# Highly siderophile elements and $^{187}Os/^{188}Os$ in individual sulfides by isotope dilution

A. BRAGAGNI[1]*, R. O. C. FONSECA[1], D. VAN ACKEN[1], I. M. SPEELMANNS[12], A. HEUSER[1] AND A. LUGUET[1]

[1]Steinmann-Institute, Universität Bonn, 53115 Bonn, Germany (*correspondence: bragagni@uni-bonn.de)

[2]Institute of Geochemistry and Petrology, ETH , 8092 Zürich, Switerland

Base metal sulfides (BMS) are of interest in ore exploration but also for understanding mantle dynamics. The highly siderophile elements (HSE) and the Re-Os decay system are key tools for investigating BMS: the Re-Os geochronology provides age information while the HSE signature can be used to discriminate their genesis (e.g. metasomatic vs. magmatic).

Two aspects are critical for trace element and isotopic analyses in individual BMS: (1) The small size of BMS in mantle and crustal rocks (typically <100 μm) and (2) the lack of suitable natural standard material. Thus, we synthesized a BMS with homogeneous major and trace element contents which was used to develop an isotope dilution procedure to determine HSE concentrations and $^{187}Os/^{188}Os$ in small BMS samples representative of natural mantle BMS ($\mu$g level).

The procedure implements the protocol described in Pearson et al. [1] and includes the mechanical isolation of single BMS (>30 $\mu$m) using a microdrill or a laser ablation apparatus. The separated grains are then dissolved in HBr together with a multi-HSE spike solution. Osmium is extracted by micro-distillation and measured by N-TIMS. The residue of the microdistillation is treated with $BaCl_2$ and $H_2O_2$ to remove $H_2SO_4$ and $Cr^{6+}$ before separating all other HSE by cation resin exchange chemistry. Ruthenium, Pd, Re, Ir and Pt concentrations are determined by SF-ICP-MS.

Our technique yields excellent reproducibility of the synthetized sulfide standard which was independently characterized by HP-Asher digestion (deviations <0.1% for $^{187}Os/^{188}Os$ and <10% for most of the HSE concentrations).

Compared to *in situ* analyses by LA-ICP-MS, our procedure has the advantage of chemical separation of analytes, thus it prevents $^{187}Re$ isobaric interference on $^{187}Os$ and minimizes any matrix effects during mass spectrometry measurements. This technique ensures the determination of HSE concentrations and $^{187}Os/^{188}Os$ of the whole BMS, avoiding any sampling bias related to the complex mineralogical assemblage typically observed in BMS.

[1] Pearson *et al*. (1998) *EPSL* **160**, 311-326.