

Figure S1. Electron backscattered images of experimental products used in this study.

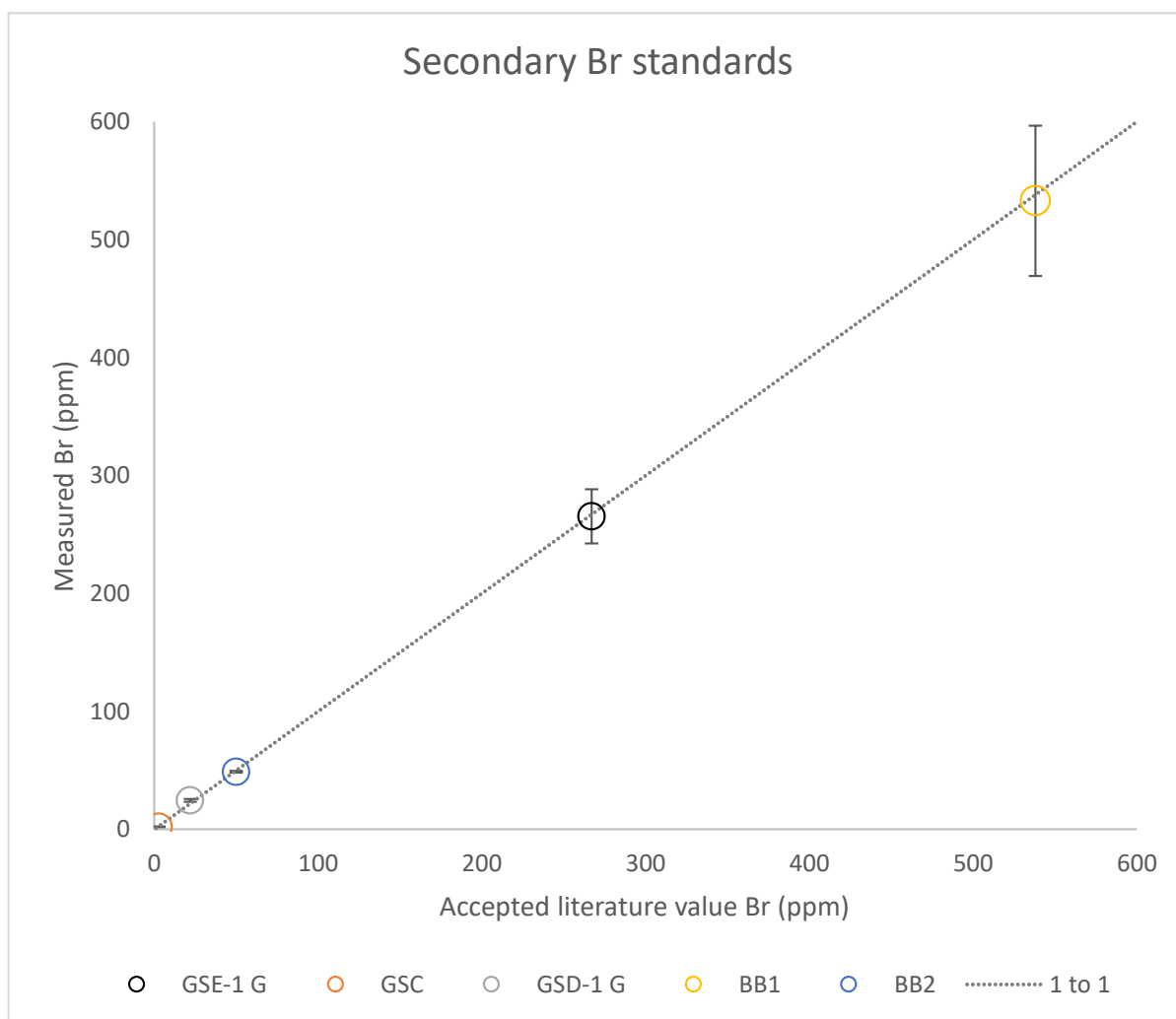


Figure S2. Secondary standards for Br compared to accepted literature values from Marks et al., 2017, Kendrick, 2012 with errors as 1 S.D.

