

Woods Hole Oceanographic Institution

NATIONAL OCEAN SCIENCES  
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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  
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## Coral

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

To estimate the milligrams of carbon in carbonate, use the formula  $\text{mg C} = \text{mg CaCO}_3 / 8.33$  then multiply by 12. When requested, a 10 % split of the  $\text{CO}_2$  generated is taken for in-line stable isotope measurement. Process

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  $\text{CaCO}_3$  (8.33 MW carbonate). When requested, a 10% split of the  $\text{CO}_2$  generated is taken for measurement (430-43  $\mu\text{g}$ ). Samples that yield  $< 100$  micrograms of carbon will require special processing.

If there is sediment on and in the forams that contains carbonate of a different age, it will affect the radiocarbon result. Some submitters sonicate forams in a 3% peroxide and sodium hydroxide solution and rinse with  $\text{DH}_2\text{O}$  to clean tests. Take care to inspect the sample immediately to remove anything that is not a foram, including fibers, hair or quartz grains. Take note of the potential impact of small bits of contamination on the isotope concentration. If



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 sample be as clean as possible. Post-collection biological activity can alter the carbon isotopic concentration of the sample. The use of a mercuric chloride solution will kill all bacteria (typically used for seawater samples), but this may not be ideal in all situations. Other poisons should be discussed with us if you choose not to use  $\text{HgCl}_2$ . If the sulphur concentration is higher 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 should be coated with Apiezon grease to prevent exchange with the atmosphere. NOSAMS has an automated water stripping system designed to fit a specific bottle opening. If the samples arrive with an opening that cannot accept our probes, the water stripping will not be as effective. We may be able to supply bottles for your sample collection - please contact us for more information and our 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 DIC for our system to accommodate. The water stripping lines are automated and run unattended overnight. They were designed to handle concentrations typically found in a liter of seawater (approximately 2 mmol/kg). One of the highest concentrations we have handled was about 14 mmol/kg and that required some creativity (one liter of water weighs 1 kg). Process used [Water Stripping](#).

#### Related Files

[DIC Sampling Protocol](#)

[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 material is available, use it to prepare a pristine portion of the inner shell by scraping, cutting or grinding away the portions of the shell that are most susceptible to recrystallization. Consider sampling across growth-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 performed immediately prior to the full acid hydrolysis. Over time, an etched surface may adsorb CO<sub>2</sub> from the atmosphere, and if you want to remove the surface portion of your shell, an acid etch/leach may be requested on the [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 inorganic carbon content of the sediment 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 homogeneously dry and grind sediment samples prior to submission to ensure homogeneity. Process used [Hydrolysis](#).

*Last updated: August 14, 2015*

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