



Sodium Chlorite Upgrading Tallow & Grease w/Chlorine Dioxide

Chlorine dioxide bleaching of tallow, the fat extracted from meat scraps and dead animals, is now regular practice in rendering plants in various parts of the United States. The advantages of the process are simplicity, low cost and higher yield. The process produces sufficient financial returns to amortize the cost of the installation in a year or less, even at relatively low production rates.

Renderers and soapers who do their own bleaching will find that the chlorine dioxide process improves yield, saves time and labor, and allows more effective use of storage facilities. Renderers can employ the principle of mixed cooking, increasing production of fancy tallow and upgrading grease. Because chlorine dioxide bleaching eliminates the need for a filter medium, there is an obvious saving. About 30 percent of the weight of the filter residue, which is generally discarded, is tallow. Also, such problems as the storage and handling of filter medium and the disposal of filter residues are eliminated.

Extensive experience with chlorine dioxide bleaching of tallow has shown that this is a safe chemical bleaching process. The chlorine dioxide converts color bodies to lighter colored ones without substantial attack on natural antioxidants in the oil which protect it against aging and rancidity.

Chlorine Dioxide Bleaching

Acid activation of technical sodium chlorite is the most practical process for generating chlorine dioxide for use in bleaching tallow. The following description applies to the use of acids in general, and to sulfuric acid in particular, for this purpose.

Most organic and inorganic acids, and some acid salts, will activate sodium chlorite to generate chlorine dioxide. It is chiefly a matter of pH. The pH must be below 4 for economical generation of chlorine dioxide gas.

The fat is most conveniently treated in a conventional cone-bottomed cylindrical iron tank, where the height is greater than the diameter. The fat is heated to about 0°C (140°F) while agitated with air or steam to prevent local overheating. It should then be degummed by washing with a weak acid solution, or with a solution of trisodium phosphate. The dirt, sludge and mucilaginous material are settled out, and drawn off from the cone bottom.

Fresh clean water is run into the tallow until the weight of water in the base of the tank is about 10% of the weight of the tallow. The temperature is again raised to 60°C while the tallow and water are agitated with air or steam. A 20% aqueous solution of sulfuric acid is poured into the tallow from the top of the tank followed by a 20% aqueous solution of technical sodium chlorite.

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The amount of chlorite used is 0.1% of the weight of the tallow and the weight of 66° Baumé sulfuric acid required is 0.025%. The addition of this amount of acid lowers the pH of the water layer to 2 or less. This amount of chlorite and acid lowers the color of prime tallow (Fatty Acid Color [FAC] 13 or 11A and Free Fatty Acid [FFA] content 4% or less) to the color of fancy tallow (FAC 7 or less).

After addition of the chemicals, agitation with air or steam is continued for 30 or 45 minutes, when the bleaching process should be complete. The pH of the water layer may be checked with the indicator metacresol purple, which changes from yellow to red as pH is reduced from 2.8 to 1.2. Another indicator, bromophenol blue, changes from blue to yellow as pH is reduced from 4.6 to 3.

After the bleach is completed, a small quantity of weak caustic soda solution (8° Baumé) is added to raise the pH of the water layer to approximately 8. A convenient indicator is phenol red, which changes from yellow to red as pH rises from 6.8 to 8.4. Failure to bring the pH value of the water layer back to 8 may result in reversion of tallow color during the drying period or later due to reaction between residual acid and the iron of the storage tank. The air or steam is then turned off. The water is allowed to settle to the bottom of the tank and is drawn off. The bleached tallow is dried to specification and allowed to stand briefly to allow residual sludge to settle to the bottom where it can be removed. Tallows or greases with a high FFA content may be bleached with technical sodium chlorite alone without the addition of any other activating agent. For example, some of the acids in brown grease having an FFA content of 25% to 50% are water-soluble. Agitating the grease with hot water as described produces a water layer having a pH below 5. Subsequent treatment with technical sodium chlorite gives a bleached

grease which makes chipped soap with a lighter color and much better odor than soap made from yellow grease.

For such darker tallows and greases, more than 0.1% of chlorite by weight may be required. In no case, however, should more than 0.4% of chlorite by weight be used, as this may cause over-bleaching.

This acid activation method gives an excellent bleach and it has the advantage of simplicity since no special equipment is required. Since the reaction takes place at a pH below 4, special care must be taken to neutralize any remaining traces of acid after the bleach to avoid both color reversion and corrosion of outlet pipes and valves.

Determining Effectiveness of Chlorine Dioxide as a Bleach

Acid activation can be carried out in the laboratory by reducing the quantities of fat, water and chemicals to laboratory scale and following the directions as given above. It's a simple way to determine the effectiveness of chlorine dioxide as a bleach for liquid fats, oils, waxes and other liquids.

After setting up the apparatus as shown (Figure 1), heat the oil to the bleaching temperature (about 60°C). Turn on the air flow sufficiently to cause moderate agitation in the generator and in the oil tube. As a safety precaution when operating the generator, be sure to have an air stream passing through it before, during and after the addition of acid.

From the separatory funnel, carefully add sulfuric acid, a few drips at a time. Soon the chlorite solution in the generator will become saturated with chlorine dioxide gas. The excess, diluted with air, will then continue to

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pass over into the tube where it will bubble up through the hot oil and escape from the open top.

