Assessing analytical methods for high precision Ni isotopic analysis in rhizosphere samples from Ni hyperaccumulating plants

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The identification of the change in the isotopic composition of Ni is a powerful tool with high potential to assess mechanisms and pathways of biogeochemical processes like the study of Ni isotope ratio variations between bedrock and chemical fractions in soils and in plants. Ni is a bio-essential trace element, which was observed to show mass dependent isotope fractionation in geochemical as well as biological processes. Soil solutions, iron oxides and clay minerals were reported to be more enriched in the heavier Ni isotopes compared to their respective parent bedrock. However, the range of Ni isotope fractionation in biological processes was observed to be significantly larger compared to abiotic processes. As such, studies of Ni isotope composition in geological and biological samples may be a valuable proxy helping to understand solubilization in the rhizosphere and interactions in the plant soil microbe system. However, routine measurements of Ni isotope ratios are currently hampered by complex sample preparation procedures such as laborious Ni – matrix separation and difficulty to obtain isotope ratio results with the required low measurement uncertainties using multi collector inductively coupled plasma mass spectrometry (MC-ICPMS). This contribution compiles the first results from the FWF funded project (P 34719) “Mobilisation of Nickel by hyperaccumulating plants” to investigate Ni solubilisation processes in the rhizosphere of Ni hyperaccumulating plants. Refined analytical protocols for sample preparation, Ni – matrix separation and Ni isotope ratio measurements with the use of a novel MC-ICP-(CRC)-MS are reported.