Particulate Organic Carbon, Hydrogen and Nitrogen (CHN or POC&PON)

modified 03/21/06 *Tristan Wohlford*; *updated* 9/12/08 *wkoz*

CHN Filtration Set-up

Equipment needed:

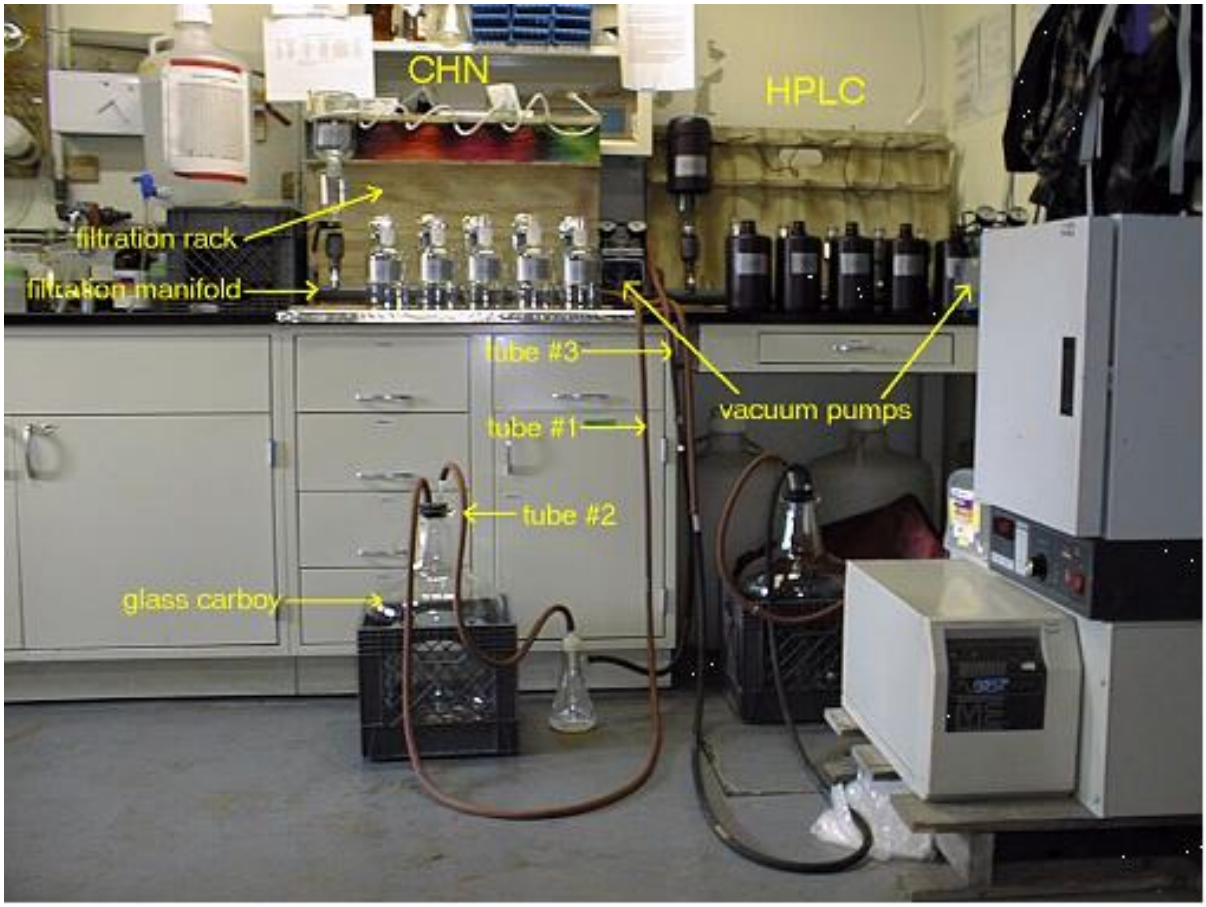
- 6 place filtration manifold (narrow spacing)
- CHN filtration rack (the ones with the thin pieces of wood that support the bottle necks)
- 5 gallon glass carboy in square gray crate
- 500 ml Erlenmeyer flask with sidearm (overflow trap)
- 3 pieces of vacuum tubing
- Gast vacuum pump (set to pump at no more than 12 psi)
- 6 1L glass bottles with stoppers or aluminum foil covers
- 6 300 ml Poretics glass funnel cups with 25 mm bases
- 6 glass frits and funnel bases in stoppers
- 6 funnel clamps
- GF/F filters (combusted at 450°C for 4 hours)
- 3"x 3" heavy duty aluminum foil squares (combusted)
- 5-6 100x80 glass petri dishes with lids (combusted)
- forceps
- lab gloves
- filtered (0.2µ) sea water in wash bottle
- absorbent “weenie” (hand-made finger gauze tubes filled with silica “dri-rite” crystals stored in the drying oven at 60^{o}C)

Secure the vacuum tubing as follows:

- tube #1 - end of manifold > stopper in carboy
- tube #2 - stopper in carboy > stopper in flask
- tube #3 - sidearm of flask > vacuum pump

Place a piece of plastic tubing in the ends of the vacuum tubes that will be secured to stoppers.

The plastic tubing will go through the stoppers into the carboy where the end of the plastic tube from the manifold should be longer than the tube going to the flask.



Combustion:

- Filters – place ~400 GF/F filters in glass jar and cover with foil
- Foil – cut a roll of aluminum foil into 3'x 3' squares and place them in a foil tray

Place filters, foil and petri dishes in muffle furnace and combust at 450°C for 4 hours. Allow to cool before opening the furnace to remove them. The foil and petri dishes can be moved to a 60°C oven for storage until use. The filters can be kept at room temperature in a sealed glass jar.

