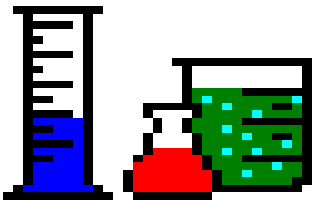
Hydrocure S.A.



SODIUM CHLORITE
Handbook

Manufacturing
Sodium chlorite is made by the partial reduction of sodium chlorate to chlorine dioxide and the chlorine dioxide's subsequent conversion to sodium chlorite in an alkaline solution in the presence of hydrogen peroxide. An excess of both peroxide and caustic is present to ensure complete reaction as follows:

$2ClO_2 + H_2O_2 + 2NaOH \rightarrow 2NaClO_2 + 2H_2O + O_2$

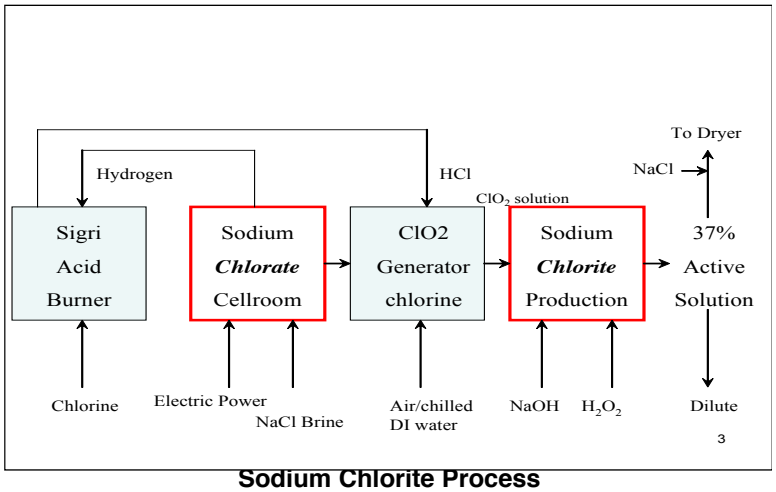
Under these conditions, ClO_2 is also known to disproportionate to chlorite and chlorate as follows:

$2ClO_2 + 2OH^- \rightarrow ClO_2 + ClO_3^- + H_2O$

Any chlorine present would be in the hypochlorite form because of the strong alkaline conditions. Hypochlorite will react with hydrogen peroxide to yield chloride as follows:

$OCl^- + H_2O_2 \rightarrow Cl^- + O_2 + H_2O$

Because there is no source of ammonia or nitrogen in the process, chloramines will not be present as an impurity.



Sodium Chlorite Process

Sodium Chlorite End Uses

Sodium Chlorite Applications
Hydrogen Sulfide Odor Control. In the ionic form, sodium chlorite is almost exclusively reactive to hydrogen sulfide, and does not react with ammonia or form other chlorinated compounds.

Copper Cyanide Destruction. Copper Cyanide, which is formed in the recovery process for copper metal, is the only cyanide that catalyzes sodium chlorite making it an effective option.

Chlorine Dioxide Applications
Chlorine dioxide has a variety of commercial uses. In all of the following applications, sodium chlorite is used in the generation of the chlorine dioxide.

Treatment of Potable Water. Chlorine dioxide has long been used to remove tastes and odors in potable water. It is also used in the disinfection of water, particularly where trihalomethanes are of concern. Chlorine dioxide also oxidizes soluble manganese and iron compounds, eliminating a major cause of stained sinks and fixtures.

Bacterial Control in Oil Wells and Petroleum Systems. A patented use for chlorine dioxide is to treat water that is or will be contaminated with petroleum oil. Many such mixtures contain sulfite- reducing bacteria that form undesirable sulfide compounds. Chlorine dioxide oxidizes these sulfides to sulfates, while preventing or substantially retarding the formation of colloidal sulfur.

Bacterial Slime Control in Paper Mills. Some of the major operational problems in paper and paperboard production are caused by proliferation of microbiological organisms in white water and stock systems. As an oxidizing biocide, chlorine dioxide, can control microbiological growths, which cause paper malodors and discoloration, deterioration of felts, equipment corrosion, fouling of pipes and showers, and paper quality problems such as spots, specks and holes.

