acidity and reduce soil fertility. Toxic metals and metalloids such as arsenic have the abilities to scavenge with Fe and Mn oxides present in low grade limestone and leach out from the soils under severe environmental condition. Adsorption of arsenic into the soil system depends greatly on the physicochemical behaviour in which arsenic enters the soil. Sequential extraction method was used to partition different arsenic species in associated with various metal-bearing phases. As, Fe and Mn contents in five extraction steps were determined by HG-AAS and XRF techniques. Solution matrix effect was observed throughout the HG-AAS analysis and minimized with addition of 1% cysteine as masking agent. All soil sub-samples demonstrated much higher As content than the above global average content of arsenic being found in limestone, pellet limestone for soil pH amendment and MAP/DAP phosphate fertilizers with majority of As showed strong binding with crystalline Fe phases. Direct X-ray spectroscopic analysis was deemed necessary because of possible repartitioning of As between dissolved Mn and residual Fe oxides in the first three extractions steps.

Reference:

(G. T. Schmidt, K. H. Lui, M. Kersten. Speciation and mobility of arsenic in agricultural lime. Journal of Environmental Quality. (In press))