CHN Filtering

Sample Water

0.5 to 2.0 liters of sample water (dependent on amount of phytoplankton in the water) at each of the light levels: 100, 50, 25, 10, 5, 0.5 for each station

Prep Work

The most important thing in doing CHNs is preventing any carbon contamination on your samples. Definitely wear gloves whenever handling filters, glasswear, and the aluminum foil that the filters are packed in. Use forceps for filters that are designated for CHNs. The combusted aluminum foil for packing the samples should be kept completely clean and dry, with no contact made on the inside foil. It works best for me to have them labeled with julian date, event number and light level beforehand so I'm not searching for a dry spot to write once water is all over the place in the midst of filtering mayhem. Put aluminum foil (doesn't need to be combusted) down on your work area for placing filtration funnels when removing filters. (see Figures)

Filtering

As you filter, make sure to record the volumes of water that you are filtering as you go along on the station log. CHN blanks will also have a separate spreadsheet to get recorded onto, as well as getting recorded in the comment section of the station log.

On a typical day at Palmer, start filtering 0.5 liters of water for each light level. As the end of the water is being filtered, the funnel should be rinsed with GF/F filtered seawater from a squirt bottle. It's important to close the valve for each funnel right as it has the last of the water running through and to not let it suck air and run dry. After filtering the sample water the filter should have a noticeable light stain in order for the carbon-hydrogen-nitrogen testing to be effective. If you don't see any color at all on the filter, you should filter some more water. It doesn't have to be a dark color, in fact, time will be saved if filters are not "overwatered".

When packing filters keep the dull side of the combusted aluminum foil as the side touching the filter (no reason other than to keep everyone handling the foils the same way). The foil should be labeled with the julian date, event number (cruise only) and station, and the light level. The filter should only be touched with forceps, and be folded in half in the center of the foil, which is also folded in half. The sides of the foil should be folded over once. Be sure to keep the top open so that the water can fully evaporate from the filter and foil pouch (ie. don't seal them tight until AFTER they come out of the drying oven). Then place the foil pouch, open end up in a glass petri dish in the oven at 60^{o}C.

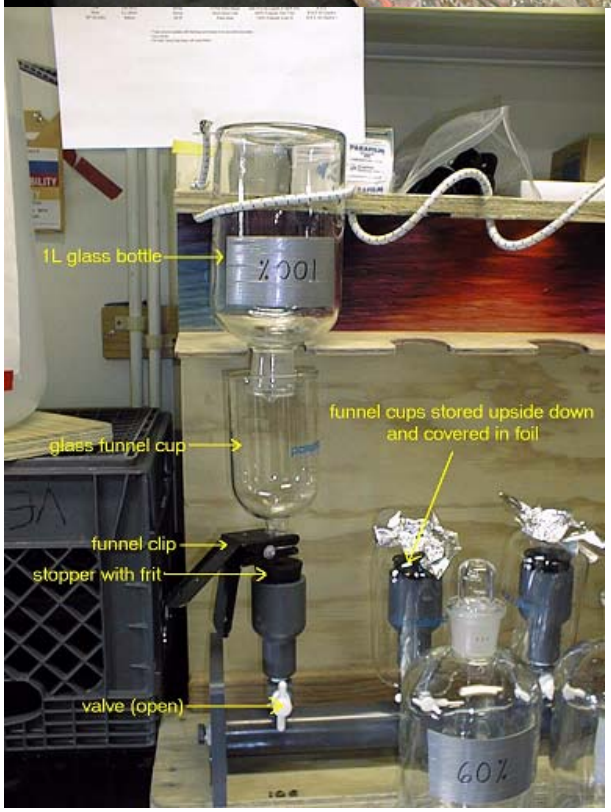
In between stations E and B at Palmer and between stations on cruises, rinse the filtration funnels and glass bottles with deionized (or Milli-Q or E-Pure) water.

In addition to filtering station E and B with their six light levels, both a dry and filtered seawater (DRY & FSW) blank filter need to be packed in with the other samples. One dry and one filtered seawater blank is done on each day of sampling. A dry blank filter is simply a combusted GF/F filter packed up in the foil, which will be tested to check and make sure the filters aren't contaminated. The filtered seawater blank is a combusted GF/F filter put on the manifold like every other sample, but just running water from the GF/F filtered seawater squirt bottle through the filter, in order to test the rinse water. The same amount of water that you would used to rinse a filtration funnel is the correct amount for the FSW blank filter.

Glassware is to be acid washed at the end of each day on cruises and after every other sampling day at Palmer. Glassware includes the filtration frits, filtration funnels, 1-liter bottles and graduated cylinder. Also, all foil (covers for funnels and bottles as wells as on the countertop) should be changed each time you acid wash.

CHN Filtration Manifold Setup

CHN Filtra



Packing up Samples

Samples need to be dried in the oven for a minimum of 24 hours. Tightly seal the edges of the foil by folding the open side over and adding an extra fold to the sides, being careful not to fold the filter. Place in a ziploc baggy with an absorbent “weenie” (dri-rite filled gauze sock) and an index card listing everything in the ziploc (see example table below). These may be stored at room temperature in a larger ziploc bag with excess air pressed out.
At the end of the season print out the CHN blanks spreadsheet as well as the CHN data from the station log. A copy of these will be included with all of the CHN filters as a "master list" of samples. This master list should also be emailed to UCSB MSI Analytical lab before the samples are shipped for analysis.

Example sample info card (3x5” index):

Julian date (8313)	**-**	**-**
Station (E)	**Station (B)**	**-**
100	**100**	**fsw blank**
50	**50**	**dry blank**
25	**25**	**-**
10	**10**	**-**
5	**5**	**-**
0.5	**0.5**	**-**
Total # of filters (14)	**-**	**-**