

Calcium and potassium isotopes analyses using the Neoma MC-ICP-MS with and without the MS/MS option: benefits and limitations

EMMANUELLE ALBALAT^{1,2}, PHILIPPE TELOUK³ AND VINCENT BALTER⁴

¹ENS de Lyon

²CNRS

³ENS-Lyon CNRS UMR 5276

⁴Ecole Normale Supérieure de Lyon

Presenting Author: emmanuelle.albalat@ens-lyon.fr

Precise isotopic ratios of potassium using MC-ICP-MS requires addressing the major isobaric interferences related to Ar plasma, ^{38}ArH on ^{39}K and ^{40}ArH on ^{41}K . Reduction of these argide interferences can be achieved using cold plasma and/or wet plasma with extra-high mass resolution [1, 2]. High precision analyses of calcium isotopic ratios can be obtained using MC-ICP-MS focusing on the measurement of ^{42}Ca , ^{43}Ca and ^{44}Ca only, ^{40}Ca being not measurable due to the overwhelming presence of plasma ^{40}Ar . Samples must be analyzed in the medium or high-resolution mode to resolve argide isobaric interferences such as $^{40}\text{ArH}_2$ on ^{42}Ca . For both elements, measurements therefore require high analyte concentrations ($\sim 1 \mu\text{g/ml}$) limiting the interest for depleted or small size samples. The recent new generation of MC-ICP-MS equipped with collision cell capability allows high-precision measurements of calcium (even ^{40}Ca) and potassium isotopic ratios at lower analyte concentration ($\sim 100 \text{ ng/ml}$) using the ThermoFisher Scientific Proteus [3, 4] or the Nu Instrument Sapphire [5-9].

In this work, we will present results of calcium and potassium isotopic ratios using the new Neoma MC-ICP-MS (ThermoFisher Scientific) instrument with different configurations. The collision cell MS/MS capabilities of the Neoma will be compared to conventional MC-ICP-MS analysis without using the MS/MS option. The sensitivity, the influence of acid molarity concentration, the matrix effect and concentration mismatch between sample and standard will be evaluated. Precision and accuracy of calcium and potassium isotopic ratios will be assessed according to the operating conditions. In comparison with literature studies obtained from others collision-cell MC-ICP-MS, the performances, the benefits and the limitations of different configurations will be discussed.

[1] Gu et al. (2021), *JAAS*, 36, 2545-2552. [2] Hobin et al. (2021), *Anal. Chem*, 93, 8881-8888. [3] Lewis et al. (2022), *Chem. Geol.*, 614, 121185. [4] Mahan et al. (2022), *Metallomics*, 14, 12, mfac090. [5] Moynier et al. (2021), *Chem. Geol.*, 571, 120144. [6] Zheng et al. (2022), *JAAS*, 37, 1273-1287. [7] Li et al. (2023), *JAAS*, Advance article. [8] Gao et al. (2022), *JAAS*, 37, 2111-2121. [9] Dai et al. (2022), *Chem. Geol.*, 590, 120688.