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# Single and Sequential Extraction for Potassium Fractionation and Nano-Clay Flocculation Structure

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**Abstract :** Potassium (K) is a known macro nutrient and essential element for plant growth. Single leaching and modified sequential extraction schemes have been developed to estimate the relative phase associations of soil samples. The sequential extraction process is a step in analyzing the partitioning of metals affected by environmental conditions, but it is not a tool for estimation of K bioavailability. While, traditional single leaching method has been used to classify K speciation for a long time, it depend on its availability to the plants and use for potash fertilizer recommendation rate. Clay mineral in soil is a factor for controlling soil fertility. The change of the micro-structure of clay minerals during various environment (i.e. swelling or shrinking) is characterized using Transmission X-Ray Microscopy (TXM). The objective of this study are to 1) compare the distribution of K speciation between single leaching and sequential extraction process 2) determined clay particle flocculation structure before/after suspension with K+ using TXM. Four tropical soil samples: farming without K fertilizer (10 years), long term applied K fertilizer (10 years; 168-240 kg K2O ha-1 year-1), red soil (450-500 kg K2O ha-1 year-1) and forest soil were selected. The results showed that the amount of K speciation by single leaching method were high in mineral K, HNO3 K, Non-exchangeable K, NH4OAc K, exchangeable K and water soluble K respectively. Sequential extraction process indicated that most K speciations in soil were associated with residual, organic matter, Fe or Mn oxide and exchangeable fractions and K associate fraction with carbonate was not detected in tropical soil samples. In farming long term applied K fertilizer and red soil were higher exchangeable K than farming long term without K fertilizer and forest soil. The results indicated that one way to increase the available K (water soluble K and exchangeable K) should apply K fertilizer and organic fertilizer for providing available K. The two-dimension of TXM image of clay particles suspension with K+ shows that the aggregation structure of clay mineral closed-void cellular networks. The porous cellular structure of soil aggregates in 1 M KCl solution had large and very larger empty voids than in 0.025 M KCl and deionized water respectively. TXM nanotomography is a new technique can be useful in the field as a tool for better understanding of clay mineral micro-structure.

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