Dechlorination Procedure using Sodium Thiosulfate

1. SCOPE AND APPLICATION

    1.1. This method is based on Standard Methods Online Edition (1997), Method 4500-Cl. It can be used to remove chlorine from bioassay, algal assay, microbiology, and any other aqueous samples that need to be dechlorinated.

2. SUMMARY OF METHOD

    2.1. Residual chlorine is measured per SOP TA-06.22. Based on the concentration of residual chlorine, the volume of sodium thiosulfate needed to dechlorinate the sample is calculated. Sodium thiosulfate is added to the sample. The residual chlorine is measured in the “dechlorinated” sample. Additional manipulations are performed if: the chlorine residual is > 0.1 mg/L after dechlorination in bioassay samples; or, greater than the MDL in other samples listed in 1.1.

3. EQUIPMENT AND SUPPLIES

    3.1. 4 L Erlenmeyer flask, one each (or sized as needed)

    3.2. 2 L Graduated cylinder, one each

    3.3. Thermometer (glass or digital), minimum 0-30 °C range (Calibrated per SOP TA-06.13 or SOP LB-035)

    3.4. Hach pocket colorimeter™ II chlorine test kits (S/N 05110C042002) (SOP TA-06.22)

    3.5. 1 mL and 2 mL Disposable pipets

    3.6. Magnetic stir-bar

    3.7. Magnetic stirrer

    3.8. Magnetic stir-bar retriever

    3.9. Calculator

    3.10. Computer with access to LIMS

4. REAGENTS AND STANDARDS

    4.1. Chlorinated sample

    4.2. Sodium thiosulfate ($Na_2S_2O_3$, $5H_2O$), 0.025 N, ACS grade

5. METHOD

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5.1. After the total residual chlorine (TRC) has been measured following SOP TA-06.22, use the following formula to determine the amount of sodium thiosulfate to add to the total volume of sample: X = [((TRC) × (total volume)) / 886.25 µg/L]

5.1.1. X = volume in mL of 0.025N sodium thiosulfate to add to sample

5.1.2. Total volume = volume of sample to be dechlorinated in milliliters

5.1.2.1. If you use liters of sample, the final volume needs to be multiplied by 1000 to convert to mL.

5.1.3. 886.25 µg/L is a dechlorination constant

5.1.3.1. Constant 886.25 µg/L is specific to 0.0250N sodium thiosulfate.

5.1.4. Example:

TRC = 0.5 mg/L, 2500 ml total volume of sample to be dechlorinated would require 1.4 mL of 0.025N sodium thiosulfate. This is 0.56 mL per L of sample.

X = [((TRC) × (TOTAL VOLUMEIN ML)) / 886.25 µg/L]

X = [(0.5 mg/L × 2500 ml) / 886.25 µg/L]

X = 1,250 mg mL/L / 886.25 µg/L

X = 1.4mL

1.4 ml is per 2500 ml sample, continue to get mL/L of sodium thiosulfate.

1.4 mL/2.5L

= 0.56 mL/L

5.2. Use the graduated cylinder to add the desired volume of sample to the 4-L flask.

5.2.1. If the volume of sample is smaller/larger, a smaller/larger flask can be used.

5.3. Put the stir bar in the flask and place both on the magnetic stirrer.

5.4. Turn the magnetic stirrer on and adjust to medium speed.

5.4.1. Set the speed fast enough to stir the sample without aerating it.

5.5. Use the 2-mL sterile disposable pipet to add the calculated volume of 0.025 N $Na_2S_2O_4$ to the flask. Keep track of the volume added to the flask as the total volume of sodium thiosulfate added to the sample (expressed as mL of sodium thiosulfate per L of sample) will have to be recorded on the Bioassay Bench Sheets.

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5.5.1. To determine the mL of sodium thiosulfate per liter of sample, divide the total mL of sodium thiosulfate by the volume (in liters) of sample.

5.6. Use the Hach chlorine test kit to determine the total residual chlorine in the dechlorinated sample. Record the result on the Bioassay Bench sheets and in the LIMS Logbook TOX_CHLORINE.

