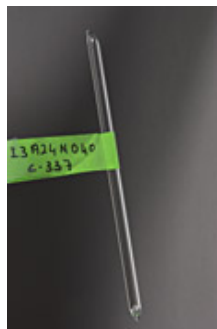


NOSAMS: Other

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CO₂ Gas



An ampoule of CO₂ submitted for AMS analysis. (Woods Hole Oceanographic Institution)

We may require that you send a "contamination-check" sample of CO₂, so we can verify that your laboratory is ¹⁴C-free, before we routinely process your gas samples in our Sample Prep Lab. Contamination check samples are prepared in a specially isolated area so as not to (potentially) contaminate samples from other investigators.

We offer free analysis of one blank and one modern standard for submissions of CO₂ in batches of 10 samples or more (that would be >= 12 actual samples submitted) and charge half price for the standards submitted with batches of less than 10 gas samples. It is good practice for submitters to include a modern and ¹⁴C-free or blank sample to assess the reliability of lab techniques used to prepare a sample to CO₂. Fees are not assessed for these standards and blanks as long as the number submitted matches criteria above and they contain > 8 μmol (100 μg) carbon. If the sample is between 2 and 8 μmol of CO₂ (24 - 100 μg C) it can be analyzed as a small sample and will bear a fee. If a blank contains < 2 μmol of CO₂ and is not analyzed, a partial processing fee will be assessed to cover the cost of quantifying the CO₂.

We recommend submitting CO₂ in 6 or 9 mm (outside dimension) flame-sealed Pyrex or quartz tubes with a targeted sample size of 80 μmol of gas. Small samples are in the range of 2 - 9 μmol. Typically a portion of the gas is transferred for on-line stable isotope analysis (¹³C). A fee will be charged for archival of large sample splits. We prefer the 6 mm OD tubes because they tend to crack more cleanly; the 9 mm tubes can hold larger volumes and may be easier to flame-seal, but tend to shatter in the cracker. We need to know the amount of gas submitted, preferably in μmol, before we can accept CO₂ samples.

Please aim for a sealed pressure of less than 2 atmospheres and a flame-sealed tube length of 6-7 inches. Label the with attached tape or paper (tightly attached) or use a permanent black marker to label the ampoule. Process used: [Gas Sample](#).



Photo of graphite samples, or pure carbon and Fe catalyst ready for pressing into an AMS target. (Woods Hole Oceanographic Institution)

Graphite

Potential submitters of graphite should first contact us for details on packing, fees and turnaround time before sending graphite samples to NOSAMS.

Generally, as an initial test, we ask for 10 to no more than 15 loose graphite samples in a batch to determine whether we can successfully analyze your graphite. These should all be primary or secondary standards and blanks of known ages. We routinely analyze graphite prepared using Fe catalyst with a minimum of 2.5 mg Fe. Our suggested target weight is 1 milligram carbon on 2.5-3.5 mg Fe. A client is allowed up to 30 free test samples to establish that we can successfully handle and analyze them, after that, the normal fees apply. Based on the performance of the test batches, we will decide whether we can accept unknowns for a fee. For every five unknowns, one standard (OXI or OXII) is required. So, n/5 + 1 additional standards are requested to bracket all unknowns where n is the number of unknowns. We typically analyze 2 process blanks per process type without fee. A unique graphite number should be assigned to each graphite sample submitted and each sample arrive labelled accordingly.

When we can successfully analyze loose graphite from a client, we can progress to receiving pressed samples if so desired, again by starting with test batches of 10-15 targets. Process used [Target Press](#).



Collecting a swipe sample. (Woods Hole Oceanographic Institution)

Contamination check and swipe samples

Swipe samples are used to check surfaces for above natural levels of ¹⁴C. Swipes and other materials suspected of elevated radiocarbon content are analyzed in a separate preparation lab using a sealed-tube graphitization procedure to prevent cross-contamination. Fees for swipe or contamination check analysis may be waived if made in conjunction with regular sample submission.

To collect a swipe sample:

Pre-clean quartz filters by baking at 900° C for 2-3 hours. The preferred filter is 25 mm quartz but other sizes and glass fiber filters are acceptable if prebaked and indicated.

Choose areas to swipe that have seen a lot of handling such as doorknobs, ovens, refrigerators, fume

hoods and counter tops. Wear disposable gloves and dispose of them after each swipe and replace to avoid transferring contamination to the next sample. A single swipe is sufficient for each surface. Place all your tools and supplies on a disposable work surface such as clean paper, aluminum foil or paper towel. Throw this away and replace in each new sampling location.

Moisten pre-baked filter with HPLC grade or better isopropyl alcohol. Gently rub the filter over the area to be swiped being careful to avoid breaking up the brittle filter if possible. Place the swipe in a prebaked glass container labeled with the name or location of the object swiped, the date and any other pertinent information. Submit as you would a normal AMS sample. A [protocol](#) for contamination check sampling is available.

Please contact [Kathryn Elder](#) regarding submission of contamination checks.

Gas Ion Source (Carbonate)

NOSAMS offers rapid radiocarbon analysis of carbonates (e.g., corals, carbonate sediments, etc.) at reduced cost and precision. For this type of analysis, each sample must contain between 3 and 4 mg of carbon (e.g., 30-35 mg of CaCO₃). Typical analytical precision will be between 1.5 and 2%. The requested minimum batch size is 25. However, smaller batches can be analyzed at our discretion and will incur a surcharge of \$300 per submission. Before submitting samples, please [contact NOSAMS](#) to discuss the technique and so that we may provide the samples vials into which the samples must be placed.

Reconnaissance Analyses

NOSAMS offers a reconnaissance type of analysis to U.S. federally funded researchers as a lower cost opportunity to survey the radiocarbon content of a suite of samples with reduced analytical precision. An example of a project that benefits from reconnaissance work is determining the approximate ages for a collection of deep-sea corals in order to identify specimens for further, more precise analysis.

Submissions of this type must be solid organic or carbonate materials provided in batches of no less than 25 with each sample containing a minimum of 40 µmol (500 µg) of carbon and a maximum of 200 µmol (2.4 mg) C. We do not guarantee routine precision for this analysis type and estimate the expected precision as shown in the table below.

Fm range	Estimated error	Radiocarbon age range (yrs)	Estimated Error (yrs)
0.5 - 1	+/- 0.015	< 5,600	+/- 250
0.1 - 0.5	+/- 0.010	18,500 – 5,600	+/- 400
0.05 - 0.10	+/- 0.005	24,000 – 18,500	+/- 700
0.01 - 0.05	+/- 0.005	37,000 – 24,000	+/- 3500

Biases may be introduced if the reconnaissance work involves simplified sample preparation prior to analysis e.g. bypassing cleaning or pretreating samples. Investigators considering reconnaissance work are strongly encouraged to [contact NOSAMS](#) staff to discuss the project prior to submitting samples. Additional reductions in cost are available if the samples are prepared to graphite by the submitter. Facilities to prepare samples to graphite at NOSAMS can be provided to qualified investigators.

High Precision Analysis

High-precision is defined as a measurement made to an analytical precision of less than 2 per mille on a modern sample. For high-precision measurements, a surcharge applies. Investigators considering high-precision analyses must contact NOSAMS staff to discuss the project and precision requirements prior to submitting samples.

Last updated: November 13, 2013

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