

ARIZONA LASERCHRON CENTER
Sphene Data Reduction Instructions
(26 July, 2005)

Extraction of data from Isoprobe analysis files

1. Load SPHENEagecalc in Excel. Size to leave a gap on right side of screen and rename SAMPLEagecalc.xls.
2. In Windows, click Start -> Search -> All Files and Folders -> *.xls in "All or part of file name" -> select CD drive under Look in -> Press Search -> Press View & select "Details" -> Click Name bar to arrange by sample name. Shrink search window so that it fits to right of Excel file.
3. Select cell A3 in Excel agecalc file.
4. In the Search window, click on samplename.xls file for first analysis, which opens it in the agecalc workbook.
5. Press Ctrl-Z to run macro that extracts data from the Isoprobe file and pastes values into the active row. Values are averages and standard deviations (1-sigma) for 12 integrations (first 4 skipped due to instability as signal ramps up, and highest two and lowest two excluded to remove extreme values).
6. Macro will automatically increment down to next row in column A.
7. Go to Search window and repeat process with next analysis.
8. Save file every few minutes!
9. If you make a mistake, use copy/paste – do not insert or delete rows, or make any changes to the right of column R.

If you want to see charts for each analysis, pull up the file as above, and then press Ctrl-C to run the macro that extracts the intensities and ratios. Red lines on charts are average and std deviation of "best" 12 analyses, blue lines are "best" 5 analyses. Click Yes to insert 12-second-data and No to insert 5-second-data. The 5-second-data are for cases where age changes dramatically during run.

If an analysis is complex, with jumps or significant shifts in 206/238 or 206/207, either discard it or enter it into the spreadsheet but add "complex" to the sample name (in column A). There may also be occasions where you can pick a better ratio or uncertainty by eye, but this should be done with caution.

Data Reduction

1. Re-name files in column A as follows: primary standard = std, secondary standard = std2, bad analyses = xx. These will eventually show up in shades of red, green, and blue.
2. To determine correct U and Th concentrations, need to input data from appropriate glass analyses. Input measured glass intensities (in mv) into appropriate rows of column W for 238 and column X for 232. Copy/paste down for all appropriate analyses.
3. Go to column AD and press button for FRACTIONATION CALIBRATION. This:
 - calculates the fractionation correction (and uncertainty) for 206/238, 206/207, and 208/232
 - orders the analyses by serial number (column B)
 - corrects 207 for analyses with intensities < 3 mv
 - sets minimum uncertainty of measured 206/238 and 206/207 to 1.0%
4. Check that the calibrations look OK on the 206/238, 206/207, and 208/232 charts. You may want to go back and re-open files/charts for outliers to either find better values or discard bad analyses. If you do more than 150 analyses, you need to adjust Source Data/Series values to show all standard

analyses on the charts. Blue diamonds show measured/known value for the standard analyses. Thick red line shows the “best fit” through the standards (determined by average of the closest ~four standard analyses, with rejection of the max and min values). Thin red lines show standard error of averaged standards, and black bars show a 2% error on the best-fit value. The average 206/238 and 206/207 ages for the standards are shown in Z1 & AA1 – these should be approximately 1050 Ma.

5. Note that there is no flag for low 206/204 or high 204 counts (as there is in the ZIRCONagecalc routine).
6. Select columns BO-BS to make a concordia plot of the standards (Ctrl-I, select U-Pb concordia, 1-sigma, percent, Auto-scale, Calculate, and ConcAge ->OK, ±2Sigma->OK, ±2Sigma and w/o decay-const errs->OK). Analyses should be centered on concordia and Concordia Age should be near 564 Ma.
7. Select columns BD-BH to make a concordia diagram of the unknowns (excluding standards and bad analyses).

Data Analysis

1. The data in columns AI-AW will be reported in the final data table, which must be a separate file. In the final table, you will need to remove the standard analyses
2. Note that uncertainties shown are only for measurement (random) errors [= only uncertainties from measurement of 206/238, 206/207, and 206/204].
3. To calculate an age from a weighted mean, select the set of best ages from columns BM-BN (or specifically BI-BJ or BK-BL if you want only 206/238 or 206/207 ages). Press Ctrl-I to start Isoplot, then select Weighted Average, 1-sigma, absolute, Calculate, and perhaps Reject OK?. The calculated Mean is for the weighted mean, with uncertainty at the 2-sigma level. These errors are only for the measurement error.
4. To factor in systematic errors (from calibration correction, composition of common Pb, decay constants, and uncertainty of standard age), you need to incorporate the value shown in cell AZ1 (for 206/238 ages) or BA1 (for 206/207 ages), which are the averages of all systematic errors for the sample (at 2-sigma). This systematic error is largely independent from the random error, so the two should be added quadratically [= $\text{SQRT}(\text{SE}*\text{SE}+\text{RE}*\text{RE})$] (do this with values in %, not Ma!). This final uncertainty, recalculated to Ma, is what you report for the age, at 2-sigma.