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Accurate and precise isotope ratio measurements by MC-ICP-MS for the production of isotopic certified reference materials at NRC

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Accurate and precise isotope ratio measurement is playing an increasingly important role in modern sciences. Significant and often unique applications include terrestrial and extra-terrestrial investigations involving geochronology, archaeology, provenance studies (chemical “finger-printing”), life/medical sciences, forensic sciences, environmental and atmospheric sciences as well as traditional analytical chemistry and physics [1-2]. Multi-collector inductively coupled plasma mass spectrometry (MC-ICPMS) is the one of two most powerful instrumentations for such measurements, providing the instrumental isotopic fractionation/mass bias is properly corrected, which is not trivial. In addition to commonly believed mass-dependent fractionation (MDF), mass-independent fractionation (MIF) has been reported in MC-ICPMS itself for many elements [2], which has a huge impact on the choice of mass bias correction models.

SI traceable isotopic Certified Reference Materials (CRMs) are essential for the validation of isotopic analysis methods or for the mass bias correction. In the last decade, many international Metrology Institutes including NRC have made significant efforts in the development and the certification of isotopic certified reference materials in order to fulfill the needs. In this lecture, the latest developments related to isotopic fractionation/mass bias and its correction models, and methods used for accurate and precise isotope ratio measurements by MC-ICPMS for the production of isotopic certified reference materials at NRC will be discussed in details.

1. Yang, L. Accurate and precise determination of isotopic ratios by mc-icp-ms: A review. Mass Spectrom. Rev. 2009, 28 (6), 990.
2. Yang, L.; Tong, S.; Zhou, L.; Hu, Z.; Mester, Z.; Meija, J. A critical review on isotopic fractionation correction methods for accurate isotope amount ratio measurements by MC-ICP-MS. Journal of Analytical Atomic Spectrometry 2018, 33 (11), 1849.