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Method for the determination of Iron used by CRIEPI

The CRIEPI Iron analyses method is fundamentally the same as Dr. Obata (1993, 1997)

1) All filtrates and unfiltered SW collected in 125-ml polyethylene bottle were then buffered at pH 3.2 with 10 M formic acid-2.4 M ammonium formate buffer solution.

2) Concentrations of Fe (III) in the buffered samples were determined with an Fe (III) analyzer using chelating resin concentration and chemiluminescence detection (Obata et al., 1993, 1997). The determined Fe is a chemically labile species, which is in unfiltered and filtered seawater and strongly reacts with 8-hydroxyquinoline resin at pH 3.2.

3) The detection limit (three times the standard deviation) of Fe (III) concentrations for purified seawater (seawater passed through 8-hydroxyquinoline resin column three times) on POLARSTERN cruise was 0.015 nM-0.032 nM.

4) The relative coefficient of variation was within 5 % (n=12) for replicate measurements of a seawater sample containing 0.53 nM Fe(III) and 6% (n=9) for 5.3 nM Fe(III).

5) Standard Solution

I used Fe standard solution which was made for atomic absorption spectrometry (Fe(NO₃)₃ Sol. 1005mg/L: made by Wako Co.LTD (Japanese)). And made substandard by diluting it with MilliQ to 10ppm (with 0.1M HCL), 100ppb (with 0.05M HCL), 10ppb (with 0.05M HCL) and 1ppb (with 0.05M HCL).

6) Calculation curve

I used seawater for diluting these substandards to make calculation curve. The seawater was collected from St. Papa surface (filtered by 0.03 µm, Fe concentration is less than 0.1nM). First, I add 10 M formic acid-2.4 M ammonium formate buffer solution to the seawater to adjust pH 3.2, and then I add substandard to the seawater. I analyze 0 (no addition St.P seawater), 5, 10, 30, 50, 100 ppt solution for low Fe concentration sample. Of course I analyze 0, 30, 50, 100, 300, 500, 1000 ppt for high concentration samples. Analyzer setting (sample loading time, elution time, column rinsing time) was different between low Fe conc and High Fe conc. I analyzed these standards at start and end of sample running (one run is about 10-16 samples). I made these standards twice in one run (start and end) and every standard solution was analyzed immediately after made these.

7) Blank seawater (Fe free seawater)

I used blank seawater which St.P seawater passed through 8-hydroxyquinoline resin column three times. I analyzed this blank seawater at every run. This blank value is used for calculating Fe conc.

8) CRIEPI Standard SW

I analyzed CRIEPI Standard SW several times for checking detection sensitivity during the POLARSTERN cruise. This seawater was collected from North western Pacific deep water.