MATERIAL SAFETY DATA SHEET

PureCide® E

This MSDS is supplied by PureLine Treatment Systems as a service to clients.

SECTION 1 – CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PureLine Treatment Systems, LLC
1672 McGaw Avenue
Irvine, CA 92614
Phone: (949) 757-0280
Fax: (949) 757-0282

PureCide® E
EPA Reg. No. 5382-45-72852

Product Name: PureCide® E
Major Update: 01/24/06
CAS#: 7758-19-2
MSDS Code: PureLine PureCide® E

Chemical Name: Sodium chlorite, sodium chlorite solution

Product Use: Generation of chlorine dioxide for use as a disinfectant or for use as an oxidant. Bleaching of textiles, wood pulp bleaching, water treatment as biocide for control of microorganisms and algae, oxidation of sulfides in wastewater, bleaching and deodorising of fats and oils, and odor control. PureCide® E solution is also used in PureLine’s proprietary electrochemical ClO₂ generation systems.

Emergency Contact:
CHEMTREC 800-424-9300 (US/N America) - 703-527-3887 (outside US-collect calls accepted)

SECTION 2 – COMPOSITION / INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>% Range</th>
<th>CAS NO.</th>
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<tbody>
<tr>
<td>Sodium Chlorite</td>
<td>15-34%</td>
<td>7758-19-2</td>
</tr>
<tr>
<td>Sodium Chloride</td>
<td>1 - 6%</td>
<td>7647-14-5</td>
</tr>
<tr>
<td>Sodium Chlorate</td>
<td>0 - 3%</td>
<td>7775-09-9</td>
</tr>
<tr>
<td>Sodium Sulfate</td>
<td>0 - 2%</td>
<td>7757-82-6</td>
</tr>
<tr>
<td>Water</td>
<td>59-74%</td>
<td>7732-18-5</td>
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</tbody>
</table>

* Denotes chemical subject to reporting requirements of Section 313 of Title III of the 1986 Superfund Amendments and Reauthorization Act (SARA) and 40 CFR Part 372
SECTION 3 – HAZARD IDENTIFICATION

EMERGENCY OVERVIEW
Clear, water white to slightly yellow liquid, slight chlorine odor
DANGER! Corrosive. Causes skin and eye irritation or burns.
Harmful if swallowed. Causes digestive tract burns.

POTENTIAL HEALTH EFFECTS

INHALATION
Breathing of vapor or mist is possible if this material is heated or sprayed. Breathing this material causes irritation of the throat and lungs with cough and difficult breathing.

SKIN
Causes severe skin irritation with redness, and itching or burning feeling, and/or swelling of the skin. May cause skin damage. Note: May cause skin burns and permanent skin damage.

EYE
Causes severe eye irritation with tearing, redness, or a stinging or burning feeling. May cause swelling of the eyes with blurred vision. Can injure eye tissue. Effects may become more serious with repeated or prolonged contact. Note: May cause burns and permanent injury to eye tissue.

INGESTION
Swallowing this material may be harmful or cause death. Harmful effects include burns and permanent damage to the digestive tract, including the mouth, throat, stomach and intestines. Symptoms may include severe abdominal pain and vomiting of blood. Blood loss through damaged tissue can lead to low blood pressure and shock.

SIGNS AND SYMPTOMS OF EXPOSURE
Depending upon level and duration of exposure, other possible signs and symptoms from breathing, swallowing, and/or entry of this material through the skin may include nosebleeds, hoarseness, sore throat, wheezing, cough with phlegm, bronchitis, tightness of the chest, pulmonary edema (high levels) irritation of the nose, throat, airways, and lungs with cough and difficult breathing, burns or ulceration of the gastrointestinal tract, including stridor, drooling, and vomiting.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE
Preexisting disorders of the following organs or systems, which may be aggravated by exposure to this material include: respiratory system (including asthma and other breathing disorders), gastrointestinal system, skin and blood (anemia, G6PD deficiency)

EFFECTS FOLLOWING REPEATED EXPOSURE
This material may cause the following effects: respiratory tract damage (nose, throat, airways), lung damage, gastrointestinal damage, and skin damage. Observations in animal studies include: blood disorders and male reproductive effects. The relevance of
these observations to humans is not clear at this time.

SECTION 4 – FIRST AID MEASURES

INHALATION
Remove individual to fresh air and get immediate attention. If breathing is difficult, give oxygen. If breathing stops, give artificial respiration.

