

Strontium isotopes measurement of certified reference materials, igneous and biological apatite samples using the MC-ICP-MS Neoma in MS/MS mode and laser ablation (LA-MC-ICP-MS/MS)

PHILIPPE TELOUK¹, DANAE GUISERIX², GRANT CRAIG³, JEREMY MARTIN⁴ AND VINCENT BALTER⁵

¹ENS-Lyon CNRS UMR 5276

²ENS-Lyon

³Thermo Fisher Scientific

⁴Univ Lyon, ENSL, Univ Lyon 1, CNRS, LGL-TPE

⁵ENS de Lyon, Univ Lyon 1, CNRS UMR 5276, LGL&TPE

Presenting Author: telouk@ens-lyon.fr

Measuring precise radiogenic strontium isotopic ratios ($^{87}\text{Sr}/^{86}\text{Sr}$) with laser ablation and MC-ICP-MS (LA-MC-ICP-MS) has a wide range of applications, from igneous and metamorphic petrology to paleoanthropology or forensics. Since the very beginning of the use of laser ablation, the presence of ^{87}Rb is very challenging for the accurate determination of the $^{87}\text{Sr}/^{86}\text{Sr}$ ratio due to the isobaric interference. The 87 m/z is also interfered by a $^{40}\text{Ca}\text{-}^{31}\text{P}\text{-}^{16}\text{O}$ polyatomic interference which must be taken into account when studying Ca-phosphate minerals (igneous and biological apatites). The LA-MC-ICP-MS technique therefore requires relative low ^{85}Rb and $^{40}\text{Ca}\text{-}^{31}\text{P}\text{-}^{16}\text{O}$ levels compared to total Sr, which is problematic for samples with depleted Sr levels (e.g. human tooth enamel). To overcome this problem, a MS/MS technique should be efficient, and this was proved with triple quadrupole ICP-MS by mass shifting Sr isotopes using O_2 or SF_6 in the collision cell. Unfortunately, the determination of Sr isotopic ratio is often not precise enough for many purposes. The Neoma MS/MS is, with the MC-ICP-MS Proteus, the only MC-ICP-MS instrument able to use MS/MS technique to resolve isobaric interferences by mass shifting Sr isotopes using a collision cell.

In this presentation, we will show $^{87}\text{Sr}/^{86}\text{Sr}$ results obtained on sintered certified reference materials (calcite and apatites), the NIST-610 and 612 glasses, a suite of igneous and sintered biological apatites and fossil tooth samples, using a Neptune + and a Neoma MC-ICP-MS with and without the MS/MS option. Of interest for practical purposes, the use of a plug-in developed with the ESI New Wave Research LA allows the Qtegra software to easily run Sr isotopic ratios in batch analyses with a sample list. The extended dynamic range of the amplifiers permits to measure signals up to 100V which tolerates the measurement of the $^{87}\text{Sr}/^{86}\text{Sr}$ ratio of Sr-enriched materials. Also, the use of the MS/MS option allows to completely remove previously identified interferences. The performances (transmission, accuracy and reproducibility) of the different configurations are then discussed.