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NONGNUCH TANTIDANAI: DEVELOPMENT OF A FLOW SYSTEM FOR SEQUENTIAL EXTRACTION OF METALS IN SOIL AND SEDIMENT. THESIS ADVISOR: JUWADEE SHIOWATANA Ph.D., DUANGJAI NACAPRICHA Ph.D. 94 p. ISBN 974-664-275-8.

Sequential extraction procedures are commonly used to isolate metals associated with soluble acid, reducible, oxidisable and residual (amongst others) fractions of soil or sediment in operationally defined speciation. Sequential extraction furnishes detailed information about the origin, mode of occurrence, biological availability, mobilization and transport of trace metals in the environment. The conventional batch method of extraction has weaknesses such as poor precision and long analysis time.

In this work, a flow extraction system was developed to speed up, facilitate and improve the accuracy of the chemical fractionation of metal in solid materials. A three-step sequential extraction scheme was used to evaluate the novel system by analysing calcium (Ca), iron (Fe), manganese (Mn), copper (Cu) and zinc (Zn) in certified reference materials. In the proposed system, extraction occurred in a closed chamber through which extractants were passed sequentially. The extracts were collected in a number of fractions for subsequent flame atomic absorption analysis. Apart from the advantages of simplicity, speed and less risk of contamination that flow analysis systems usually possess, the flow system can improve the accuracy of chemical fractionation of metals by sequential extraction. Two flow systems were designed for continuous operation of sequential extraction. In the first system, the extracts from continuous sequential extraction were directly transferred to a Flame Atomic Absorption Spectrometer for measurement. Extraction profiles of each extraction step can be obtained. The decreasing of flow rate caused by accumulation of fine particles of soil samples on the membrane filter can be monitored by occasional injection of a standard solution of the element being measured. In the second system, extracts were collected fractionwise and each fraction was subsequently measured. The offline detection with flow sequential extraction is more attractive because it can avoid the inconstant flow rate during detection. Variations of temperatures and sample weight/extractant volume ratios were investigated by the flow sequential extraction with offline detection. The results showed that in the flow sequential extraction system that greater amounts of metals were extracted in reducible fraction at higher temperatures (26°C – 80°C). The effect of sample weight/chamber volume ratios (1:12 – 1:40) has no effect on the total concentration of extractable metals. The flow system was assessed by analysing a soil reference material SRM 2710. The summation of concentration of all fractions was found to agree with the certified value.