Comparison of medium to heavy metals analytical data of soil samples by three XRF analytical systems

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X-ray fluorescence (XRF) analysis is an ideal analytical method to evaluate concentrations of medium to heavy metals as Cu, Zn, As, Mo, Cd, Sn, Sb and Pb in soil samples, because XRF analysis is capable to analysis soil samples without acid digestion processes.

We used SHIMADZU XRF1800, TEXA500, and Epsilon 5 to obtain calibration lines of these metals which occur in soil standard samples [1]. SHIMADZU XRF1800 is a wave range XRF with a Rh target 4kW X-ray tube. TEXA 500 is an energy dispersive XRF with a LiF monochrometer and a W target 2kW X-ray tube. Epsilon 5 is an energy dispersive XRF with a 3-dimensional polarizing optical geometry together with a Gd target 600W X-ray tube. The soil samples were pressed using aluminum sample cap and a 20ton press machine for the analysis.

Among these three XRF systems, the qualities of calibration lines obtained by Epsilon 5 are best for these metals analyzed. The qualities of calibration lines obtained by TEXA500 are not enough for qualitative analysis of Cu, Zn and Mo, because TEXA 500 uses a narrow range of energy around 40keV of the white X-ray of W tube line obtained by the monochrometer and the 40keV X-ray is not efficient to enhance the fluorescence of these metals.

The qualities of calibration lines of SHIMADZU XRF1800 are not enough for qualitative analysis of As, Mo, Cd, Sn and Sb, because the data processing program of XRF1800 does not use a peak separation program.

[1]K.Marumo, T.Ujiie, Y.Onoki, T.Nemoto and K. Matsuno, Adv.X-ray.Chem. Anal., Japan 37. 75-97 (2006).