

Measurement of small and ultra-small ^{14}C samples

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In the field of geo-science applications there is an increasing demand for small and ultra-small ^{14}C measurements, e.g. for compound specific or in-situ investigations. For this purpose it is an attractive option to measure the sample material directly as CO_2 without performing the usual graphitization. At CologneAMS we are operating a dedicated Cs sputter source, HVE SO-110 B, which has been tuned for an efficient C^- extraction when CO_2 is used as sample material. In routine operation a negative ion yield of 6% is obtained. For the CO_2 injection we use an Ionplus AG gas system for which the control of the automated measurements was modified.

With this setup gaseous samples of 1-300 μg carbon can be measured. The blank level for samples with masses $>50 \mu\text{g}$ is 3×10^{-15} while the detection limit of smaller samples is limited due to a contamination of typically 0.3–0.4 μg modern carbon which is mostly introduced during sample preparation work. In order to further improve the system towards the operation of ultra-small samples, special effort was spent to lower the blank level. Additionally, first test measurements of in-situ samples, prepared from 1-3 g of ^{14}C saturated CoQtz-N material and SynQtz blanks, have successfully been performed which yielded ^{14}C contents of 50k-750k atoms, with 50k atoms being the blank value.

A new spectrometer for stable isotope measurements, isoprime precisION from elemental, was acquired and will be connected to the existing gas system. This allows to measure the same sample material simultaneously with two different spectrometers and fractionation effects can be investigated more detailed.

In this contribution we report on the actual performance of the measurements and the status of the set-up.