Food Processing. Chlorine Dioxide is highly effective for microbiological control in organically contaminated flume waters. Control of microbiological growths is necessary to ensure food product safety and quality. Chlorine dioxide has also found an application in cherry bleaching.

Algae Control in Cooling Towers. Chlorine dioxide efficiently and economically controls microbiological growths in industrial cooling waters under conditions unfavorable to chlorine. It is the primary microbiological control agent in systems with high pH, ammonia-nitrogen contamination, or persistent slime problems.

Treatment of Wastes. Chlorine dioxide is used to disinfect sewage and plant wastes. It destroys phenolics, simple cyanides and sulfides by oxidation.

Stripping Dyestuffs from Textiles. Chlorine dioxide removes dyestuffs from textiles with a minimum of fiber degradation. However, its effectiveness depends upon the dyestuff and the type of fabric. This method also provides a good bottom for redying.

Upgrading of Fats and Oils. Chlorine dioxide is effective in the bleaching of fats and oils. The process is simple and low cost and since it eliminates the need for a filter medium, it produces a higher yield than other methods. (About 30% of the weight of the filter residue, which is generally discarded, is tallow.) Problems such as storage and handling of the filter medium and disposal of filter residues are eliminated as well.

Sodium Chlorite Product Grades

Hydrocure sodium chlorite is an excellent source of chlorine dioxide. Sodium chlorite is available in both dry and liquid forms. The dry forms contain approximately 80% Sodium chlorite and the solutions range from 7.5% to 40% sodium chlorite. Some of the chemical and physical properties of Hydrocure most popular product is:

Sodium Chlorite ($NaClO_2$)

31% Active Solution

COMPONENT	SPECIFICATIONS
Sodium Chlorite, wt% as $NaClO_2$	30.5 – 31.5
Sodium Chlorate, wt% as $NaClO_3$	0.5 max.
Sodium Chloride, wt% as NaCl	3.5 max.
Total Alkalinity as NaOH @ pH4, wt%	1.0 max.
Hydrogen Peroxide, wt% as H_2O_2	0.01 max.
Water (by difference), wt%	61 – 69.5

TYPICAL PROPERTIES

Appearance	Clear, slightly yellow liquid
Turbidity, NTU	15 max
Density, lb/gal @ 25°C	10.7

Typical properties are listed for information only, and are not to be considered as specification requirements. These items are not analyzed on a routine basis. Product meeting the specification test items will exhibit the listed typical properties.

Shipping Information

Technical Sodium Chlorite Solution 31.25 and 31% Active Sodium Chlorite Solution are available in 250 kgs HDPE drums, 1250 kgs non-returnable IBC tanks.

Safety and Handling

The following summary of health and safety information is not intended to be complete. For complete information, read the current Material Safety Data Sheet (MSDS).

Toxicological Properties

Sodium chlorite is toxic by ingestion. Sodium chlorite may cause anemia by oral exposure and has low toxicity by dermal exposure. Sodium chlorite solutions have an oral LD50 (rat) of 389 mg/kg. Solution products have a dermal LD50 (rabbit) of greater than 2 g/kg. Sodium chlorite can produce severe irritation or burns to the skin and eyes. Corneal damage can occur if not washed immediately from the eyes.

Personnel Protection

When there is a potential for contact while handling sodium chlorite solutions, chemical goggles, face shield, neoprene gloves, apron, and boots should be worn. A respiratory protection program must be followed whenever workplace conditions warrant the use of a respirator. Wear a NIOSH approved acid gas respirator with a dust/mist filter if any exposure is possible. Local exhaust is required where exposure to dust or mist might occur. If sodium chlorite is spilled on clothing, remove and wash contaminated clothing at once to avoid the potential of fire.

First Aid
Eyes: Immediately flush eyes with large amounts of water for at least 15 minutes while frequently lifting the upper and lower eyelids. Consult a physician immediately.

Skin: Remove contaminated clothing. Immediately flush exposed skin areas with large amounts of water for at least 15 minutes. Consult a physician if burning or irritation of the skin persists. Contaminated clothing must be laundered before reuse.

Ingestion: DO NOT induce vomiting. Drink large quantities of water. Consult a physician immediately. DO NOT give anything by mouth if the person is unconscious or having seizures.

Inhalation: Move patient to fresh air and monitor for respiratory distress. If coughing or difficulty in breathing develops, administer oxygen, and consult a physician immediately. In the event that breathing stops, administer artificial respiration and obtain emergency medical assistance immediately.

