A comparison of methods of analysis of heavy metals in soil samples of Mitrovica environment, Republic of Kosovo

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Abstract – In this work, the distribution of heavy metals in surface soil samples (0-5 cm) from the Mitrovica Region, was studied. The investigated region (301.5 km^2) is covered by a sampling grid of 1.4×1.4 km. In total 156 soil samples from 149 locations were collected. Digestion methods, including Aqua Regia Digestion (mixture of HNO_3 and HCl and water at 95ºC- the 1DX1 method) and acid digestion: use of concentrated acids such as hydrofluoric acid (HF), hydrochloric acid (HCl), nitric acid (HNO_3) and perchloric acid ($HClO_4$) (ISO 14869- 1:2001(E) method), are used to prepare samples for spectroscopic analysis. High-sensitivity spectroscopy techniques such as inductively coupled plasma emission spectrometry (ICP-AES) and inductively coupled plasma mass spectrometry (ICP-MS) were applied to measure the concentration of Ni and Co in soil samples. Data analysis and construction of the map were performed using the Statistica (ver. 9), AutoDesk Map (ver. 2008) and Surfer (ver. 9) software. It was found that the average content of Ni and Co in the surface soil for the entire study area is 96 mg/kg (with a range of 7.6-2600 mg/kg) and 22 mg/kg (with a range of 2.7-1600 mg/kg), respectively. The obtained average and median values obtained by ICP-MS are very similar with those obtained by ICP-AES. Namely, the correlation factor for Co and Ni between the results from both methods are 0.92 (for normal distribution), 0.93 (for logarithmic) and 0.94 (for rank), and 0.86 (for normal distribution), 0.94 (for logarithmic) and 0.96 (for rank), respectively. The obtained results show that the high concentrations of the Ni and Co in the surface soil samples may originate from similar sources and their distribution follows the lithology of the study area.

Keywords – Soil, Spatial Distribution, Nickel, Cobalt, ICP-MS, ICP-AES, Mitrovica Region, Republic of Kosovo