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New backflushing System on GasBench II improves Reliability of Oxygen isotopic Analysis of Water

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Determination of oxygen isotope ratios in water has been of great relevance for various research areas for decades. Different setups for analyzing water isotope ratios have been developed. Of these, the GasBench II periphery (Thermoquest, Bremen, Germany) using the equilibration method is a widespread application. This technique avails the equilibration of added CO_2 with the original water sample in the headspace of a sample vial. Most GasBench users report precisions usually better than 0.1 permill for δ^{18}O.

However, condensation of water in the sampling line is a recurrent problem that is also being discussed online in e-mail discussion list servers (e.g. ISOGEOCHEM-List: http://www.uvm.edu/∼geology/geowww/isogeochem.html). Blockages caused by condensed water limit the reliability of measurements, and, therefore, those measurements are usually discarded.

Why does condensation occur and what problem does it cause? During the long equilibration time for oxygen isotope analysis (c. 18 hours), water condenses at the septum in the lid of the sample vial and can enter the sampling line through the sampling needle. Tiny amounts of water in the sampling capillary, though, can block the sampling line and this leads to faulty peaks or completely unusable measurements. This problem can be limited by equilibrating the samples at temperatures very close to room temperature or by injecting the rubber septum with the sampling needle at a slightly different spot than with the flushing needle. Unfortunately, condensation of water in the sampling line is still hardly avoidable.

We developed an easy and low cost modification to the GasBench II, which we call backflushing system, in order to keep the sampling line free of condensed water. We

interposed a 3-port Valco valve (VICI AG International, Schenkon, Switzerland) between the sampling capillary and the GasBench II, which switches into flushing mode between two samples and, thus, flushes out the sampling line. Precision as well as acquisition time does not change but the reliability of each single δ^{18}O measurement is much higher.