High precision Pb isotope analyses by LA-MC-ICP-MS: A novel approach using a USGS synthetic glass spiked with NIST SRM 981(BPbISO-1)

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Accuracy and precision for laser ablation multi-collector inductively coupled plasma mass spectrometry (LA-MC-ICP-MS) determinations of Pb isotopic composition is limited due to the lack of a solid isotopic standard for in-situ mass bias fractionation correction. Numerous mass bias fractionation correction methods are used for Pb isotope analyses by MC-ICP-MS including simultaneous aspiration of NIST SRM 997 Tl into a gas mixing chamber combined with ablated sample material. The measured fractionation factor (f) for Tl is then applied to Pb. However, previous studies for solution MC-ICP-MS have suggested f for Tl is not equal to f for Pb for the range of Pb isotope pairs, and the use of Tl for correction requires additional external normalization to incorporate the variations, as well as behavioral differences during vaporization, atomization, and ionization. Simultaneous aspiration of SRM 997 Tl during laser ablation analyses possibly introduces differences in mass bias fractionation between the two systems. Our study reports on a new isotope reference material developed at the USGS (BPbISO-1) made by spiking a synthetic glass with NIST SRM 981 Pb isotope standard and using it for mass bias fractionation correction during in-situ Pb isotope ratio measurements, eliminating the need for Tl addition.

	$^{208}Pb/^{204}Pb$	$^{207}Pb/^{204}Pb$	$^{206}Pb/^{204}Pb$
BPbISO-1 method	**36.967 ± 5**	**15.507 ± 3**	**17.040 ± 2**
Preferred values[1]	**36.964 ± 22**	**15.504 ± 9**	**17.045 ± 8**

Table 1: Comparison of preliminary NIST SRM 610 Pb isotope ratio results using BPbISO-1 to previously published values.

[1] Jochum, K.P. and Stoll, B. (2008), *Mineralogical Association of Canada*, **147-168.**