Because excess chlorine dioxide gas will escape out of the oil tube, the whole operation must be conducted under a hood with a good draft. Upon completion of the procedure, after the acid is shut off, keep the air flowing until the solution in the generator is colorless. Dispose of the generator solution by flushing to the sewer or drain with large quantities of water.

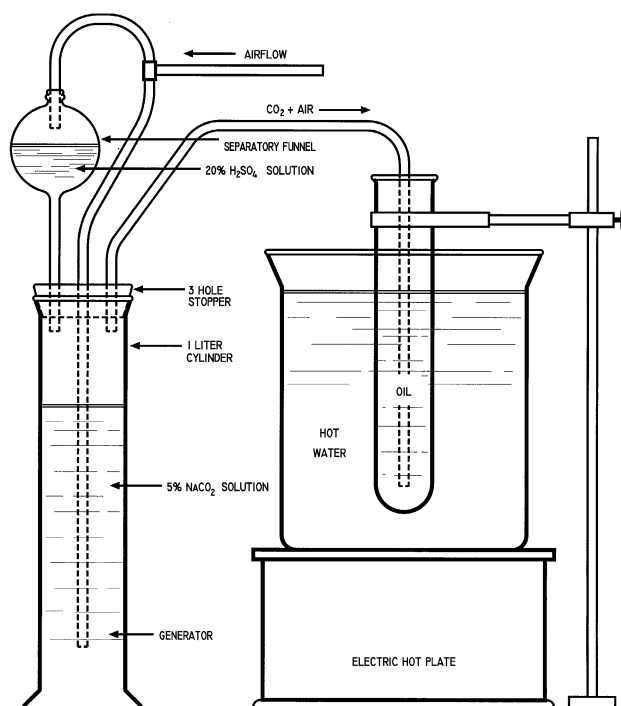


Figure 1
Laboratory Apparatus

While this process, as described, is mainly qualitative, it enables the operator to determine quickly whether the oil or other liquid under

observation can be bleached with chlorine dioxide.

Safety and Handling

The following summary of health and safety information is not intended to be complete. For complete information, read the current Safety Data Sheet (SDS). To obtain a current SDS, contact OxyChem Technical Services Department.

Toxicological Properties

Sodium chlorite is toxic by ingestion. Sodium chlorite may cause anemia by oral exposure and has low toxicity by dermal exposure. OxyChem sodium chlorite has an oral LD₅₀ (rat) of 165 mg/kg. Sodium chlorite has 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 handling sodium chlorite solutions, chemical goggles, face shield, neoprene gloves, apron, and boots should be worn. Wear a NIOSH/MSHA approved acid gas respirator with a dust/mist filter if any exposure is possible. Additionally, for dry sodium chlorite, wear a chemically impervious suit. 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.

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Consult a physician if burning or irritation of the skin persists. Contaminated clothing must be laundered before re-use.

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 cough 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

Do not contaminate sodium chlorite with incompatible materials such as dirt, organic matter, oxidizers, reducing agents, chemicals, soap products, solvents, acids, paint products, or combustible materials. Do not store or transport sodium chlorite with incompatible materials. Contamination may start a chemical reaction with generation of heat and emission of chlorine dioxide (a poisonous, explosive gas). A fire or explosion may result. Rinse empty containers thoroughly with water and dispose of in accordance with label instructions.

Dry sodium chlorite. Do not expose to moisture during storage. Store in the original container, in a cool, dry, well ventilated area away from direct sunlight.

Always replace cover tightly. Mix only into water using a clean, dry metal scoop reserved for this product alone.

Keep away from flame or any burning material (such as a lighted cigarette). If fire occurs, extinguish with plenty of water. Cool any unopened drums near the fire by spraying water on them.

Sodium chlorite solutions. Store in clean, closed, non-translucent containers. Exposure to sunlight or ultra-violet light will reduce product strength.

Do not allow solution to evaporate to dryness; this product becomes a fire or explosion hazard if allowed to dry and can ignite in contact with combustible materials.

Spill and Leak Procedures

In the event of a spill or leak, remove all sources of ignition. Wear NIOSH/MSHA approved positive pressure, self-contained breathing apparatus with a chemically impermeable, fully encapsulated suit. Follow OSHA regulations for respirator use (see 29 CFR 1910.34).

Sodium chlorite, dry, is a fire or explosion hazard if contaminated with combustible material. Clean up in a manner to avoid contamination. Spilled material should be picked 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, soil or non-flammable

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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 defined in 40 CFR 261. The EPA hazardous waste designation for dry sodium chlorite waste would be D001 and sodium chlorite solution waste would have the waste designation of D002. As a hazardous waste, it is subject to the Land Disposal Restrictions under 40 CFR 268 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.

Shipping Information

Technical sodium chlorite is available in 100 lb. drums. Technical sodium chlorite solution 50 is available in tank trucks. Technical Sodium Chlorite Solution 31.25 is available in 55 gallon drums, 275-gallon non-returnable totes and tank trucks.

Further Information

More detailed information on sodium chlorite is available on request through the OxyChem Technical Service Department. Call or write:

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Post Office Box 12283
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