1.3.P03

Hf-isotope measurements at ppt concentration levels with multi ion counting ICP-MS

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Over the past few years, the use of the Hf iso-tope system as geochemical tool has rapidly increased, as chemical purification of Hf from the matrix and Hf isotope measurements with MC-ICPMS have become simple and routine [1,2]. In parallel, the geochronological interest in the Lu-Hf system has also increased, particularly using garnet for dating metamorphic events [3]. In metamorphic or mantle rocks, minerals are often not equilibrated on a large scale and mineral separates can not be used for geochronology. Single grains (e.g. single garnets) however, have usually only sub-ng amounts of Hf, which cannot be measured with conventional techniques, using Faraday detectors.

We are presenting a technique of measuring the Hf isotope composition with multiple ion counting detectors integrated into the Finnigan NEPTUNE MC ICP-MS. Up to eight miniaturized ion counters identical in size and interchangeable with standard Faraday cups can be integrated everywhere into the variable multicollector array. With multiple ion counters isotope ratios can be measured with a precision of < 1‰, [4] if the cross calibration of the ion counters is tracked during the course of the analysis. We are using a configuration of four ion counters set up to measure ^{173}Yb, ^{175}Lu, ^{176}Hf and ^{177}Hf. For Hf in run yield calibration and mass bias correction is done, using the known ^{178}Hf/^{177}Hf ratio, which is measured on the same counters as the ^{176}Hf/^{177}Hf in a dynamic mode. Since, e.g. old garnets of > 1Ga have an increase in ^{176}Hf in the %-range, the precision of the method is sufficient to get age information from such garnets.

References

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1.3.P04

CONCH: A Visualbasic program for interactive processing of ion-microprobe geochronology data

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A Visualbasic program has been developed that enables flexible interactive processing of ion-microprobe data acquired for quantitative trace-element and U-Th-Pb geochronology applications. Default but editable mineral run-tables enable software identification of the secondary-ion species analyzed and for characterization of the standard mineral used. Counts obtained for each species may be displayed in plots against analysis time and edited interactively. Count outliers may also be automatically identified, via a set of editable count-rejection criteria, and displayed for assessment. Background-corrected count rates, ratios and uncertainties are written to a spreadsheet and may be saved as a text-delimited file. Standard analyses are distinguished from Unknowns by matching of the analysis label with a string specified in the Set-up dialog, and processed separately. Specialized routines process U-Th-Pb isotopic data obtained for zircon, titanite, perovskite, monazite, xenotime and baddeleyite and Th-U disequilibrium analysis types. Correction to measured Pb-isotopic, Pb/U and Pb/Th ratios for the presence of common Pb may be made using the measured ^{204}Pb counts, or the ^{206}Pb, ^{207}Pb or ^{208}Pb counts following subtraction from these of the radiogenic component. Common-Pb corrections may be made automatically, using a (User-specified) common-Pb isotopic composition appropriate for that on the sample surface, or for that incorporated within the mineral at the time of its crystallization, depending on whether the ^{204}Pb count rate determined for the Unknown is substantially higher than the average ^{204}Pb count rate for all session standards. Pb/U inter-element fractionation corrections are determined using an interactive $\log_e$–$\log_e$ plot of common-Pb corrected ^{206}Pb/^{238}U ratios against any nominated fractionation-sensitive species pair (commonly $^{238}U^{16}O^+/^{238}U^+$) for the session standards. Also displayed with this plot are calculated Pb/U and Pb/Th calibration line regression slopes, *y*-intercepts, calibration uncertainties, standard ^{204}Pb- and ^{208}Pb-corrected ^{207}Pb/^{206}Pb dates and other parameters useful for assessment of the calibration-line data. Calibrated data for Unknowns may be automatically grouped according to calculated date and displayed in colour on interactive Wetherill Concordia, Tera-Wasserburg Concordia, Linearized Gaussian ("Probability Paper") and Gaussian-summation probability density diagrams.