

CARULITE® CATALYSTS

PRODUCT SAFETY SUMMARY

This Product Safety Summary document is intended to provide the public with an overview of product safety information and typical uses of these catalysts. This summary is a general overview of the chemical and physical properties, potential hazards to human health and environment and advice for the safe use and handling of the product. It is not intended to provide emergency response, medical or treatment information, or to provide a discussion of all safety and health information. Additional information is available through the relevant Safety Data Sheet, which should be consulted before the use of the product.

Chemical Identity, Chemical Formula and CAS #:

One or more of the following chemical substances are present in the CARULITE catalysts.

| <u>Chemical name</u> | <u>Chemical Formula</u> | <u>CAS number</u> |
|----------------------|--------------------------------|-------------------|
| Manganese dioxide | MnO ₂ | 1313-13-9 |
| Copper oxide | CuO | 1317-38-0 |
| Aluminum oxide | Al ₂ O ₃ | 1344-28-1 |
| Lanthanum oxide | La ₂ O ₃ | 1312-81-8 |

What are CARULITE catalysts and what are they used for?

The CARULITE catalysts are a series of manganese based catalysts used for treatment of oxygen containing air streams. The catalysts are mainly granular in shape made in various mesh sizes but they may also consist of powder materials as well as spherical forms of catalysts. In all cases the catalyst is used in a filter or in an air purification system of some type.

The CARULITE 200 granular catalysts are used to convert ozone emitted from water off-gas operations, corona treaters or digital printers, back to oxygen.

The CARULITE 300 catalysts granular catalysts are used to convert poisonous carbon monoxide in compressed breathing air filters, escape mask filters and cryogenic gas purification to harmless carbon dioxide.

The CARULITE 400 powder catalyst is used for the destruction of low level ozone concentrations emitted from printers, copiers or commercial air cleaners, when it is coated on to a monolithic substrate.

The CARULTE 500 granular catalyst is used to convert ethylene oxide used in the sterilization of medical goods to carbon dioxide and water.

The CARULITE 110-TR spherical catalysts are used to convert oxygenated hydrocarbons to carbon dioxide and water in a recuperative catalytic oxidizer.

To summarize, the main benefits of CARULITE catalysts are high quality breathing air, the destruction of air pollutants such as carbon monoxide and ozone to enhance the human health and environment, as well as the purification of air used to generate high quality gases for the electronics industry. CARULITE catalysts are often the most effective means of destroying air pollutants such as carbon monoxide and ozone, for cleaner air in a cost effective fashion.

Physical- Chemical properties:

CARULITE catalysts are in the solid form, and appear as a powder, granular or spherical shape. They are brown or black in color. They are highly insoluble and the bulk density ranges from 800-900 Kg/m³. They are thermally very stable, with a maximum temperature stability of 400°-700°C, depending upon the formulation.

Health and Environmental Effects:

Mostly the workers at the Original Equipment Manufacturers (OEM) may have direct exposure to the CARULITE catalysts. Other workers who handle the filters, cartridges or equipment may have almost no or minimum exposure to CARULITE catalysts. Under normal conditions of use, CARULITE catalysts are not expected to cause skin corrosion/irritation, serious eye damage/eye irritation or other health hazards. However, in applications where dust, vapors or mist are created, inhalation may cause skin irritation, serious eye irritation and respiratory irritation. Dust may irritate throat and cause coughing. It may also cause damage to organs (brain) through prolonged or repeated exposure. Even though the toxicity is very low, it is harmful if swallowed.

Chronic exposure to breathing low levels of manganese dust or fume over a long period of time can result in "manganism," a disease of the central nervous system similar to Parkinson's Disease, gait impairment, muscle spasms and behavioral changes. Frequent inhalation of dust over a long period of time increases the risk of developing asthma, chronic lung diseases, and skin irritation. Proper use of personal protective equipment such as NIOSH approved dust/mist respirator helps to minimize the exposure and reduce the chances of developing these conditions.

None of the components in the CARULITE catalysts have been classified as a carcinogen by ACGIH, OSHA, NTP, IARC, or California Proposition 65. CARULITE catalysts are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Since it is an

inorganic substance or mixture, it is not considered as a PBT (Persistence Degradability or Bio accumulative potential) substance or mixture.

Exposure Potential:

Under normal conditions of use, CARULITE catalysts are not expected to cause skin corrosion/irritation, serious eye damage/eye irritation or other health hazards.

