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Beyond ultra-sensitive trace elemental analysis: a new era for isotope composition using tandem ICP-MS

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MC-ICP-MS have proved to be, in three decades, reliable and efficient instruments for high-precision measurement of isotope compositions. First adopted for the determination of radiogenic isotope compositions of e.g., Nd, Pb or Hf, the use of MC-ICP-MS then extended to the measurement of stable isotope compositions of e.g., Cu, Ca or Ag, which has opened applications in medicine, biology, or archaeology. The isotope composition of some elements such as K or Se are nevertheless still difficult to be analysed.

During the last decade, a new type of tandem quadrupole ICP-MS with the MS/MS technology entered the market, which finally enabled the measurement of accurate concentration of reluctant elements such as Si, P or Ca in complex matrices. Transferring the MS/MS technology to a MC-ICP-MS has been difficult. The first instrument was the ThermoFisher Proteus (in 2015 equipped with a quadrupole and a collision/reaction cell. The results were encouraging with some clear limitations. A second system was developed by Nu-Instruments (in 2019) with the Sapphire just holding a collision/reaction cell. Finally, one year ago, a new MC-ICP-MS/MS was introduced by ThermoFisher named Neoma, equipped with a pre-cell mass filtering (double Wien filter) and a collision/reaction cell permitting real MS/MS analyses.

A survey of the capabilities of the double Wien filter will be presented as well as different innovative applications using the Neoma MS/MS installed at Lyon during 2022. These include laser ablation mapping of Sr radiogenic isotope compositions thanks the fast acquisition electronics installed on the instrument; removing $^{40}Ar^{23}Na$ isobaric interference on ^{63}Cu up to a Cu/Na ratio of 10; and easily measuring Se stable isotope compositions without any ^{40}Ar interference.