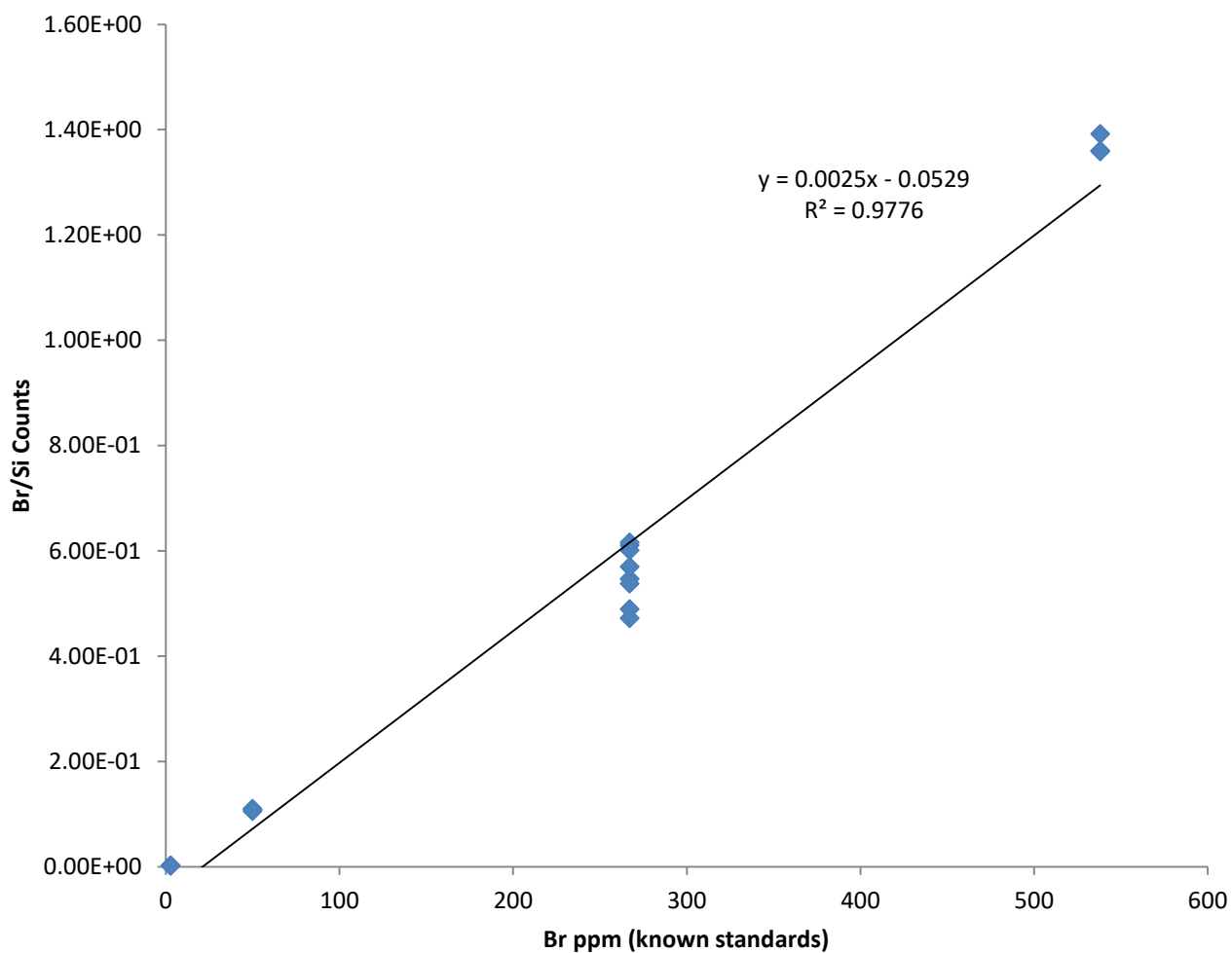


Figure S3. Bromine SIMS primary calibration for standards of BB1, BB2 and GSE-1G and GSC.

