

## Application of the modified-BCR sequential extraction procedure to the assessment of the anthropogenic pollution in contaminated soils from the city of Huelva (SW Spain)

M.T. GUILLÉN\*, J. DELGADO, J.M. NIETO  
AND M.A. CARABALLO

Department of Geology, University of Huelva. Avda. Fuerzas Armadas s/n, 21071 Huelva, Spain  
(marco.guillen@dgeo.uhu.es)

Modified-BCR sequential extraction procedure has been successfully employed in the last decades to study metal distribution in samples affected by different anthropogenic activities and considered potentially toxic to human health. [1], [2]. Soil samples from the municipal district of Huelva were analyzed with this procedure to establish As, Cd, Cu, Cr, Fe, Mn, Ni, Pb and Zn distribution in 5 selected soil phases (interchangeable ions, metals bound to carbonates, metals bound to Fe and Mn oxides and residual fraction). In addition to the modified-BCR the samples were studied by X-ray diffraction to determine its mineralogical composition and a total digestion were performed to know the bulk chemistry of the samples. Bulk chemistry analyses of the samples affected by industrial activity showed a significant As, Cd, Cu, Cr, Pb and Zn concentration with maximum values of 2065 mg kg<sup>-1</sup> of As, 18 mg kg<sup>-1</sup> of Cd, 425 mg kg<sup>-1</sup> of Cu, 112 mg kg<sup>-1</sup> of Cr, 5469 mg kg<sup>-1</sup> of Pb and 4707 mg kg<sup>-1</sup> of Zn. Obtain values for the local baseline are: 63 mg kg<sup>-1</sup> of As, 0.85 mg kg<sup>-1</sup> of Cd, 392 mg kg<sup>-1</sup> of Cu, 154 mg kg<sup>-1</sup> of Pb, and 321 mg kg<sup>-1</sup> of Zn. Fe, Mn and Ni concentrations are representative of the lithology of the area of study and do not imply any risk to the environment. Elements distribution in the different phases reveal greater mobility for Cd, Cu, Mn and Zn as they are released in the bioavailable phase of the sequential extraction (Step 1), showing them as a mayor risk to the human health. Although As, Cr and Pb showed high concentrations in the bulk chemistry analyses, they were only release in the sequential extraction after digestion of the residual phase (Step IV), and they do not represent great risk [3].

[1] Sahuquillo *et al.* (2003) *Trends in Analytical Chemistry* **22**, No 3, 329–337. [2] Pérez-López (2008) *Applied Geochemistry* **23** 3452–3463. [3] Morillo *et al.* (2008) *Environ Monit Assess* No **139**, 329–337.

## Pushing laser ablation ICP-MS to the limit: Speed, reproducibility and sensitivity

MARCEL GUILLONG\* AND LEONID DANYUSHEVSKY

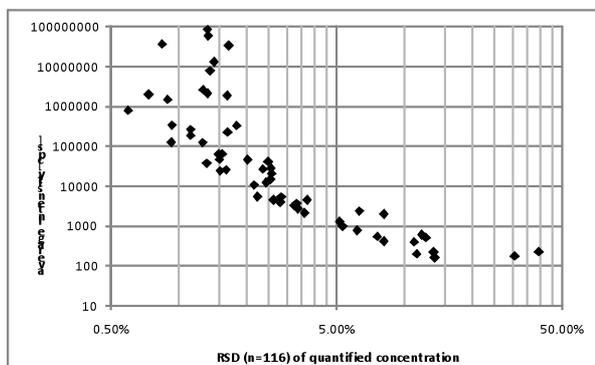
CODES, UTAS, Hobart TAS, 7001 Australia

(\*correspondence marcel.guillong@utas.edu.au)

Laser Ablation in combination with ICP-MS has become the leading method for trace element and isotope ratio analysis of solid samples. The ease of sample handling, high sample throughput, low limit of detection, high possible spatial resolution, and a wide range of elements that the technique can analyze, are the key figures of merit making this method versatile and popular.

This presentation shows recent results obtained using a commercially available laser ablation system (Resonetics M50) equipped with 193nm excimer laser and a constant volume equal geometry ablation cell [1]. Reproducibilities better 2% RSD for more the 100 individual spots covering the whole 25 cm<sup>2</sup> of the cell can be achieved (Fig. 1). With such an excellent stability across the cell of both the ablation and aerosol transport characteristics, it becomes possible to investigate in detail the effects of a number of important analytical parameters such as optimum laser energy density, elemental fractionation, and fine-scale sample heterogeneity.

The laser ablation system can produce laser beam sizes between 5 and 380 micrometer and is able to change aerosol density, sensitivity and LOD's within six orders of magnitude varying the repetition rates up to 100 Hz and energy densities up to 30 J/cm<sup>2</sup>. We will present the results of investigating the effect of plasma mass load using a quadrupole ICP-MS with an increased tolerance of changing matrices.



**Figure 1:** RSD of quantitative concentrations versus the average intensity of 116 spot analyses of NKT-1G.

[1] Muller W. *et al.* (2009) *JAAS* **24**, 209–214.