



Our Facility utilizes Chlorine Dioxide Provided by:



GENERAL INFORMATION

Chlorine dioxide (ClO_2) is a yellow-green gas with an odor similar to chlorine with excellent distribution, penetration and sterilization abilities due to its gaseous nature. Although chlorine dioxide has *chlorine* in its name, its properties are very different, much like carbon dioxide is different than elemental *carbon*. Chlorine dioxide has been recognized as a disinfectant since the early 1900s and has been approved by the US Environmental Protection Agency (EPA) and the US Food and Drug Administration (FDA) for many applications. It has been demonstrated effective as a broad spectrum, anti-inflammatory, bactericidal, fungicidal, and virucidal agent, as well as a deodorizer, and also able to inactivate beta-lactams and destroy both pinworms and their eggs.

MOLECULAR SIZE MATTERS

A chlorine dioxide gas molecule is 0.124 nm, much smaller than microorganisms and viruses, allowing the gas to easily penetrate into any areas where these microorganisms might be concealed.

CHEMICAL PROPERTIES

Although chlorine dioxide has "chlorine" in its name, its chemistry is radically different from that of chlorine. When reacting with other substances, it is weaker and more selective, allowing it to be a more efficient and effective sterilizer. For example, it does not react with ammonia or most organic compounds. Chlorine dioxide oxidizes products rather than chlorinating them, so unlike chlorine, chlorine dioxide will not produce environmentally undesirable organic compounds containing chlorine. Chlorine dioxide is also a visible yellow-green gas allowing it to be measured in real-time with photometric devices.





INACTIVATION OF SPORES VS. BACTERIA

The difference between spore and bacterial inactivation is the same as the difference between sterilization and disinfection. For a chemical agent to be classified as a sterilant, it must be demonstrated to be effective at inactivating spores. Spores are among the hardest organisms to kill and for this reason *sterilizing* agents are considered the most rigorous decontaminating agents and offer complete kill of all antimicrobial life. Disinfection, on the other hand, does not require the complete inactivation of spores or all microbial life and is normally validated against a few vegetative bacteria species. For this reason, *disinfecting* agents are less rigorous decontaminating agents and are not as effective as sterilizing agents.

"Bacterial endospores are one of the most persistent forms of microbial life and typically require aggressive inactivation procedures. Vegetative bacteria are generally much more easily inactivated than are bacterial endospores. This is primarily because the sensitive areas of bacteria are easily contacted by chemosterilizing agents. The spore, however, has a more complex structure than the vegetative bacterial cell. Its sensitive material is contained within a core and that core is surrounded by a cortex and spore coats. These coats tend to act as a permeability barrier to the entry of chlorine dioxide and other compounds" (Knapp, 2000).

ENVIRONMENTAL IMPACT

Chlorine dioxide's special properties make it an ideal choice to meet the challenges of today's environmentally concerned world and is an environmentally preferred alternative to elemental chlorine. When chlorine reacts with organic matter, undesirable pollutants such as dioxins and bio-accumulative toxic substances are produced. Thus, the EPA supports the replacement of chlorine with chlorine dioxide because it eliminates the production of these pollutants. It is a perfect replacement for chlorine, providing all of chlorine's benefits without any of its weaknesses and detriments. Most importantly, chlorine dioxide does not chlorinate organic material, eliminating the formation of trihalomethanes (THMs), haloacetic acids (HAAs) and other chlorinated organic compounds. Other properties of chlorine dioxide make it more effective than chlorine, requiring a lower dose and resulting in a lower environmental impact.

USES

Chlorine dioxide is widely used as an antimicrobial and as an oxidizing agent in drinking water, poultry process water, swimming pools, and mouthwash preparations. It is used to sanitize fruit and vegetables and also equipment for food and beverage processing and widely used in life science research laboratories. It is also employed in the health care industry to decontaminate rooms, passthroughs, isolators and also as a sterilant for product and component sterilization. Utilization in the sterilization of medical devices has previously only been available on a small scale and is now an option for contract sterilization with capacity on a scaled level for multiple pallets.