SKIN
Wash exposed skin well with plenty of soap and water. Remove contaminated clothing and shoes. Wash clothing and thoroughly clean shoes before reuse. If symptoms develop, get medical attention.

EYES
Hold the eyelids apart and flush the eye gently with a large amount of water for at least 15 minutes. Get immediate medical attention.

INGESTION
Have person drink a glass of water immediately if able to swallow. Get immediate attention. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person.

NOTES TO PHYSICIAN
Chlorine dioxide vapors are emitted when this product contact 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.

See Section 11 for Toxicological Information

SECTION 5 – FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Flash Point</td>
<td></td>
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<tr>
<td>Flammable Limits (Lower)</td>
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</tr>
<tr>
<td>Flammable Limits (Upper)</td>
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</tr>
<tr>
<td>Auto Ignition Temperature</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Extinguishing Media</td>
<td>Not applicable-Choose extinguishing media suitable for surrounding materials.</td>
</tr>
</tbody>
</table>

FIRE FIGHTING INSTRUCTIONS
Approach fire from upwind to avoid hazardous vapors and toxic decomposition products. Use flooding quantities of water as fog or spray. This product becomes a fire or explosion hazard if allowed to dry, so use water spray to keep fire-exposed containers cool. Extinguish fire using agent suitable for surrounding fire.
SECTION 6 – ACCIDENTAL RELEASE MEASURES

Isolated spill area and deny entry to unnecessary or unprotected personnel. Remove all sources of ignition, such as flames, hot glowing surfaces or electric arcs. Stop source of spill as soon as possible and notify appropriate personnel. Cleanup personnel must wear proper protective equipment (refer to Section 8). Notify all downstream water users of possible contamination.

Create a dike or trench to contain all liquid material. Spill materials may be absorbed using clay, soil or non-flammable commercial absorbents. Continue to keep damp. If allowed to dry, dried material can ignite in contact with combustible materials.

This product may represent an explosion hazard if it contacts acids or chlorine. If such contact is possible, evacuation procedures must be placed into effect. Evacuate all non-essential personnel. Hazardous concentrations in air may be found in local spill area and immediately downwind.

Do not place spill materials back in their original container. Containerize and label all spill material properly. Decontaminate all clothing and, if permitted, the spill area using strong detergent and flush with large amounts of water.

For all transportation accidents, call CHEMTREC at 800/424-9300.

SECTION 7 – HANDLING AND STORAGE

HANDLING
Do not get in eyes, or on skin, or clothing. Do not taste or swallow. Avoid breathing mists or fumes. Do not handle with bare hands. This product becomes a fire hazard if allowed to dry. Remove and wash contaminated clothing to avoid fire.

Carefully monitor handling, use and storage to avoid spills and leaks. Follow protective controls set forth in Section 8 when handling this product. Do not eat, drink, or smoke in work area. Wash hands prior to eating, drinking, or using restroom.

This solution contains sodium chlorite. Dry sodium chlorite is a strong oxidizing agent. Mix only into water. Contamination may start a chemical reaction with generation of heat, liberation of hazardous gases (chlorine dioxide a poisonous, explosive gas), and possible fire and explosion. Do not contaminate with garbage, dirt, organic matter, household products, chemicals, soap products, paint products, solvents, acids, vinegar, beverages, oils, pine oil, dirty rags, or any other foreign matter.

STORAGE

STORAGE CONDITIONS
Store in closed, properly labeled tanks or containers. Do not store at temperatures above 100°C (212°F). Do not remove or deface labels or tags. Do not expose to direct sunlight or ultraviolet light. Do not drop, roll or skid drums. Keep drums upright.
Avoid contact with combustible or readily oxidizable materials; sulfur-containing rubber.

**INCOMPATIBLE MATERIALS FOR STORAGE OR TRANSPORT**
Acids, reducing agents, combustible material, oxidizers (such as hypochlorites), paints, sulfur and solvents.

<table>
<thead>
<tr>
<th>SECTION 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION</th>
</tr>
</thead>
</table>

**ENGINEERING CONTROLS**

**VENTILATION**
Local exhaust ventilation is recommended if vapors, mists or aerosols are generated. Otherwise, use general exhaust ventilation.

**PERSONAL PROTECTIVE EQUIPMENT**

**EYE AND FACE PROTECTION**
Wear chemical goggles. A face shield should be worn in addition to goggles where splashing or spraying is possible.

**SKIN PROTECTION**
Wear Neoprene gloves, boots and apron.

**RESPIRATORY PROTECTION**
Wear NIOSH/MSHA approved acid gas respirator plus dust/mist pre-filters if any exposure to dust or mist is possible.

