Print

NOSAMS: Inorganic Carbon

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Overview

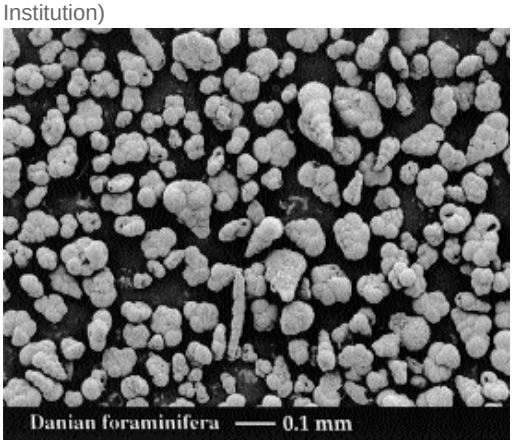
Inorganic carbon samples will be weighed and directly hydrolyzed in our Sample Prep Lab.

Coral pieces in a 1 dram vial. (Woods Hole Oceanographic Institution)

Coral

Corals, like tree-rings, and sometimes molluscs, have annual growth bands and can be sampled according to the years of growth. A good sample size for carbonates is approximately between 8 and 12 milligrams.

To estimate the milligrams of carbon in carbonate, use the formula mg C = mg $CaCO_3$/8.33 then multiply by 0.9 to account for impurities. When requested, a 10 % split of the CO_2 generated is taken for in-line stable isotope measurement. Process used Hydrolysis.



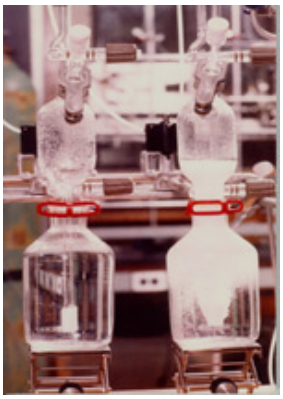
Microscopic photo of a mixed assemblage of foraminifera. (Woods Hole Oceanographic Institution)

Foraminifera

If pure, a 4 mg sample will conservatively yield approximately 430 micrograms of carbon (0.004g * 0.9 yield / 8.33 MW carbonate). When requested, a 10% split of the CO_2 generated is taken for in-line stable isotope measurement (430-43 µg).

Samples that yield < 100 micrograms of carbon will require small sample processing.

If there is sediment on and in the forams that contains carbonate of a different age than the forams, it will skew the radiocarbon result. Some submitters sonicate forams in a 3% peroxide and sodium hexametaphosphate solution and rinse with DH_2O to clean tests. Take care to inspect the sample immediately prior to submitting and to remove anything that is not a foram, including fibers, hair or quartz grains. The smaller the sample, the larger the potential impact of small bits of contamination on the isotope concentration. Process used Hydrolysis.



DIC samples undergoing "water-stripping" process. (Woods Hole Oceanographic Institution)

Dissolved Inorganic Carbon

Sea, lake, pond, ground or pore water.

Beginning with sample collection, it is extremely important that all of the materials coming into contact with the water are as ^{14}C-free as possible. Post-collection biological activity can alter the carbon isotopic concentration of the samples. Addition of a saturated mercuric chloride solution will kill all bacteria (typically used for seawater samples), but this may not be appropriate for your sampling situation. Other poisons should be discussed with us if you choose not to use $HgCl_2$. If the sulphur content in the water is greater than that of standard seawater, then you may need additional poison.

DIC Sample Bottles

Our preferred DIC sample collection vessel is a 500 ml borosilicate glass bottle with a high-quality ground-glass stopper.The stopper is lubricated prior to collection with Apiezon grease to prevent exchange with the atmosphere. NOSAMS has an automated water stripping vacuum line system with probes designed to fit a specific bottle opening. If the samples arrive with an opening that cannot accept our probes, the water must be transferred and this is less than ideal. We may be able to supply bottles for your sample collection - please contact us for more information and refer to the collection protocols for full specifications. A shipping account number will be required to return sample bottles that differ from these specifications.

In order to handle a water sample, we must know the DIC concentration. We need to know whether there will be too much CO_2 evolved for our vacuum system to accommodate. The water stripping lines are automated and run unattended overnight. They were designed to accommodate a range of concentrations typically found in a liter of seawater (approximately 2 mmol/kg). One of the highest

concentrations we've handled (from groundwater) was about 14 mmol/kg and that required some creativity (one liter of water weighs 1 kg). Process used Water Stripping .

Related Files
&#0187 DIC Sampling Protocol
&#0187 DIC Sampling Procedure (no pictures)

Arctica islandica bivalve next to an example of AMS-sized sub-sample on finger. (Woods Hole Oceanographic Institution)

Mollusc

Mollusc samples are typically quite large and require subsampling to prepare an AMS sample. When there is the luxury of excess material, use it to prepare a pristine portion of the inner shell by scraping, cutting or grinding away the sometimes chalky outer portions of the shell that are most susceptible to recrystallization. Consider sampling across growth-bands for a representative sample, or using the inner or outer year growth parts only for a more age-constrained sample.

Treating carbonates with a mild acid leach prior to submission is not recommended because this procedure is best done immediately prior to the full acid hydrolysis. Over time, an etched surface may adsorb CO_2 from the air. If there is enough material and you want to remove the surface portion of your shell, an acid etch/leach may be requested on the submittal form. Process used Hydrolysis.

Ground, dried sediment. (Woods Hole Oceanographic Institution)

Sediment (carbonates)

The inorganic carbon content of sediments can vary considerably. We need at least an approximate idea of the $\%CaCO_3$ of sediment before we can treat it. Without this information, we will not be able to process the samples.

Submit dry sediment samples in well-labeled, clean glass or plastic containers. We assume samples are homogeneous. Some submitters dry and grind sediment samples prior to submission to ensure homogeneity. Process used Hydrolysis.

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