



The abiotic disproportionation of sulfur dioxide (SO₂) produces sulfate with an oxygen isotope signature close to the isotope composition of seawater sulfate

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Whereas the sulfur isotope effects during the abiotic disproportionation of SO₂ were thoroughly investigated in the last years, data on the oxygen isotope signature of produced sulfate is scarce. To fill in this gap in knowledge, we performed laboratory experiments which simulated the abiotic SO₂ disproportionation at temperatures ranging from 150°C to 320°C.

In our experiments SO₂ disproportionated rapidly into sulfate and elemental sulfur. The oxygen isotope fractionation between produced sulfate and water is in the range of the observed oxygen isotope offset between seawater sulfate and seawater. The isotope fractionations observed for the experiments is likely composed of an initial kinetic oxygen isotope fractionation, which is rapidly overprinted by equilibrium oxygen isotope between sulfate and water (reaching completion probably within a time frame of $\frac{1}{2}$ to 1 hour).

Our observations raise the questions if disproportionation of magmatic SO₂ in submarine hydrothermal vent systems is an important control for today's seawater sulfate isotope composition, and if so, if marine hydrothermal SO₂ disproportionation shaped the oxygen isotope signature of marine sulfate over geological times.