Notes to Physician: Chlorine dioxide vapors are emitted when this product contacts acids or chlorine. If these vapors are inhaled, monitor patient closely for delayed development of pulmonary edema, which may occur up to 48-72 hours post-inhalation.

Following ingestion, neutralization and use of activated charcoal is not indicated.

Storage and Handling
Keep container properly labeled and tightly closed

Avoid exposure to high temperatures during storage making sure it is below 212 F (100 C)

Store remote from other chemicals and combustible materials

Store in a covered area avoiding exposure to sunlight or ultraviolet light

Avoid heat, flames, sparks and any other sources of ignitions

Incompatibilities / Materials to Avoid: Acids, reducing agents, combustible material, oxidizing agents, hypochlorite, organic solvents and compounds, garbage, dirt, organic materials, household products, chemicals, soap products, paint products, vinegar, beverages, oil, pine oil, dirty rags, sulfur-containing rubber, or any other foreign matter.

Chlorine dioxide is formed on contact with acids, Thermal decomposition products include chlorine and oxides of sodium.

Spill and Leak Procedures
In the event of a spill or leak, remove all sources of ignition. W ear NIOSH approved positive pressure, self contained breathing apparatus with a chemically impermeable, fully encapsulated suit.

Sodium chlorite, dry, is a fire or explosion hazard if contaminated with combustible material. Clean up in a manner to avoid contamination. Lightly wet spilled material and then pick up, by using a clean, dry, scoop or shovel and placed into a clean, dry, container. Do not return spilled material to the original container. Isolate the recovery container outside or in a well ventilated area and hold for proper waste disposal. Do not seal the container. Flush any residual material with large quantities of water.

Sodium chlorite solution also becomes a fire or explosion hazard if allowed to dry and can ignite on contact with combustible material. Continue to keep damp. Contain spilled material by diking or absorbing with clay, or non-flammable commercial absorbents. Do not return spilled material to original container. Place in a clean container and isolate outside or in a well ventilated area. Do not seal the container. Flush any residual material with large quantities of water.

Disposal
Spill residues may be a hazardous waste. As a hazardous waste, it will be subject to the Land Disposal Restrictions and must be managed accordingly. As a hazardous waste solution or solid, it must be disposed of in accordance with local, state, and federal regulations in a permitted hazardous waste treatment, storage and disposal facility.

Method of Analysis

Analytical Methods presented here shall be limited to those methods used for quality control; not for field-testing. The following Hydrocure Standard Methods of Analysis is.

Determination of Sodium Chlorite Strength in Sodium Chlorite Products

Method Summary

Sodium chlorite assay is determined in sodium chlorite product samples by iodiometric titration of the iodine released when the samples are treated with potassium iodide and hydrochloric acid. The samples are titrated with a standard sodium thiosulfate solution.

Apparatus:

1. 250 ml Erlenmeyer flask.
2. 500 ml Class A Volumetric flask.
3. 20 ml Class A Volumetric pipet.
4. Analytical balance, 3 place.
5. 50 ml buret.

Reagents and Solutions:

1. Potassium Iodide, 5% solution, LaMarKa # VW-13.
2. 1.0 N Hydrochloric Acid, LaMarKa # VW-9.
3. 0.1 N Sodium Thiosulfate standard solution, Fisher cat # SS368-20.
4. Starch indicator solution, 5 gpl amylose in water, LaMarKa # VW-20.
5. Deionized water.

Procedure

1. Weigh sample (to the nearest 0.001 grams) into a 500 mL volumetric flask, according to the following table:

PRODUCT GRADE	TARGET WEIGHT
Solution 31.25	10. grams
31 % Active	8. grams
Solution 50	6.5 grams
Solid Flake	3. grams

2. QS to 500 ml and mix well.
3. Rinse a 20 ml Class A pipet with the above solution. Pipet 20 ml of the solution into a 250 ml erlenmeyer flask containing 100 ml of DI water.
4. Add40mlof5%KIandMIXWELL.(KI MUST be added before HCl.)
5. Add6.5mlof1NHClandmix.
6. Titrate with 0.1 N Na2S2O3 to a faint yellow color.
7. Add Starch indicator and continue the titration to a colorless endpoint. Record titer to the nearest 0.01 ml.

