



Carbon and sulfur isotope ratios of DIC and sulfate from fresh waters - Effect of BaCO₃ and BaSO₄ coprecipitation and analytical technique

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Stable carbon isotope compositions of dissolved inorganic carbonate (DIC) and sulfate in fresh water are useful tools for modeling the evolution of aqueous solutions in natural surroundings. Moreover, ¹³C/¹²C ratio of DIC comprises a basic correction parameter for the interpretation of ¹⁴C ages of for instance carbonate-bearing ground waters in hydrogeochemical studies.

Different techniques exist to prepare DIC for carbon isotope analysis. One technique is based on quantitative precipitation of DIC as BaCO₃ by the addition of an alkaline barium chloride solution (e.g., [1, 2]). Subsequently, precipitated BaCO₃ and concentrated phosphoric acid react to gaseous CO₂ which is analyzed off-line by stable isotope mass spectrometry. However, in sulfate-bearing solutions BaSO₄ besides BaCO₃ is formed. It was suggested from experimental data of [3] that isotope fractionation may occur during the reaction of co-precipitated well mixed BaCO₃-BaSO₄ with phosphoric acid.

In the present study, the ¹³C/¹²C content of ground waters with different sulfate/DIC ratios (0.03 to 17.3) were investigated with both off-line and on-line techniques (complete combustion by C-irmMS). Additionally, ³⁴S/³²S ratios of sulfate were measured by means of C-irmMS on mixed BaCO₃-BaSO₄ coprecipitates and separately purified BaSO₄ precipitates [e.g., [1, 2]).

The results show no effect of ¹³C/¹²C analyses on sulfate/DIC ratios and no significant change of ³⁴S/³²S ratios due to varying C-content. This indicates that coprecipitation

of BaCO_3 and BaSO_4 as well as the different analytical techniques do not influence the stable isotope analyses of DIC and dissolved sulfate.

References:

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