



Rare earth elements and thorium analysis of geological samples by inductively coupled plasma optical emission spectrometry

Chalermpon Tungseng¹, Paweeapat Junsong¹, Boonnak Sukhummek¹, Tawatchai Chualaowanich², Uthaiwan Injarean³ and Dussadee Rattanaphra^{3*}

¹*Department of Chemistry, Faculty of Science,
King Mongkut's University of Technology Thonburi, Thailand*

²*Research Bureau of Minerals, Department of Mineral Resources, Thailand*

³*Research and Development Division, Thailand Institute of Nuclear Technology, Thailand*

*e-mail: dussadeejjt@gmail.com

Geological samples collected from Chumporn and Surat Thani provinces obtained from Department of Mineral Resources Laboratory (DMR) were analyzed for rare earth elements and thorium by inductively coupled plasma optical emission spectrometry (ICP-OES). This technique offers fast and cost effective simultaneous multi-element for geological analysis. The samples were taken at different soil horizons (organic – top soil; O-A, top soil –sub soil; A-B, sub soil – substratum; B-C (1) and B-C (2) as well as hard bedrock; D). The four digestion methods including nitric acid, hydrochloric acid, aqua regia and sulfuric-nitric acid methods were investigated. Influence of digestion time (2, 3, 4, 5 and 6 h) on the concentration of elements was also studied. Most elements in all samples tested were efficiently extracted by the nitric acid method. The high concentrations of all elements were observed in A-B and B-C horizon samples. The concentration values in those horizons for Ce, La, Pr, Nd, Sm, Gd, Y, Dy and Th were 198.07-220.80, 82.45-84.89, 40.85-45.38, 51.02-54.41, 13.44-15.40, 7.60-8.19, 33.44-35.44, 5.86-6.08, 61.31-66.74 mg kg⁻¹, respectively, under the optimum conditions: using the nitric acid method, digestion temperature of 160 °C and digestion time of 4 h. Strong linear relationship between the result values determined by this method and those measured by ICP-MS in DMR Laboratory were observed for all elements with R² in the range of 0.85 to 0.98 except for Sm.

Keywords: Rare earth elements; Thorium; Geological sample; ICP-OES