

Additional Info from the USA on Chlorine Dioxide

March 23, 2008

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Chlorine dioxide is a [chemical compound](#) with the formula ClO₂. This reddish-yellow [gas](#) crystallizes as orange crystals at -59 °C. As one of several [oxides](#) of [chlorine](#), it is a potent and useful oxidizing agent used in water treatment and in bleaching.

Chlorine dioxide is used primarily (>95%) for [bleaching of wood pulp](#), but is also used for the [bleaching of flour](#) and for the [disinfection](#) of water. The [Niagara Falls, New York](#) water treatment plant first used chlorine dioxide for [drinking water](#) treatment in 1944 for [phenol](#) destruction. Chlorine dioxide was introduced as a drinking water disinfectant on a large scale in 1956, when [Brussels, Belgium](#), changed from chlorine to chlorine dioxide. Its most common use in water treatment is as a pre-[oxidant](#) prior to chlorination of drinking water to reduce [trihalomethanes](#) which are a carcinogenic disinfection by-product associated with chlorination of naturally occurring organics in the raw water. Chlorine dioxide is also used in conjunction with [ozone](#) disinfection of water to reduce the formation of [bromates](#) which are regulated carcinogens. Chlorine dioxide is also superior to chlorine when operating above neutral [pH](#), when ammonia is present and for the control of biofilms. Chlorine dioxide is used in many industrial water treatment applications as a [biocide](#) including [cooling towers](#), process water and food processing. Chlorine dioxide is less corrosive than chlorine and superior for the control of [legionella](#) bacteria.

It is more effective than chlorine against [viruses](#), [bacteria](#) and [protozoa](#) – including the [cysts](#) of [Giardia](#) and the [oocysts](#) of [Cryptosporidium](#).

Protective effect of low-concentration chlorine dioxide gas against influenza A virus infection Ogata N, Shibata T. J Gen Virol 89 (2008), 60-67; DOI 10.1099/vir.0.83393-0 <http://vir.sgmjournals.org/cgi/content/abstract/89/1/60>

It can also be used for air disinfection, and was the principal agent used in the decontamination of buildings in the United States after the [2001 anthrax attacks](#). Recently, after the disaster of [Hurricane Katrina](#) in [New Orleans, Louisiana](#) and the surrounding Gulf Coast, chlorine dioxide has been used to eradicate dangerous [mold](#) from houses inundated by water from massive flooding.

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Chlorine dioxide is used as an oxidant for phenol destruction in waste water streams, control of [zebra mussels](#) in water intakes and for odor control in the air scrubbers of animal byproduct (rendering) plants.

Stabilized chlorine dioxide can also be used in an oral rinse to treat oral disease and malodor.^[1]

Handling properties

At concentrations greater than 15% volume in air at [STP](#), ClO_2 explosively decomposes into [chlorine](#) and [oxygen](#). The decomposition is initiated by light. Thus, it is never handled in concentrated form, but is almost always used as a [dissolved](#) gas in water in a concentration range of 0.5 to 10 grams per liter. Its solubility increases at lower temperatures: it is thus common to use chilled water (5 °C or 41 °F) when storing at concentrations above 3 grams per liter. In many countries, such as the [USA](#), chlorine dioxide gas may not be transported at any concentration and is almost always produced at the application site using a chlorine dioxide generator. In some countries, chlorine dioxide solution below 3 grams per liter in concentration may be transported by land, but are relatively unstable and deteriorate quickly.

A number of products are marketed as "stabilized chlorine dioxide" (SCD). These solutions do not actually contain chlorine dioxide but consist of solutions of buffered [sodium chlorite](#). A weak acid can be added to SCD to "activate" it and make chlorine dioxide in-situ without a chlorine dioxide generator. The use of SCD is effective when the demand for chlorine dioxide is low and when impurities, such as small amounts of sodium, can be tolerated. For application requiring above 5 kg day⁻¹ ClO_2 , chlorine dioxide produced by a generator with either [sodium chlorite](#) or [sodium chlorate](#) is typically more economical.