Investigation of the $^{87}Rb^{+}$-$^{87}Sr^{+}$ Separation in fs-LA-ETV-ICPMS by Online Electrothermal Vaporization

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Using laser ablation inductively coupled plasma mass spectrometry (LA-ICPMS), in particular with multi- collector MS, Sr isotope ratios in solids can be determined online with high spatial resolution. However, in contrast to solution-based sample introduction, isobars cannot be separated from the laser-generated aerosol before the ICP. Therefore, the interference of ^{87}Rb on ^{87}Sr, can only be accounted for by mathematical correction and for samples with Rb/Sr concentration ratios typically << 0.15 [1]. When the laser-generated aerosol is heated in an electrothermal vaporizer (ETV), changes in its chemical composition can be achieved. As soon as a suffiecently high temperature is reached, volatile elements can be removed selectively by vaporization and subsequent condensation. [2] In earlier work [3], a partial suppression of the Rb-signal was achieved, while the Sr-signals did not undergo suppression. The selective elimination of Rb led to a 45-fold (Rb/Sr = 0.5) improvement in $^{87}Sr/^{86}Sr$ accuracy. It was shown previously that a more efficient elemental separation can be achieved in an ETV if a fs-laser is used instead of a ns-laser. Therefore, this work has investigated the improvements when using a fs-laser (Excite Pharos, 206 nm) connected to a GF-ETV-4000 (Spectral Systems) and an Element XR sector field ICPMS (Thermo Scientific). It could be shown that the magnitude of Rb-suppression was about one order of magnitude stronger than the one achieved in previous work, while the Sr-sensitivity was retained. The influence of the sampling parameters (carrier gas flow, mass load of the furnace) for an optimal Rb-Sr separation were evaluated using NIST SRM 610 and, subsequently, Sr-isotope measurements were performed for vartious sample types with varying Rb/Sr concentration ratios using the optmized settings.

[1] Jackson, Hart (2006) *Earth and Plan. Sci. Lett.*, 245, 260 – 277.
[2] Vaculovic, Guillong, Binkert, Kanicky, Günther (2008), *Can. J. Anal. Sci. Spectrom.*, 353 – 361.
[3] Brogioli (2012), *ETH Diss. Nr. 20795*.