5.7. If the TRC of the dechlorinated sample is less than 0.1 mg/L (ideally <0.03 mg/L), the sample is ready to be used (go to Step 5.8). If the TRC is > 0.1 mg/L, check the original calculation and then (if calculation is correct) repeat Step 5.1, Step 5.5 and Step 5.6. DO NOT ADD more than three times the original calculated volume (if correct) of sodium thiosulfate to the sample.

5.7.1. The necessity of adding more than the original calculated volume of sodium thiosulfate to the sample is usually the result of interfering substances in the sample.

5.8. Record the total volume (expressed as mL/L) of sodium thiosulfate used to dechlorinate the sample on the Bioassay Bench sheets. Record the final TRC of the dechlorinated sample on the Bioassay Bench sheets.

5.8.1. Reminder: Tox Bioassays that require chlorine adjustment are accompanied by a screen test consisting of a sodium thiosulfate spiked control and 100% non-dechlorinated sample. AGP requires a sodium thiosulfate spiked blank and a non-dechlorinated sample to accompany the regular lab blank and dechlorinated sample. AGP blanks and bioassay controls are spiked with the same amount of sodium thiosulfate that was added to the sample.

5.9. Place the used pipet in the disposable glass container. Place dirty glassware on the "to be washed" cart.

6. DATA ARCHIVAL

6.1. Use a black, waterproof pen for all bench sheets and logbooks.

6.2. Record information in Bioassay Bench Sheets logbooks.

6.3. To correct raw data entries, place a single line through the incorrect entry, write the corrected entry near the error, date and initial the correction. Do not overwrite entries.

6.3.1. The corrected entry is written as near its appropriate space as possible or else in the comment box on the appropriate bench sheet.

6.3.2. If the correction requires an explanation, write a comment and reference the error. Initial and date the explanation. Do not attempt to put all information (correction and comments) into a small space.

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6.4. Use sequential alphabetical annotation to identify errors and corresponding comments (use A for first error and use A for corresponding explanatory comment; use B for second error, etc.).

7. QUALITY CONTROL

7.1. Refer to Laboratory Quality Assurance Manual for corrective action and handling out-of-control data.

7.2. If a problem occurs during the sample processing or testing, the following steps are performed: 1) Lab supervisor is notified. 2) Client is notified (client makes decision for additional testing). 3) Section administrator is notified. 4) A non-conformance report (NCR) is submitted describing the problem and the corrective action.

7.2.1. To create NCR: open LIMS and go to Laboratory/Administrative/Non-Conformance Report. Refer to https://floridadep.gov/dear/quality-assurance/content/dep-sops for sample collection and preservation, and the Laboratory Quality Manual for corrective action and handling out-of-control data.

8. SAFETY/HAZARDOUS WASTE MANAGEMENT

8.1. Proper laboratory protection, including lab hood or ventilation system, lab coat, gloves, and safety glasses, is required when working with chemicals and unprocessed samples.

8.2. Refer to Laboratory Quality Assurance Manual for sample disposal.

8.3. Refer to the Laboratory Health and Safety Manual and Hazardous Waste Management.

9. REFERENCES

9.1. Standard Methods Online Edition (1997), Method 4500-Cl Chlorine (Residual) G DPD Colorimetric Method.

9.2. DEP SOP LB-035, Calibration of Lab Thermometers Using a Constant Temperature Calibration Bath.

9.3. DEP SOP TA-06.13, Thermometer Calibration and Use.

9.4. DEP SOP TA-06.22, Measuring Total Residual Chlorine using the Hach® Pocket Colorimeter™ and Colorimeter™ II Test Kits.

9.5. DEP Laboratory Quality Assurance Manual

9.6. DEP Health and Safety Manual

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APPENDIX OF SIGNIFICANT CHANGES

12/21/2007 Added Scope and Application; Summary of Method and Appendix of Changes. Moved reference from title to Scope and Application.

02/11/2015 Formatted for 508 compliance.

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