



PRODUCT SAFETY SUMMARY **SODIUM AND POTASSIUM PERMANGANATES**

This Product Safety Summary document is intended to provide the general public with an overview of product safety information and general uses of this chemical substance. It is not intended to provide emergency response, medical or treatment information, or to provide a discussion of all safety and health information. This document is not intended to replace the Material Safety Data Sheet.

What are permanganates and what are they used for?

The permanganate family consists of two unique chemicals, potassium permanganate, identified by the Chemical Abstracts Service as CAS Number 7722-64-7, and sodium permanganate, identified as CAS Number 10101-50-5.

Permanganates are primarily used as an integral part of processes used by municipal drinking water authorities to purify and improve the quality of drinking water before it is distributed to the public. Various low-level impurities that may be present in raw water, such as arsenic, are oxidized by permanganates to insoluble precipitates that can be removed from drinking water by clarification and filtration. Permanganates also remove impurities such as phenols and sulfides that may cause drinking water to have an objectionable taste and odor, and metals such as iron and manganese that may cause staining of plumbing fixtures.

Permanganates are added to the raw water in the treatment plant and are completely consumed in the treatment plant. Under normal use conditions, there are no residual permanganates in the finished drinking water. Permanganates are not generally used directly in consumer products.

Potassium permanganate products are pure granular products used in applications where less concentrated levels of permanganate are needed to oxidize specific contaminants. Sodium permanganate products are sold as water soluble solutions in varying concentrations where ease of handling is a criterion for use. While there is no significant difference between the chemical properties of sodium and potassium permanganate, there is a significant difference in the physical property between both permanganates, specifically in their solubility in water. The potassium permanganate, although available as a 97% solid, can only be applied as a 3-4% solution because of the solubility limits. Sodium permanganate is soluble up to 40%, providing a solution that can be applied in

much higher concentrations. Carus markets permanganates under the trade names AQUOX[®], CAIROX[®], LIQUOX[®], ECONOX[®], CARUSOL[®] and RemOx[®].

Permanganates are also used in wastewater treatment facilities and in hazardous site remediation processes.

Permanganates are also used in various industrial applications such as metal surface treatment and equipment cleaning.

Highly purified potassium permanganate, designated as USP (United States Pharmacopeia) grade, can be used as an oxidizer for chemical synthesis, pharmaceutical production, and food processing where permitted by government regulations.

What risk management practices has Carus Corporation established to minimize the risks from permanganates?

The primary mechanism for providing advice on the handling of permanganates is through the Material Safety Data Sheet (MSDS). Carus provides a MSDS to all customers and others directly involved in handling the products, and to other stakeholders upon request through the company website. All of the pertinent handling information is reemphasized in Product Data (specification) Sheets and in Technical Bulletins targeted to specific uses of permanganates.

Carus also provides customers advice and assistance in the design and construction of equipment used to safely handle permanganates. For example, municipal water treatment authorities are offered a pre-engineered system using recyclable containers that is designed to safely and effectively feed permanganates into water treatment plants.

Carus has prepared a series of Technical Briefs that advise customers how to safely and effectively use permanganates.

In addition Carus provides PowerPoint safety presentations given by the Technical Services Department or trained personnel. In many municipal bids this is written in as a requirement of the vendor.

Health Effects Information

Permanganates have a distinctive purple color and can be present as both solids and liquids. Potassium permanganate is a distinctive dark purple inorganic solid that is soluble in water to form a dark purple solution. They are strong oxidizers, and can undergo self-sustaining decomposition if exposed to excessive heat (above 150°C) or if mixed with reducing agents.

Permanganates have been shown to be severely irritating or corrosive to the eyes, skin and digestive tract. Animal studies show that oral ingestion of permanganates causes toxicity. Because of this toxicity, permanganates are classified as “Harmful if Swallowed.”

Aquatic toxicity of potassium permanganate to various species of fish has been studied. Based on these studies, potassium permanganate is classified as “Dangerous to the Environment.” However, because permanganates are readily converted by oxidizable materials to insoluble manganese oxide, they are not expected to remain in the environment as “dangerous” for very long.

Under normal storage and handling conditions, permanganates are stable. However, a strong chemical reaction can occur if they are subject to excessive heat (>150°C) or allowed to contact strong reducing agents such as organic fluids, metal powders, and hydrochloric acid.

How can the general public be exposed to permanganates?

Routine public exposure to permanganates is not expected since products containing permanganates are generally intended for industrial and institutional use, and are not typically sold to the general public. It is possible that the public can be exposed to permanganates through accidents, spills, and inadvertent misuse of the products.

How can workers be exposed to permanganates?

Workers in the manufacture, transportation and use of permanganates can be exposed to them. Normal industrial hygiene practices, which include use of protective equipment such as chemical goggles, gloves, and work clothing that covers arms and legs as needed, have been established to minimize the risk of any such exposure. Emergency responders such as firefighters could also be exposed to permanganates if they are present during an incident. Normal turnout protective gear for first responders such as positive pressure breathing units, chemical resistant suits, boots and gloves will minimize their risk.

How can there be the potential for environmental releases?

Intended industrial and institutional uses of permanganates normally result in these substances being consumed by a chemical reaction, thus routine environmental releases are not expected. Non-routine releases to the environment can occur from accidents, spills and inadvertent misuse of the products.

Have any federal or state agencies made scientific assessments or developed specific regulations for permanganates?

Transportation authorities such as US Department of Transportation have reviewed and classified permanganates as oxidizers (Class 5.1).

EU authorities have reviewed and classified permanganates and required labeling as Oxidizers (R8 - Contact with combustibles may cause fire), Harmful (R22 - Harmful if swallowed), and Dangerous to the Environment (R50/53 - Very toxic to aquatic organisms, may cause long term effects in the aquatic environment).

US Food and Drug Administration has evaluated and approved potassium permanganate for direct addition at low levels to modified food starch (21CFR172.892) and as a component in indirect food additive sanitizing solutions for food processing equipment (21CFR178.1010).

The National Sanitation Foundation has reviewed and certified both sodium and potassium permanganate under the provisions of ANSI/NSF Standard 60 for Drinking Water Treatment Chemicals.

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