OxyChem ®

Basic Chemicals

Chlorine Dioxide Health & Safety

Introduction

Chlorine dioxide (ClO_2) is an effective disinfectant and an oxidant that is widely used in water treatment. At ambient temperatures, chlorine dioxide is a reactive gas that is potentially explosively unstable at concentrations above 10% by volume in air. It is normally generated on site and used as a dilute aqueous solution.

Chlorine Dioxide Gas

Chlorine dioxide is a yellow to reddish-yellow gas with a pungent, sharp odor similar to that of chlorine and ozone. It has an odor threshold concentration of 0.1-0.3 ppm and will become irritating at concentrations above 0.5 ppm. The density of chlorine dioxide gas is about 2.4 times that of air, allowing it to collect in low-lying areas.

Health Hazards

Chlorine dioxide is a severe respiratory and eye irritant in humans. It is harmful if swallowed or inhaled.

Inhalation may cause irritation of the mucous membranes and respiratory tract. Symptoms may include coughing, wheezing, and severe breathing difficulties which may be delayed in onset. Pulmonary edema is common following severe exposure.

Chlorine Dioxide Exposure Limits	
8 Hour Time-Weighted Average (TWA)	
ACGIH – TLV	0.1 ppm
OSHA – PEL	0.1 ppm
Short-term Exposure Limits (STEL)	
ACGIH - STEL (15 min)	0.3 ppm
Immediately Dangerous to life or health	
IDLH	5 ppm

Direct eye contact may cause severe irritation and possibly burns. Symptoms may include tearing, redness and in severe cases, eye damage due to burns.

All users should read the appropriate Chemical Fact Sheet or Safety Data Sheet (SDS) before handling chlorine dioxide in any form.

Reactivity

Chlorine dioxide gas is normally stable at concentrations up to 10% (v/v) in air but contact with oxidizable materials can cause decomposition at lower concentrations.

Chlorine dioxide gas is explosive at concentrations above 10% (v/v) in air and can be ignited by almost any form of energy such as sunlight, heat or sparks. The reaction is as follows:

$ClO_2 \rightarrow \frac{1}{2}Cl_2 + O_2$

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The following precautions should be followed when handling chlorine dioxide solutions:

- DO NOT store chlorine dioxide solutions at temperatures above 100 °F (38 °C).
- DO NOT expose chlorine dioxide solutions to ultra-violet light, as this will reduce product strength.
- Chlorine dioxide gas and concentrated solutions will attack some forms of plastic, rubber and coatings. Store chlorine dioxide ONLY in containers that are approved for chlorine dioxide use.
- DO NOT allow chlorine dioxide gas to come into contact with dust and other combustible materials such as organic matter and sulfur as this may cause fires and explosions.
- Chlorine dioxide gas is incompatible with mercury, carbon monoxide, hydrocarbons, fluoramines, potassium hydroxide, phosphorous and sulfur.
- DO NOT allow chlorine dioxide gas to build up in any enclosed space. Ventilation is required for all handling operations.
- DO NOT breathe chlorine dioxide vapors. Toxic gases and vapors (such as chlorine gas) may be released when chlorine dioxide decomposes.
- DO NOT enter confined spaces such as tanks or pits without following proper entry procedures. Entry into these spaces must be in accordance with 29CFR§1910.146. Before entering tanks or opening pipelines that have contained chlorine dioxide solutions, they should be drained or pumped out and thoroughly flushed with water. Contact with the liquid draining from the equipment should be avoided.
- Avoid breathing vapors. After handling, always wash hands thoroughly with soap and water.

Good housekeeping practices are important where chlorine dioxide is used. All spills should be contained or flushed with water into a chemical sewer or segregated holding tank or pond, which is provided for the specific purpose of neutralization. Chlorine dioxide solutions must NEVER be flushed to a sanitary sewer or other outlet, which connects to waterways or uncontrolled runoff streams. Contact local and federal authorities for applicable regulations.

Personal Protective Equipment

Personnel working with chlorine dioxide should always wear the proper protective equipment. OxyChem recommends that employees be provided with and required to use personal protective equipment and clothing necessary to prevent any possibility of skin or eye contact with chlorine dioxide. Remember the use of personnel protective equipment is not a substitute for safe handling practices.

Avoid breathing vapors. After handling, always wash hands thoroughly with soap and water.

Where vapor concentration of chlorine dioxide exceeds or is likely to exceed 0.1 ppm, a NIOSH approved full-face acid gas respirator is acceptable. A NIOSH approved self-contained breathing apparatus, with full- face piece, is required for vapor concentrations above 5 ppm and for leaks and/or emergencies. Follow any applicable respirator use standards and regulations.

First Aid

Due to the toxic characteristics of chlorine dioxide, if someone receives accidental exposure it is extremely important to seek first aid immediately

If in eyes:

- Hold eye open and rinse slowly and gently with water for 15-20 minutes.
- Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.
- Call a poison control center or doctor immediately for treatment advice.

If on skin or clothing:

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