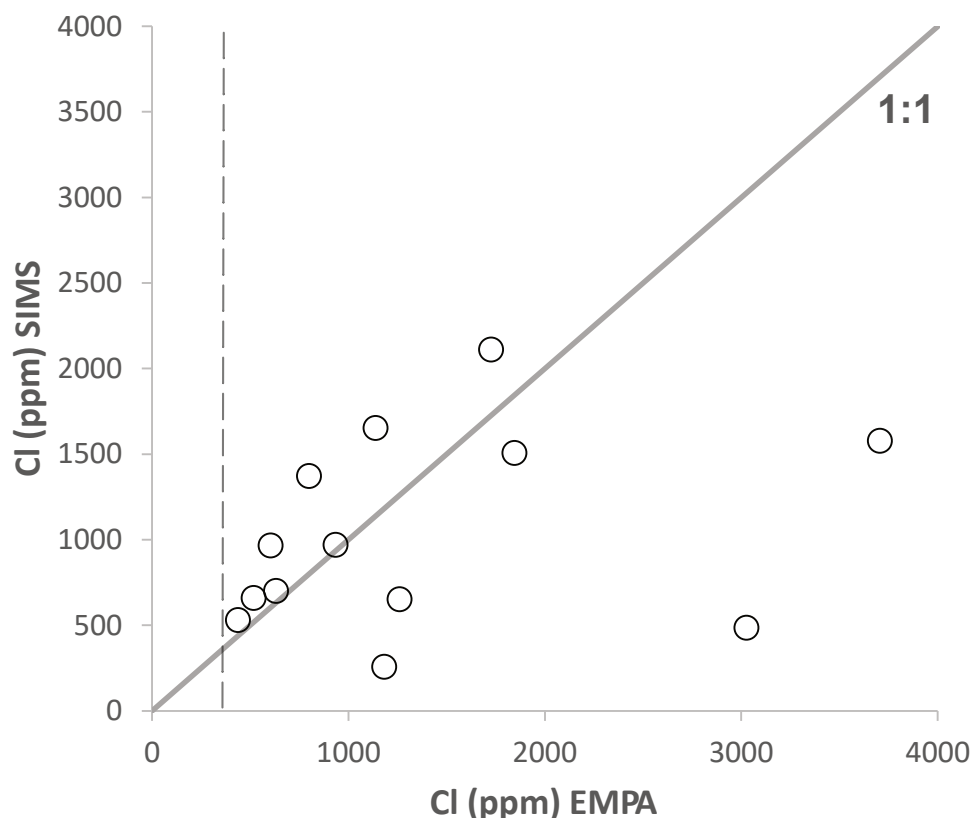


Figure S4. Comparison between SIMS and EMPA measurements for Cl. F and Br had too low detection limits to be measured on the EMPA. A 1:1 line is plotted for comparison. Limit of detection for Cl SIMS was 0.6 ppm compared to ~320 ppm measured for EMPA (dotted line). There is a fairly good relationship for Cl, though it was less reliable at lower concentrations, which was closer to the detection limits for Cl. Three data points have been removed as they were below the limit of detection for EMPA. Separating the analysis routine for Cl and other major elements has been shown to optimise halogen measurements with EMPA, a methodology recently optimised (Flemetakis et al., 2020, Microscopy and Microanalysis) and so was not attempted in this study, but this may be the cause for the higher detection limit and outliers.

