Interlaboratory calibration of mass spectrometric methods used for Pb-Pb dating of meteorites under the auspices of the EarlyTime initiative

CONNELLY, J. N[1] AND CONDON, D. J[2]

[1]Centre for Star and Planet Formation, University of Copenhagen, 1350 Copenhagen, Denmark
[2]NERC Isotope Geosciences Laboratory, British Geological Survey, Keyworth, NG12 5GG, UK

The U-Pb and derivitive Pb-Pb method of dating ancient meteorites and their components now has the capability to return ages with precision of ±200,000 years for favourable samples. The accuracy of derived ages depends critically on a number of issues related to mass spectrometry, including but not limited to correct estimates of instrumental isotopic mass fractionation, the applied mass fractionation law, recognition of interfering species across the Pb spectrum and blank correction associated with the isotopic analyses. Furthermore, a range of mass spectrometer types (including both TIMS – thermal ionization mass spectrometer and MC-ICP-MS – multi-collector inductively coupled plasma mass spectrometer) are currently used to generate Pb-Pb ages. Despite the potential for interlaboratory biases, no standard solutions or samples that span the appropriate Pb isotopic compositional space have been available for the quantification of interlaboratory agreement.

To address this issue, a series of solutions have been prepared for distribution that define a linear array in $^{204}Pb/^{206}Pb$ vs $^{207}Pb/^{206}Pb$ space that corresponds to an age approximating that of the solar system. Two end-member solutions were first created from purified Pb isotopes, one corresponding to an early solar system initial Pb composition and the other equivalent to a highly-radiogenic mixture with a pseudo-model age approximating the age of the solar system. The radiogenic solution also contains normal uranium such that the U/Pb is broadly concordant with the Pb-Pb date. Three intermediate solutions were mixed from these end-member solutions with approximate mixtures containing 45%, 80% and 95% of the highly-radiogenic end-member. Aliquots of these three mixtures along with the pure-radiogenic end-member solution are being distributed to any laboratory wishing to participate in an interlaboratory calibration test of Pb isotopic analyses. The results from each laboratory will be collated and presented blindly in an effort to check for interlaboratory consistency and to work as a community to remedy any descrepencies that become apparent in this experiment.