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Grain size and moisture content effects soil sample properties in portable X-ray fluorescence analysis of geological samples

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The elemental compositions measurements of the geological samples using portable X-ray fluorescence (pXRF) technique in the laboratory were studied. The influences of the grain size and the moisture content of the samples on the pXRF analysis were also investigated. The pXRF was used to determine the major (Al, Ca, Fe, K, Mg, Si and Ti) and minor (Mn, Nb, Pb, Rb, Sr, Th and Zr) elements in the geological samples with different depths collected from Phang-nga province, Thailand. Seven reference materials were utilized to calibrate the analytical method. The calibrated values were strongly correlated to that reference values (R2 > 0.95) for Al, Ca, Fe, K, Mg, Mn, Rb, Si, Sr, Th, Zr except for Cu, Nb, Ni, P, U, V, W, Y, Zn. The results showed that both grain size and moisture content had significant effect on the elemental concentrations measured by pXRF. The decreasing of grain size resulted in an increase the elements concentrations. While the moisture content in the sample increased with decreasing of the elements concentrations. The mesured elements were Si (22.03 –25.79 wt%), Al (17.39 –21.38 wt%), Fe (4.39 -7.41 wt%), Ti (0.70 –1.23 wt%), Nb (47 –99 mg/kg), Rb (50 –99 mg/kg) and Zr (499 –900 mg/kg). These elements concentrations were measured by pXRF under the optimum conditions, the grain size of the sample of <75 μm and the moisture content in the sample of less than 1 wt%, as well as were good agreement with that WDXRF results. For Ca, K, Mg and Mn, their concentrations were lower than detection limits of the pXRF.

Primary author: Dr NUCHDANG, Sasikarn (Thailand Institute of Nuclear Technology (Public Organization))

Co-authors: Dr RATTANAPHRA, Dussadee (Thailand Institute of Nuclear Technology (Public Organization)); Mrs LEELANUPAT, Orapun (Thailand Institute of Nuclear Technology (Public Organization)); Ms PITIPHATHARABUN, Siraprapa (King Mongkut's University of Technology Thonburi); Ms ☒NIYOMSAT, Thanaporn (King Mongkut's University of Technology Thonburi); Dr SUKHUMMEK, ☒Boonnak (King Mongkut's University of Technology Thonburi)

Presenter: Dr NUCHDANG, Sasikarn (Thailand Institute of Nuclear Technology (Public Organization))

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