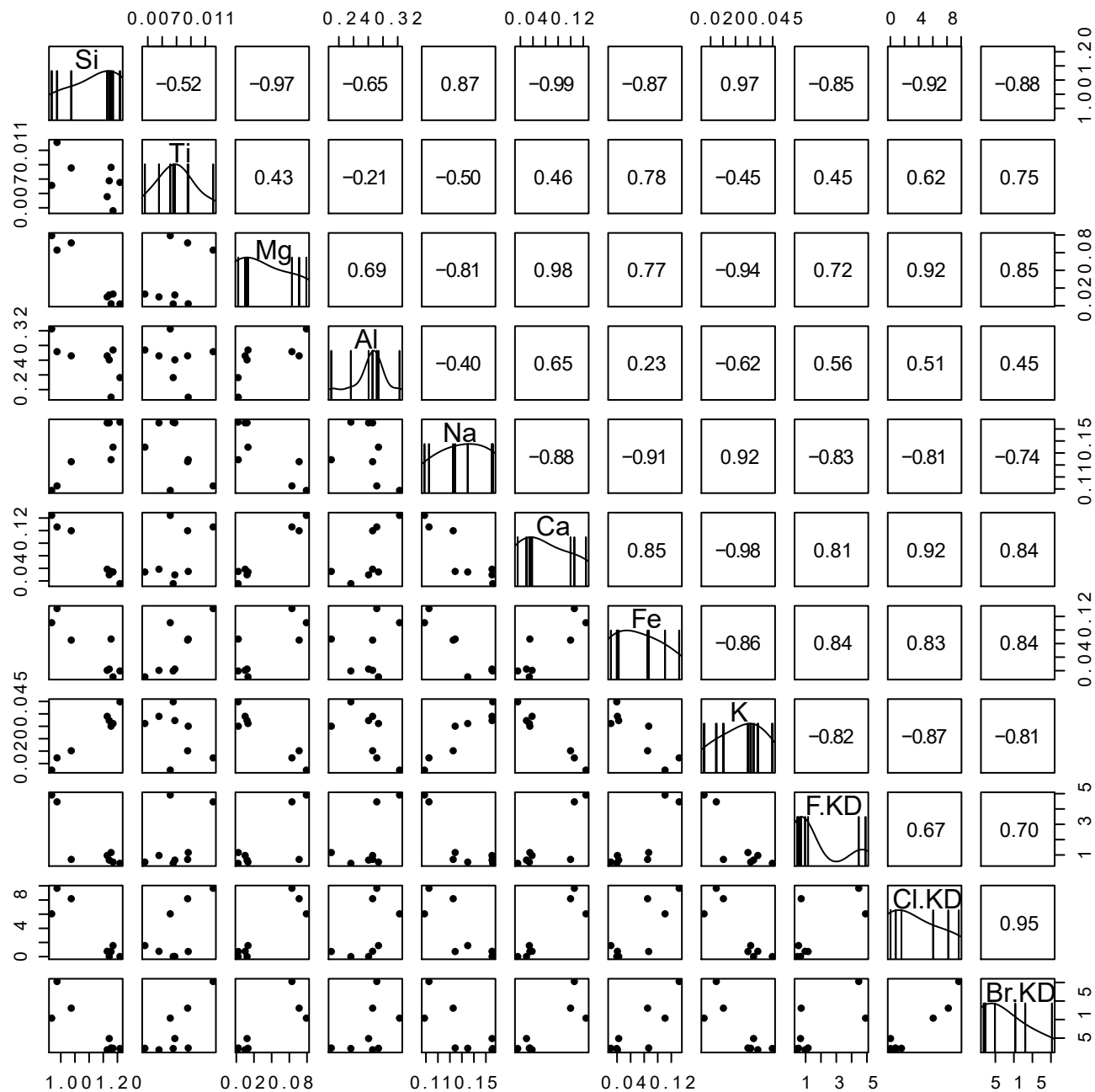


Figure S5. Scatter plot of Kelud experiments of matrices of different elements and the Cl, F and Br partitioning values, with bivariate scatter plots below the diagonal, histograms on the diagonal, and the Pearson correlation above the diagonal. In the scatter plots X axes represent the range of values of the element in the same row, while the Y axes represent the element in the vertical column.