Calculations:

Wt %NaClO2 =
ml of Na2S2O3 x N x Dilution Factor x 2.2612
Sample Weight in grams Dilution Factor = (500/20) = 25
N = normality of Na2S2O3
simplified calculation:
Wt %NaClO2 = ml Na2S2O3 x 56.53 x N Sample Weight
gpl NaClO2 = Wt% NaClO2 x Specific Gravity x 10

Notes

1. Sodium chlorite is a very strong oxidizing reagent and as such is incompatible with strong reducing agents, finely powdered metals, phosphorus and acids!
2. Keep solid sodium chlorite away from combustible materials, heat, sparks and open flame!
3. Since potassium iodide will oxidize when exposed to air in acidic conditions, the starch endpoint color may return after the titration is actually completed. Therefore, record the ml of sodium thiosulfate used at the first clear endpoint.
4. KI **MUST** be added and mixed before 1.0 N HCl. If the HCl is added first, chlorine dioxide will gas off, and the strength will be reported lower than actual.
5. A reagent blank should be run periodically, to insure the purity of reagents. This will mainly be a check on the KI solution. It could possibly become oxidized with chlorine (turning it yellow) which will give erroneously high results.
6. If the alkalinity of the sample is unusually high, 10 ml of 1 N HCl may be needed, rather than 5 ml. The pH needs to be between 1 and 2 for the ClO2- to oxidize the I- completely. Following is a table showing the relationship between volume of 1.0 N HCl and pH, for a Solution 50 assay:

ml of 1.0 N HCl Added	pH	Assay: % $NaClO_2$
0	9.0	
0.5	6.0	
1.0	5.6	
1.5	5.6	
2.0	5.3	15.1%
2.5	5.2	
3.0	5.1	23.3 %
3.5	5.0	
4.0	4.9	31.6 %
4.5	4.2	
5.0	2.5	37.4 %

5.5	2.1	
6.0	1.9	37.4 %
6.5	1.8	Recommended Target
13.0	1.2	
20.0	1.0	
30.0	0.9	

7. Reaction that occurs when acid is added (KI already present):
   $4I^- + ClO_2^- + 4H^+ \rightarrow 2I_2 + Cl^- + 2H_2O$ Note that 4 electrons are transferred; thus, equivalent weight of sodium chlorite is molecular weight divided by 4.
8. Reaction that occurs during titration:
   $2S_2O_3^- + I_2 \rightarrow S_4O_6^= + 2I^-$ Note that 2 electrons are transferred; thus, equivalent weight of sodium thiosulfate is molecular weight divided by 2.
9. Reaction that occurs if acid is added
   BEFORE KI is added:
   $5NaClO_2 + 4HCl \rightarrow 4ClO_2\uparrow + 5NaCl + 2H_2O$ The chlorine dioxide will tend to gas out of solution, and thus will not be titrated. Results for $NaClO_2$ strength will be falsely low.
10. Reaction that occurs if titration is done too slowly, or if too much acid is added:
    $O_2 + 4I^- + 4H^+ \rightarrow 2H_2O + 2I_2$ The resulting free iodine is then titrated by thiosulfate, giving falsely high results.

Determination of Sodium Hydroxide and Sodium Carbonate in Sodium Chlorite Products

Method Summary
Sodium hydroxide and sodium carbonate are determined in sodium chlorite product samples by an acid/base titration of two samples (one of which has been treated with barium chloride to precipitate barium carbonate), using hydrochloric acid titrant. The difference between the two titrations determines the sodium carbonate present.

Apparatus
1. Two 250 ml Erlenmeyer flasks, with stoppers.
2. Analytical balance, 3 place.
3. Buret, 50 ml.

Reagents
1. 0.1 N Hydrochloric Acid, LaMarKa # VW-8.
2. Phenolphthalein indicator, 5 gpl in Methanol, LaMarKa # VW-12.
3. Deionized water.
4. Barium Chloride, 100 gpl, LaMarKa # VW-2.

