

Towards an improved IMS 1280 model: The IMS 1280-HR

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SIMS technique provides direct *in situ* measurement of elemental and isotopic composition in selected μm -size areas of the sample. The CAMECA IMS 1280 is a ultra high sensitivity ion microprobe that delivers unequalled analytical performance for a wide range of SIMS applications: isotope ratio measurements [1], geochronology applications (U-Pb dating in Zircon) [2], trace element analyses [3].

In order to optimize the performance at high mass resolution conditions, both in monocollection and multicollection modes, a new model of the CAMECA IMS 1280 is introduced: the IMS 1280-HR.

Main targeted applications are the K/Ca and Rb/Sr dating, in monocollection mode at Mass Resolving Power (MRP) > 20, 000, as well as Mg and metal isotope analysis in multicollection mode at MRP > 5, 000.

The IMS 1280-HR combines the well-proven features of the standard IMS 1280 with new developments oriented towards high mass resolution capabilities:

- 1) redesign of the coupling section for minimizing second-order aberrations, which are known to limit the MRP capabilities
- 2) low noise electronics, new Hall probe and associated pre-amplifiers for an improved magnetic field stability
- 3) modification of the magnet pole piece in order to minimize the off-axis aberrations and improve the peak shape in multicollection mode
- 4) magnet flight tube with new baking system for a better abundance sensitivity.

Data obtained on the IMS 1280 will be presented. Transmission tests performed for the ⁴⁰K in Adularia sample show that a transmission of 75 c/s/ppm/nA can be achieved at MRP (10%) > 32, 000 in monocollection mode. In multicollection mode, a reproducibility of < 0.3 permil (1 σ) could be obtained for the $\delta^{25}\text{Mg}$ and $\delta^{26}\text{Mg}$ ratios measured at MRP (10%) > 6, 800 in Olivine San Carlos.

[1] F.Z. Page *et al.* (2007), *Ame. Min.* **92**, 1772. [2] G. Srinivasan *et al.* (2007), *Science* **317**, 345. [3] T. M. Harrison *et al.* (2007), *EPSL* **261**, 9

Chemical variations in multicoloured “Paraíba”-type tourmalines from Brazil and Mozambique: Implications for authentication and provenance determination

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Chemical profile analyses by LA-ICP-MS and EMPA analysis revealed characteristic chemical differences between different colour zones in copper-bearing tourmalines from Mozambique and Brazil. From the core to the rim of the tourmaline crystals chemical variations were found for the elements Be, F, Mg, Ti, Fe, Cu, Zn, Mn, Sb, Nb, Ta, U, Th, Pb and REE. [1]

Cu-isotope ratios have been measured in tourmalines using femtosecond LA-MC-ICP-MS as an additional critical test for provenance and authentication. The samples from Paraíba that were analyzed for copper-isotopes showed very similar $\delta^{65}\text{Cu}/^{63}\text{Cu}$ ratios, positively biased to NIST610. The additional potential of this method [2] for future identification of treatments of tourmaline is discussed.

It was possible to create a flow chart for different methods useful for origin determination of copper-bearing tourmaline. The EMPA and LA-ICP-MS generated database allows using commonly applied gem-testing methods (ED-XRF- and LIBS-analysis) to measure critical Cu/Ga-ratios, Be- and Mg-concentrations for origin determination of copper-bearing tourmalines.

[1] Peretti *et al.* (2009) *Contrib. to Gemology* **9**, 1-77. [2] Fontaine *et al.* (2010) *Winter Conference on Plasma Spectrochemistry* 2010.