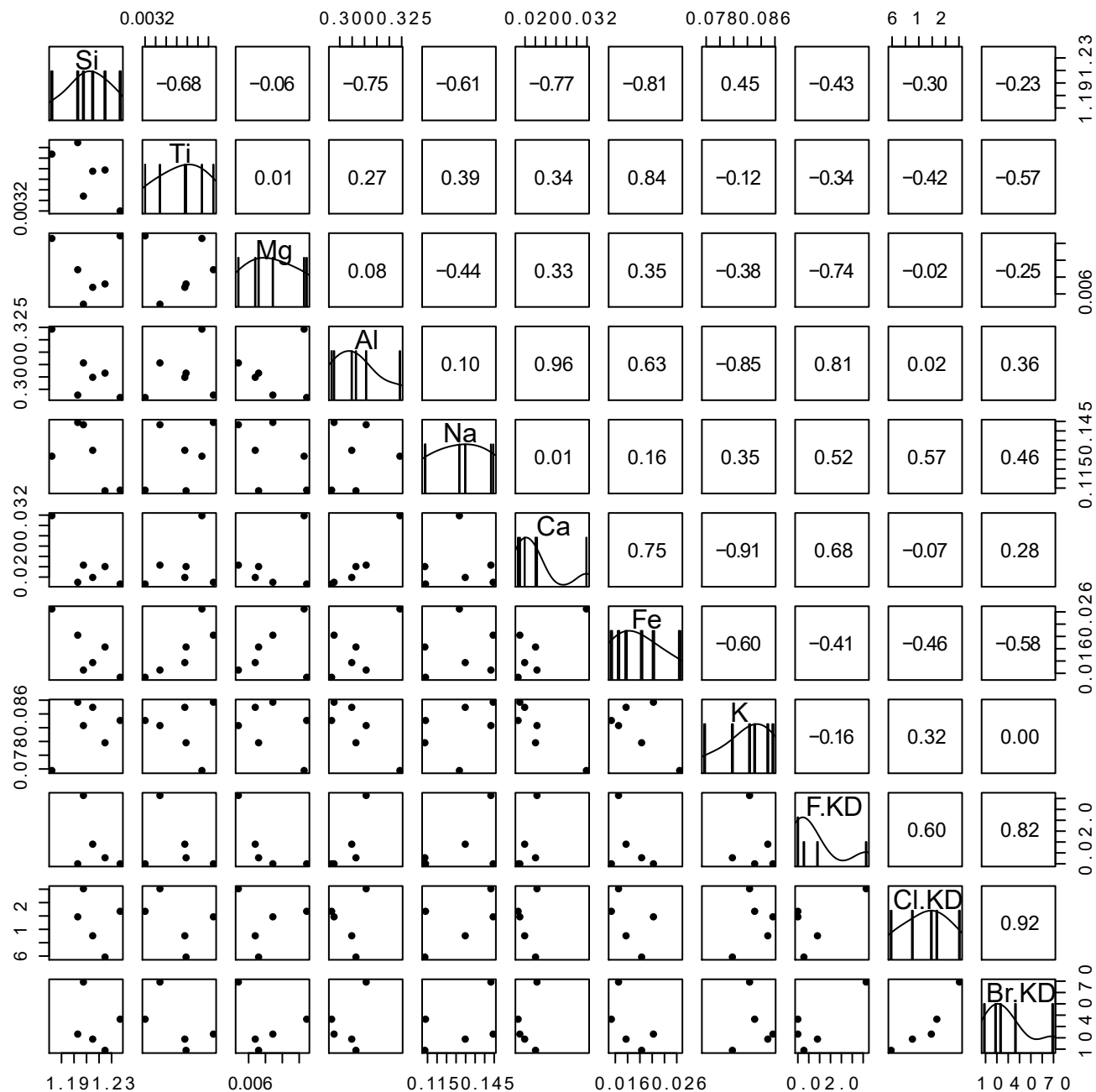


Figure S6. Scatter plot of Quizapu experiments of matrices of different elements and the Cl, F and Br partitioning values, with bivariate scatter plots below the diagonal, histograms on the diagonal, and the Pearson correlation above the diagonal. In the scatter plots X axes represent the range of values of the element in the same row, while the Y axes represent the element in the vertical column.

