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Do we need to have mineral-specific Δ_{47} : calibrations and/or acid fractionation factors and/or community standards ?

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Over two decades the carbonate clumped isotope community has reached large methodological and interpretational improvements driven by long-term collaborative efforts to address inter-laboratory analytical issues. The latest outcomes of this long-term endeavour are the definition of a new reference scale for Δ_{47} measurements based on carbonate anchors of calcitic mineralogies [1] and consideration of fully propagated uncertainties associated with data normalization [2], which resolved most of the long-standing interlaboratory discrepancies. However, because of the difference in the conditions (e.g., temperature, length) required for quantitative phosphoric acid digestion of different carbonate mineralogies, some mineral-specific real features and/or interlaboratory discrepencies might exist for dolomite, aragonite or siderite. At the light of these recent advances, now also allowing to better resolve smaller Δ_{47} differences if any, we here re-assess the suggestions of a universal calibration for all inorganic (Ca, Mg, Fe)CO_3 carbonates and similar acid fractionation factors for dolomite and calcites at 90°C [3].

We will present data from experiments and inter-laboratory comparisons designed to investigate the needs to have either dedicated Δ_{47} – calibrations and/or acid fractionation factors and/or community standards for dolomite, aragonite and siderite. To address these questions, we notably compare: (1) Δ_{47} results acquired over 70 and 90°C acid reactions on a suite of experimental calcites, dolomites, aragonites and siderites for which their ^{13}C–^{18}O bonds distribution has been experimentally driven to the stochastic distribution at high temperature and pressure (with a piston cylinder), allowing to directly measure the absolute Δ_{47} fractionation factors over acid reaction; (2) calibration samples presenting a large range of growth temperatures and that have been reacted at 70 and 90°C; and (3) preliminary data on proposed dolomite and siderite reference material ran in four different laboratories.

Finally, this contribution will help shaping the last contours of a new community effort dedicated to solve the identified remaining analytical questions about inter-mineral or intra-mineral specificities (e.g. cation ordering for dolomite). Any suggestions, data or proposition of homogeneous reference materials from additionnal contributors will be welcomed.

[1] Bernasconi et al. (2021) *G3*, e2020GC009588
[2] Daeron M. (2021) *G3*, *22* e2020GC009592
[3] Bonifacie et al. (2017) *GCA*, 200 255–279