**GENERAL**
Safety shower and eye wash station must be provided in the immediate work area. Protective equipment and clothing should be selected, used, and maintained according to applicable standards and regulations. For further information, contact the clothing or equipment manufacturer.

**EXPOSURE GUIDELINES**
None established

<table>
<thead>
<tr>
<th>SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES</th>
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<tbody>
<tr>
<td>Chemical Formula</td>
</tr>
<tr>
<td>Molecular Weight</td>
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<tr>
<td>Appearance and Odor</td>
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<tr>
<td>Specific Gravity</td>
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<tr>
<td>Vapor Pressure</td>
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<td>-----------------</td>
</tr>
<tr>
<td>Density</td>
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<tr>
<td>PH @ 25°C</td>
</tr>
<tr>
<td>Volatiles, Percent By Volume</td>
</tr>
<tr>
<td>Crystallization Point</td>
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<tr>
<td>Solubility In Water</td>
</tr>
</tbody>
</table>

**SECTION 10 – STABILITY AND REACTIVITY**

**CHEMICAL STABILITY**

Stable

**CONDITIONS TO AVOID**

Temperature above 175°C (347°F) (dry material)
Evaporation to dryness; dried material can ignite upon contact with combustibles.
Exposure to sunlight or ultraviolet light can reduce product strength.

**INCOMPATIBILITY WITH OTHER MATERIALS**

Acids, reducing agents, combustible materials, oxidizers (such as hypochlorites),
sulphur-containing rubber, dirt, soap, solvents, paints.
Contamination with acids, chlorine or organic materials. Avoid contact with heat or flame source.

**HAZARDOUS DECOMPOSITION PRODUCTS**

Explosive and toxic chlorine dioxide gas will be generated on contact with acids or chlorine.

**HAZARDOUS POLYMERIZATION**

Will not occur

**SECTION 11 – TOXICOLOGICAL INFORMATION**

**TOXICOLOGICAL INFORMATION**

**ANIMAL TOXICOLOGY**

- Inhalation LC$_{50}$: No available data
- Dermal LD$_{50}$: >2g/kg (rabbit)
- Oral LD$_{50}$: 165 mg/kg (rat)
- Oral LD$_{50}$: 350 mg/kg (mouse)

**EFFECT FOLLOWING PROLONGED OR REPEATED EXPOSURE**

The chronic ingestion of sodium chlorite in drinking water has been studied in laboratory animals and to a limited extent in humans. Concentrations of 100 ppm and higher have
been shown to cause mild anemia and other blood red blood cell effects in laboratory animals, including G6PD deficiency. In a reproductions study, decreased serum levels of the thyroid hormones, T3 and T4, were observed on days 21 and 40 in both male and female pups exposed to 100 ppm of sodium chlorite. In a more recent study, methemoglobin levels were increased with high doses of sodium chlorite (70 ppm), as well as decreased liver weights. In general, clinical studies of communities using sodium chlorite as a disinfectant found no adverse effects in the human population studied.

CARCINOGENICITY
Sodium chlorite is not listed by NTP, IARC, OSHA, EPA, or any other authority as a carcinogen. Dermal and oral carcinogenicity studies conducted in mice and rats did not result in significant carcinogenic effect. According to the USEPA and IARC sodium chlorite is not classifiable because of inadequate animal and human data.

MUTAGENICITY
Sodium chlorite has been evaluated for possible mutagenic effects in several laboratory tests. It has tested positive in the Ames Salmonella reverse mutation assay without metabolic activators and caused chromosomal aberrations in an in vitro Chinese hamster fibroblast cell line without metabolic activators. Sodium chlorite also tested positive in the mouse micronucleus assay when administered intraperitoneally (directly into the body cavity), but was not mutagenic when administered orally. The significance of these test results for human health is unclear because the oxidizing effect of the chlorite or salting effect of sodium may significantly affect the ability of the test to accurately detect mutagens.

REPRODUCTIVE/DEVELOPMENTAL TOXICITY
Groups of male rates exposed to 100 or 500 ppm sodium chlorite in drinking water ad libitum showed a significant increase in the percentage of morphologically abnormal sperm as well as a significant decrease in sperm motility. No effects on reproduction were reported. Sodium chlorite has not been found to be teratogenic in studies in which animals have been exposed up to 100 ppm in the drinking water.