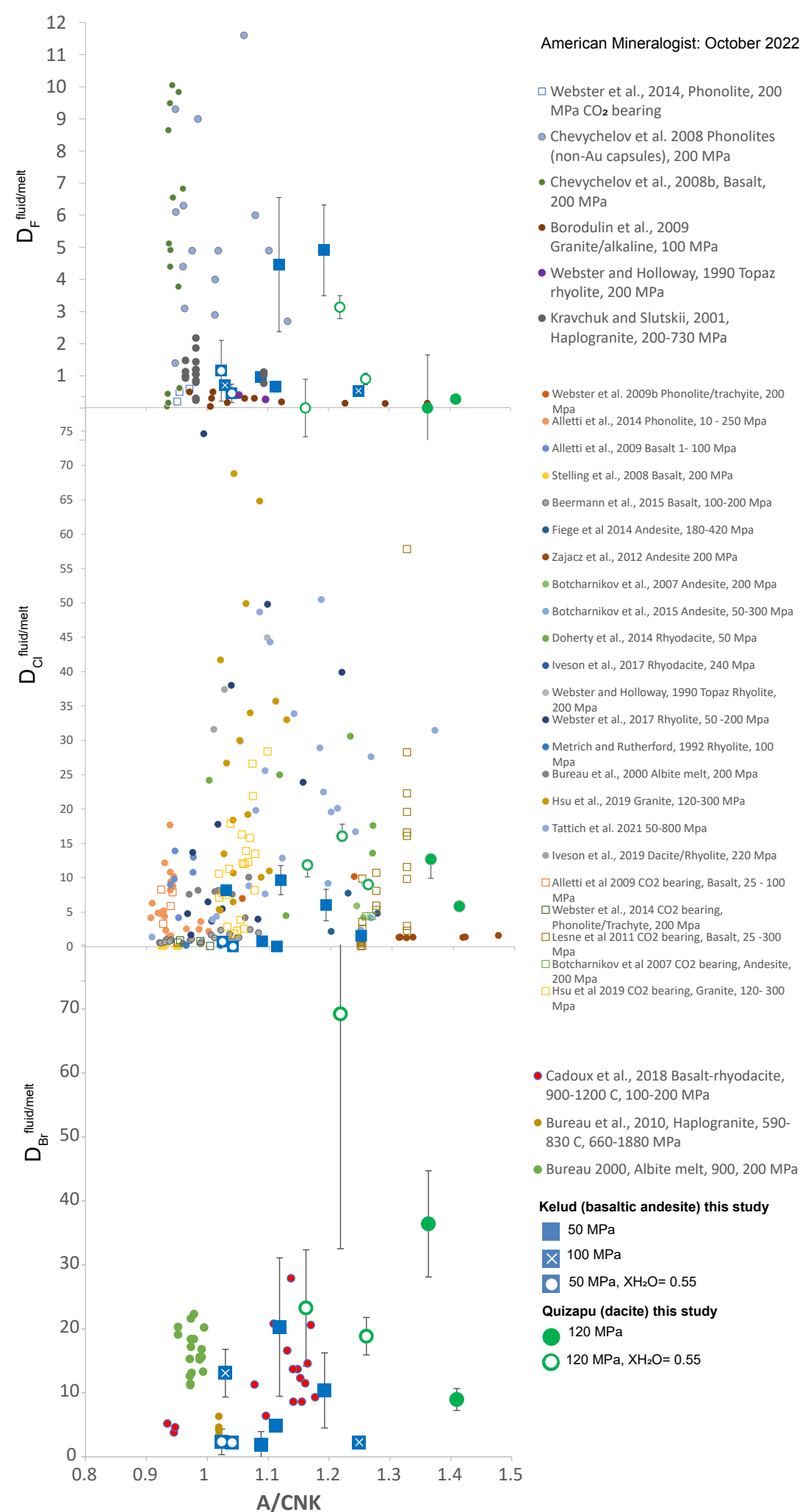


Figure S7. The molar Aluminium/Calcium*Sodium*Potassium ratio for data in these study as a comparison to data from literature for non-brine systems and therefore thought to represent henrian partitioning. The key is ordered by composition and CO₂ bearing experiments are grouped.