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Effects of oxide interferences on in-situ Rb-Sr dating by LA-MC-ICP-MS/MS

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The ^{87}Rb-^{87}Sr system is a versatile chronological tool and geochemical tracer. Unlike conventional Rb-Sr measurements by thermal ionization mass spectrometry, *in-situ* laser ablation (LA) mass spectrometry offers a high sample throughput and minimizes sample destruction. This method, however, is compromised by the presence of multiple isobaric interferences in the Sr mass range. This problem can be overcome using multi-collector inductively-coupled-plasma mass spectrometers (MC-ICP-MS) with a pre-cell mass filter and a collision/reaction cell (CRC), which allows simultaneous measurements of on-mass and mass-shifted Rb and Sr isotopes using SF_6 reaction gas [1-4]. Here, we present the first results of Rb-Sr measurements using the Thermo Scientific™ Neoma™ MS/MS MC-ICP-MS installed at the Max Planck Institute for Solar System Research with the overarching goal of dating extraterrestrial materials. During the initial laser ablation measurements of reference materials and (extra-)terrestrial samples, we found systematic offsets in the $^{87}Sr/^{86}Sr$ and $^{87}Rb/^{86}Sr$ ratios of reference materials (NIST610, USGS BCR2-G, MPI-DING T1-G), when these are calibrated against each other via standard-sample bracketing. We attribute these offsets on $^{87}Sr/^{86}Sr$-ratios – and partly on $^{87}Rb/^{86}Sr$-ratios – to the formation of $^{89}Y^{16}O^+$, $^{90}Zr^{16}O^+$, and $^{91}Zr^{16}O^+$ in the CRC, which interfere with $^{86}SrF^+$, $^{87}SrF^+$, and $^{88}SrF^+$, respectively. Measurements of standard solutions having varying Rb, Sr, Zr, and Y concentrations show similar systematic offsets in measured $^{87}Sr/^{86}Sr$ and also in their $^{87}Rb/^{86}Sr$ ratios, depending on their Zr/Sr and Y/Sr ratios. This confirms the assumption that YO^+ and ZrO^+ interferences affect the measured $^{87}Sr/^{86}Sr$ and $^{87}Rb/^{86}Sr$ ratios in La-MC-ICP-MS/MS measurements, which thus far has only been reported sparsely [1]. These interferences can form in the CRC if Y and Zr are present in the sample solution or ablated material, and if O_2/H_2O is entering the CRC either from impurities in the reaction gas or from molecules that formed in the plasma. Our results reinforce the importance of suitable calibration standards for *in-situ* Rb-Sr measurements with sample-matching Zr/Sr and Y/Sr ratios. [1] Bevan et al. (2021), *JAAS* 36, 917-931; [2] Craig et al. (2021), *Anal. Chem.* 93, 30, 10519-10527; [3] Dauphas et al. (2022), *JAAS* 37, 2420-2441; [4] Telouk et al. (2024), *JAAS* 39, 879-887.