Procedure

1. 1A. Solid Sodium Chlorite Sample:
   Weigh 10.0 gm into each erlenmeyer flask, record the weights to the nearest 0.001 gm, and label the flasks A and B.
2. 1B. Sodium Chlorite Solutions:
   Pipet 25 ml of sample into each Erlenmeyer flask, record the weights to the nearest 0.001 gm, and label the flasks A and B.
2. To flask A add 50 ml of DI water. Stopper and mix well.
3. To flask B add 40 ml of 10 % BaCl2. Stopper, mix well, and allow to sit for at least 3 minutes.
4. Add phenolphthalein indicator to each flask.
5. While swirling vigorously, titrate flask A with 0.1N HCl to the absence of pink; record titer to the nearest 0.01 ml.
6. While swirling virorously, titrate flask B with 0.1N HCl to the absence of pink; record titer to the nearest 0.01 ml. The B titer will be smaller than the A titer.

Calculations:

$$\% \text{ NaOH} = \frac{\text{ml B} \times \text{N} \times 4.000}{\text{Weight of Sample B in grams}}$$

$$\% \text{ } Na_2CO_3 = \frac{(\text{ml A} - \text{ml B}) \times \text{N} \times 10.5999}{\text{Average Weight of Samples A and B in grams}}$$

$$\% \text{ Total Alkalinity} = (\% \text{ } Na_2CO_3 \times 0.7547) + (\% \text{NaOH})$$

Notes

1. Sodium chlorite is a very strong oxidizing reagent and as such is incompatible with strong reducing agents, finely powdered metals, phosphorus and acids!
2. Keep solid sodium chlorite away from combustible materials, heat, sparks and open flame!
3. NaClO2 may degrade the indicator, and more may need to be added when the endpoint is approached.
4. Swirl flask vigorously during titration to minimize localized reaction of acid with chlorite:
   5NaClO2 + 4HCl → 4ClO2↑ + 5NaCl + 2H2O

Determination of Hydrogen Peroxide in Sodium Chlorite Products

Method Summary

Hydrogen peroxide is determined in sodium chlorite product samples by an iodimetric titration of the sample using a 0.1 N sodium hypobromite titration solution.

Apparatus:

1. 500 ml Erlenmeyer flask.
2. 10 ml volumetric pipet.
3. Analytical balance, 4 place.
4. 50 ml buret.

Reagents:
1. 0.1 Normal Sodium Hypobromite solution,
LaMarKa # VW-76.

Preparation:

1. Add 1 Liter DI water to a 2 Liter volumetric flask.
2. Add 17 ml of 50% membrane NaOH.
3. Add 5.8 ml reagent liquid Bromine.
4. Stopper and mix well, until reaction ceases.
5. QS to 2 Liters, mix well, and store in amber bottle.

Standardization:

1. dd 150 ml DI water to a 500 ml erlenmeyer flask.
2. Pipet 25 ml of NaOBr solution into flask.
3. Add 40 ml of 5% KI (or 2 gm KI crystals).
4. Add 8 ml glacial acetic acid, and 5 drops starch indicator.
5. Titrate with standard 0.1 N Na2S2O3 to a clear endpoint.
6. Record titer, and calculate as follows:
   Normality of NaOBr = ml Na2S2O3 x Normality ml NaOBr
7. If the normality of the NaOBr is more than 1% too strong (over 0.101 N), adjust it as follows:
   mlDIwatertoadd = (1975xN)-1975
2. Starch indicator solution, 5 gpl, LaMarKa # VW- 20.
3. Deionized water.
4. Potassium Iodide, 5% (w/v), LaMarKa # VW-13.

Procedure
Blank Titration:

1. Add approximately 150 ml of deionized or equivalent water to a 500 ml erlenmeyer flask.
2. Add20mlof5%KIsolution(or1gramofKI crystals).
3. Add 2 ml of starch indicator.
4. Titrate the sample using the 0.1 N NaOBr titration solution by adding it dropwise.
5. When a light blue color appears and is permanent the titration is complete.
6. Record the number of mls of 0.1 N NaOBr used to titrate the blank.

Sample Titration:

1. Add approximately 150 ml of deionized or equivalent water to a 500 ml erlenmeyer flask and tare the flask.
2. Add20mlof5%KI.
3. Add 2 ml of starch indicator.
4. Pipet 10 ml of sample into flask, holding the tip of the pipet below the surface of the liquid. If sample is a solid flake, weigh in 10 grams of sample. Record sample weight.

5. Titrate the sample using the 0.1 N NaOBr titration solution by adding it dropwise.
6. When a light blue color appears and is permanent the titration is complete.
7. Record the number of mls of 0.1 N NaOBr used.