1. Worker exposure:

However, when exposed, it may cause skin irritation and serious eye irritation and inhalation may cause respiratory irritation. Ingestion exposure is not very likely to occur. To minimize the risk of exposure, engineering controls, good industrial hygiene practice, and the use of personal protective equipment, such as chemical goggles, gloves, and work clothing that covers arms and legs as needed, have been established.

Emergency responders such as firefighters could also be exposed 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.

2. Consumer Exposure:

Carus Corporation does not sell CARULITE catalysts to consumers directly, although our products may also be an ingredient in some specialty consumer products such as escape masks, respirators etc. from other manufacturers. Public exposure is possible through accidents, spills, and inadvertent misuse of the products.

3. Environmental Releases:

Non-routine releases to the environment can occur from accidents, spills and inadvertent misuse of the products. If a spill occurs, emergency personnel should wear protective equipment suitable for the task to minimize exposures.

Risk Management Measures:

The primary mechanism for providing directions on the handling of CARULITE catalysts is through the Safety Data Sheet (SDS) and Labels. Carus provides an SDS 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 use and handling information is reemphasized in Product Data (specification) Sheets and in Technical Bulletins targeted to specific uses of various types of CARULITE catalysts.

Carus also provides customers directions and assistance to the OEMs and other users to safely handle CARULITE catalysts.

Regulatory Information / Classification and Labeling:

Under GHS substances and mixtures are classified according to their physical, health, and environmental hazards. The hazards are communicated via specific product labels and the SDS.

GHS attempts to standardize hazard communication so that the intended audience (workers, consumers, transport workers, and emergency responders) can better understand the hazards of the chemicals in use.

Note: The hazard statements and symbols presented here refer to the hazard properties of the product and are meant to provide a brief overview of the product's labeling. It is not intended to be comprehensive or to replace information found in the SDS or product labels.

STATE AGENCY REVIEW

The substances present in the CARULITE catalysts have been registered under REACH (EC) 1907/2006.

REGULATORY INFORMATION / CLASSIFICATION AND LABELLING

Physical hazards: Not classified.

| | | |
|------------------------|---|--------------------|
| Health hazards: | Acute toxicity, oral | Category 4 |
| | Acute toxicity, inhalation | Category 4 |
| | Skin corrosion/irritation | Category 2 |
| | Serious eye damage/eye irritation | Category 2 |
| | Specific target organ toxicity, single exposure respiratory tract irritation | Category 3 |
| | Specific target organ toxicity, repeated exposure | Category 2 (brain) |

OSHA defined hazards: Not classified.

Label elements:

Signal word: Warning

Hazard statement: Harmful if swallowed. Causes skin irritation. Causes serious eye irritation. Harmful if inhaled. May cause respiratory irritation. May cause damage to organs (brain) through prolonged or repeated exposure.

Precautionary statement:

Prevention: Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Do not breathe dust. Use only outdoors or in a well-ventilated area. Wear protective gloves/protective clothing/eye protection/face protection.

Response: If swallowed: Call a poison center/doctor if you feel unwell. Rinse mouth. If inhaled: Remove person to fresh air and keep comfortable for breathing. Call a poison center/doctor if you feel unwell. If on skin: Wash with plenty of water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

Storage: Store in a well-ventilated place. Keep container tightly closed. Store locked up.

Disposal: Dispose of contents/container in accordance with local/regional/national/international regulations.

Hazard(s) not otherwise classified (HNOC): None known

RCRA (Resource Conservation and Recovery Act of USA):

Unused or virgin CARULITE catalysts are not considered as hazardous waste under U.S. 40 CFR 261. Dispose of used CARULITE catalysts in a landfill approved to accept chemical waste, after verifying that it is not contaminated with hazardous substances through usage.

Transport Information:

CARULITE catalysts are not regulated by DOT, TDG, IMDG and IATA.

CONCLUSION

CARULITE catalysts are used in air purification applications. Exposure to humans and the environment is considered low if properly handled. Use of this product has been shown to be safe when usage instructions provided are followed carefully. Short term exposure may cause skin irritation and serious eye irritation and inhalation may cause respiratory irritation. Prolonged or repeated exposure may cause damage to organs (brain).

CONTACT INFORMATION WITHIN COMPANY

For further information on this substance or product safety summaries in general, please contact: salesmkt@caruscorporation.com or visit our website at <http://www.caruscorporation.com/page/site/responsible-care>

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