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Origin and paleo-temperature reconstruction of fluids that originate MDAC from the Gulf of Cadiz, using differentiation of the calcite and high Mg-calcite from dolomite for stable isotopes measurements

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Selective separation of the coexisting carbonate minerals, such as calcite, high Mg-calcite, protodolomite and dolomite is required for accurate phase-specific determination of oxygen and carbon isotope composition of the methane-derived authigenic carbonates from the Gulf of Cadiz. This work is devoted to the description of the research method to separate calcite and high Mg-calcite from dolomite (and protodolomite) using the organic acid athylenedinitrilotetraceticacid (EDTA). This method developed at the ETH, Zurich by Van Lith (2001) proved to be efficient, allowing the separation of dolomite from complex mixtures of calcite, high Mg-calcite and dolomite, by slow dissolution of the calcite and high Mg-calcite fraction in a boiling 0.25 M EDTA solution with pH 11. Dolomite is well separated from mixtures comprising more than 40 wt.% dolomite in 24 hours. Isotope measurements of the bulk carbonate and the separated dolomite allowed the calculation of the isotopic composition of the calcite and high Mg-calcite fractions. Both the carbon and oxygen isotopic composition of the calcite and high Mg-calcite is lower than the bulk carbonate. This isotopic difference between the different carbonate phases indicates the relevance of separating the coexistent carbonate mineralogies for accurate temperature calculations and to evaluate the fluid compositions and the influence of heavy water from decomposition of gas hydrates.