The CMA conducted a two-generation reproductive rat study with developmental neurotoxicity to evaluate the effects of sodium chlorite on reproduction and pre-and post-natal development when administered orally via drinking water for two successive generations. Sodium chlorite was administered at 0, 35, 70, and 300 ppm in drinking water to male and female rats for ten weeks prior to mating. Dosing continued during the mating period, pregnancy and lactation. The final report concluded that there were no meaningful treatment related effects at any dose level for systemic, reproductive/developmental, and developmental neurological end points. Hematological effects and reduced body weight gains were observed in some treatment groups.

SECTION 12 – ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL INFORMATION
This product is toxic to fish and aquatic organisms. Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to the
discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority.

ENVIRONMENTAL FATE

Water:
Sodium chlorite in water will eventually degrade to sodium chloride.

Soil:
Sodium chlorite in contact with acidic soil could generate chlorine dioxide.

ECOTOXICITY

Acute TL<sub>50</sub> for rainbow trout: 50.6 mg/l (as 80% NaClO<sub>2</sub>)
Acute LC<sub>50</sub> (96 hrs.) for rainbow trout: 290 mg/l (as 80% NaClO<sub>2</sub>)

Acute TL<sub>50</sub> for bluegill: 208 mg/l (as 80% NaClO<sub>2</sub>)
Acute LC<sub>50</sub> (96 hrs.) for bluegill: 265-310 mg/l (as 80% NaClO<sub>2</sub>)

Acute TD<sub>50</sub> mallard ducks: 0.49-1.00 g/kg (gavage) (as 80% NaClO2)
Acute LD<sub>50</sub> bobwhite quail: 0.66 g/kg (gavage) (as 80% NaClO2)

Acute LC<sub>50</sub> (48 Hours) for daphnia magna: 0.29 mg/l (as 80% NaClO2)

Sodium Chlorite in the diet of birds was not acutely toxic. Eight-day dietary LC<sub>50</sub>'s in mallard ducks and bobwhite quail were both greater than 10,000 ppm in the diet.

SECTION 13 – DISPOSAL CONSIDERATIONS

All disposals of this material must be done in accordance with Federal, state and local regulations. Waste characterization and compliance with disposal regulations are the responsibilities of the waste generator.

SPILL RESIDUES

If this product becomes a waste, it meets the criteria of a hazardous waste as defined under 40 CFR 261 and would have the following EPA hazardous waste designation: D002. Also, it will be subject to the Land Disposal Restrictions under 40 CFR 268 and must be managed accordingly.

As a hazardous liquid waste, it must be disposed of in accordance with Federal, state, or local regulations in a permitted waste management facility. Do not dump into any sewers, on the ground, or into any body of water.

SECTION 14 – TRANSPORT INFORMATION

DOT IDENTIFICATION NO.
UN 1908

DOT SHIPPING DESCRIPTION (49 CFR 172.101)
Chlorite solution, 8, UN 1908, II
PLACARD REQUIRED
Corrosive, 1908, Class 8

LABEL REQUIRED
Corrosive, Class 8
Label as required by EPA and by OSHA Hazard Communication Standard, and any applicable state and local regulations.

IMO REQUIREMENTS
EmS No.: 806  MFAG Table No.: 741

SECTION 15 – REGULATORY INFORMATION

US FEDERAL REGULATIONS

REPORTABLE QUANTITY (RQ)
Not Applicable

TOXIC SUBSTANCES CONTROL ACT
Listed on TSCA Inventory

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) TITLE III
Components identified with an asterisk (*) in Section 2 are subject to the reporting requirements of Section 313 of Title III of the 1986 Superfund Amendments and Reauthorization Act (SARA) and 40 CFR Part 372.

SARA HAZARD CATEGORIES (40 CFR 370.2)
  HEALTH: Immediate (Acute), Delayed (Chronic)
  PHYSICAL: Fire

INTERNATIONAL REGULATIONS

CANADA

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) CLASSIFICATION
WHMIS Classifications applicable to this product:
E (Corrosive Material) based on assignment to TDG Class 8

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA)
All components of this product are on the Domestic Substances List (DSL).

HAZARDOUS PRODUCTS ACT
This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR).
EUROPE
EINECS No.: 231-836-6

STATE REGULATIONS

CALIFORNIA PROPOSITION 65
Sodium Chlorite does not appear on the California Proposition 65 list.

SECTION 16 – OTHER INFORMATION

National Fire Protection Association (NFPA) Rating
Health 3, Flammability 0, Instability 1

Date of Preparation: January 24, 2006
Sections Revised: Section 1 (Company Name, Logo, Product Name)

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