Calculations:
10 ml Liquid Sample:
%H2O2 =
(ml of NaOBr - ml Blank) x Normality x 0.170074
Specific Gravity Solid Flake Sample:
%H2O2 =
(ml of NaOBr - ml Blank) x Normality x 1.70074
Sample Weight

Notes
1. Sodium chlorite is a very strong oxidizing reagent and as such is incompatible with strong reducing agents, finely powdered metals, phosphorus and acids!
2. Keep solid sodium chlorite away from combustible materials, heat, sparks and open flame!
3. Hydrogen peroxide is unstable in sodium chlorite solutions and will react with other contaminants in the sodium chlorite sample. For this reason, the samples should be analyzed for hydrogen peroxide as soon as possible.
4. Handle liquid bromine under a fume hood using appropriate protection.
5. Reaction during standardization of NaOBr:
   $BrO^- + 2I^- + 2H^+ \rightarrow Br^- + I_2 + H_2O$ Hypobromite oxidizes iodide. A two electron transfer.
   $I_2 + 2S_2O_3^= \rightarrow 2I^- + S_4O_6^=$ Thiosulfate reduces iodine. A two electrontransfer.
6. Reaction during analysis of H2O2:
   $H_2O_2 + I^- \rightarrow$ No Rx in basic solution. Solution stays clear.
   $BrO^- + H_2O_2 \rightarrow Br^- + O_2 + H_2O$
   Hypobromite oxidizes peroxide. A two electron transfer.
   $BrO^- + 2I^- + H_2O \rightarrow Br^- + I_2 + 2OH^-$ Hypobromite oxidizes iodide, forming iodine,which forms a blue complex with starch. A two electron transfer.

Determination of Sodium Chlorate and Sodium Sulfate in Sodium Chlorite by Ion Chromatorgraphy with Conductivity Detection

Method Summary

Chlorate and sulfate levels are determined in sodium chlorite by ion chromatography, using an IONPAC AS9-SC separator column. Sodium chlorite is injected into a DIONEX 2000i/sp ion chromatograph after dilution with DI water. Concentrations of chlorate and sulfate are determined by comparison with response curves and calculated as sodium chlorate and sodium sulfate.

Apparatus

1. Dionex Model 2000i/SP ion chromatograph or equivalent.
2. Dionex Ionpac AS-9 separator column.
3. Dionex Ionpac AG-9 guard column.
4. Dionex AMMS-II Micro Membrane Suppressor.
5. Nelson chromatography, electronic data handling system.
6. 100 ml volumetric flasks.
7. Disposable transfer pipet.
8. 3 ml plastic disposable syringes.
9. Analytical balance, 4 place.

Reagents

1. Milli-Q Deionized water. (Low conductivity, free from sulfate and chlorate.)
2. Sodium Carbonate, ACS Reagent grade. Na2CO3. Fisher cat # S263-500.
3. Sodium Bicarbonate, ACS Reagent grade. NaHCO3. Fisher cat # S233-500.
4. Concentrated Sulfuric Acid, ACS Reagent grade. Fisher cat # A300S-212.
5. Stock Eluent Concentrate: Into a 1 liter volumetric flask, weigh 21.978 grams of Na2CO3 and 6.301 grams of NaHCO3, qs to 1000 ml. Mix thoroughly, store in a labeled plastic container. (200 mM Na2CO3/75 mM NaHCO3)
6. Working Eluent for chromatograph: Pipet 20 ml of stock eluent into a 2 liter volumetric flask (2mM Na2CO3 and 0.75 mM NaHCO3). qs to 2000 ml with Milli-Q DI water.
7. 0.025 N sulfuric acid: To 4 liters Milli-Q deionized water, add 2.8 ml of concentrated sulfuric acid. Mix thoroughly.
8. Sodium Chlorate, ACS Reagent grade. NaClO3. Baker cat # 3616-01.
9. Sodium Sulfate, ACS Reagent grade. Na2SO4. Fisher cat # S421-500. (Alternative: Standard solution 50.0 ± 0.5 mg/l as SO4 Hach cat # 2578-49)

Procedure

Instrument parametes:

Sample size:	50 µl
Columns:	Ionpac AG-9 Guard column Ionpac AS-9 Separator Column
Eluent:	2.0mM Na2CO3/0.75mM NaHCO3 Flow rate= 2.0 m/min
Pressure:	850-1400 psig
Suppressor:	AMMS II Micromembrane Suppressor
Regenerant:	0.025N H2SO4 Flow rate= 7-10 ml/min
Sensitivity:	3µs

1. Start the ion chromatograph and ensure that proper flows of eluent and regenerant are established. Allow the instrument to equilibrate and ensure that a stable baseline is established. Select the appropriate detector output range setting.
2. Weigh sample (to the nearest 0.001 grams) into a 500 ml volumetric flask, according to the following table:

PRODUCT GRADE	TARGET WEIGHT
Solution 31.25	10 grams
31 % Active	8 grams
Solution 50	6.5 grams
Solid Flake	3 grams

3. QS to 500 ml and mix well.
4. Rinse a 0.5 ml Class A pipet with the above solution. Pipet 0.5 ml of the solution into a 100 ml Erlenmeyer flask containing 50 ml of DI water, qs to 100 ml. Mix well.
5. Prepare and inject a Milli-Q or equivalent water blank into the ion chromatograph.
6. Prepare and inject 5 ml of the diluted sample in to the ion chromatograph and press the start button on the Nelson box.
7. Quantitation of sodium chlorate/sodium sulfate will be accomplished by comparison of sample peak heights to standard peak heights OR via the Nelson integrator data system which also uses peak height. If using the Nelson, use a "Nelson dilution factor" of 100,000 and a "Nelson sample weight" of Wt (from step 2 above) divided by specific gravity. For flake, use the weight from step 2 above for "Nelson sample weight."

Calculations

Peak Height Single Point Calibration:

$$\text{ppm } NaClO_2/Na_2SO_4 = \frac{\text{Sx Pk Ht} \times \text{Std Conc.} \times 100{,}000 \times \text{Sp Gr}}{\text{Std pk ht} \times \text{Sx wt}}$$

where: Sx Pk Ht = sample peak height,
Std Conc = standard concentration (ppm),
Sp Gr = specific gravity of sample,
Std Pk Ht = standard peak height,
Sx wt = actual sample weight in grams, and
100,000 = dilution factor.

Nelson Calibration Curve:

$$\text{ppm } NaClO_2/Na_2SO_4 = \frac{\text{Cal Conc x 100,000}}{\text{Nelson Sx wt}}$$

where:
Cal Conc = ppm $NaClO_2$ or Na_2SO_4 concentrations from calibration curve
100,000 = Nelson dilution factor,
Nelson Sx wt = actual sample weight / specific gravity (for liquid samples), or
Nelson Sx wt = actual sample weight (for flake samples).

Notes

1. Nitrate and other anions may elute at nearly the same time as chlorate. If the procedure is adapted to other samples, some sort of screening will be necessary to assure that no interfering substances are present.
2. Sodium chlorite is a very strong oxidizing reagent and as such is incompatible with strong reducing agents, finely powdered metals, phosphorus and acids!
3. Keep solid sodium chlorite away from combustible materials, heat, sparks and open flame!
4. Do not use hydroxide eluents or hydroxide to adjust the pH of any eluent higher than pH 11 to effect selectivity changes. Using eluents with pHs greater than 11 may cause irreversible damage to the IonPac AS9- SC/AG9-SC Columns.

Standard Preparation

1. Stock standard (500 mg/l NaClO3, 740 mg/l Na2SO4): On an analytical balance weigh 0.25 grams of dry sodium chlorate into a weighing boat. Then weigh 0.37 grams of dry sodium sulfate into a weighing boat. Transfer the salts to a 500 ml volumetric flask, rinse boats into flask, QS with Milli-Q DI water, and mix well. Store in a labeled plastic bottle.
2. Working standard: Into a 100 ml volumetric flask about 2/3 full of DI water, micropipet 100 μl of the stock standard. QS and mix well. This standard contains 0.50 mg/l Na2ClO3 and 0.74 mg/l Na2SO4.
   (1 ml of 50 mg/l Na2SO4 soln, qs to 100 ml, gives 0.739 mg/l Na2SO4, if solid Na2SO4 is not available.)
3. Analyze the working standard three times, calculate and average the peak heights for both NaClO3 and Na2SO4. Store and save the averages in Nelson method SO4-9B.