

Carbon Monoxide

Product Stewardship Summary

Chemical Information

Carbon monoxide was identified as a compound containing carbon and oxygen by the Scottish chemist William Cumberland Cruikshank in 1800. The toxic properties of carbon monoxide were known to Aristotle, but its toxic properties were not thoroughly investigated until Claude Bernard studied the effects on dogs around 1846

At standard temperature and pressure, carbon monoxide is a colorless, odorless, tasteless, flammable and toxic gas. It is shipped as a compressed gas in cylinders. When carbon monoxide is cooled to extremely low temperatures (-313°F/-191°C) it becomes a cryogenic liquid. Carbon monoxide is produced by the incomplete combustion of carbon containing fuels. Carbon monoxide is often produced in industry as part of the Steam Methane reforming process, which can yield both carbon monoxide and hydrogen as products. In the presence of oxygen, carbon monoxide burns to form carbon dioxide.

Carbon monoxide is a flammable gas with a flammable range in air of 12.5% to 74%. Carbon monoxide can form explosive mixtures in air and should only be used outdoors or in a well ventilated area.

Chemical Formula: CO

Other Names: None

Applications, Benefits, & Use

Chemicals: Carbon monoxide is used to recover nickel from ore. Carbon monoxide is used as a raw material in the synthesis of phosgene, as well as a variety of aldehydes, acids, esters, alcohols and acids.

Carbon monoxide is also used in the manufacture of metal carbonyls, which can be used to make powdered metals or catalysts. The catalysts are used in the hydrogenation of fats and oils and the powdered metals can be molded into complex shapes via powder metallurgy.

Food: Carbon monoxide is used as a Modified Atmosphere Packaging (MAP) to help keep meats like beef and pork looking fresh.

Regulatory Information

There are regulations that govern the manufacture, sales, transportation, use and/or disposal of carbon monoxide. These regulations vary by city, state, country or geographic region. Additional regulatory information may be found on the Safety Data Sheet for carbon monoxide as well as local and federal agency websites.

Human Health and Environmental Effects

Human Health:

- Carbon monoxide is a chemical asphyxiant. Its toxic action is caused by combining with the hemoglobin in the blood to form the relatively stable carboxyhemoglobin. The stability of the carboxyhemoglobin prevents oxygen from being taken up by the body and consequently the body is deprived of needed oxygen.
- Carbon monoxide is a poisonous gas. It is considered a reproductive toxin and also has acute toxicity. It is also has specific target organ toxicity affecting the central nervous system.

Environment:

- Manufactured carbon monoxide is a pollutant, which can affect workers by causing headaches and dizziness.
- In urban areas carbon monoxide is a temporary atmospheric pollutant caused by the exhaust from internal combustion engines.
- Carbon monoxide is, along with aldehydes, part of the series of chemical reactions that form smog.
- Indoors the concentration of carbon monoxide can easily rise to lethal levels from improper heater operation.

Exposure Potential and Risk Mitigation Measures

Industrial Use:

- Carbon monoxide is shipped as a high pressure gas. Precautions should be taken based on shipment mechanism (pipeline, gas cylinders, tube trailers, etc.).
- Use atmospheric and personal monitors to ensure carbon monoxide levels do not exceed occupational exposure limits.
- Personnel should be trained on the hazards and risks of carbon monoxide and eliminate all ignition sources.
- Precautions for the flammability of carbon monoxide include no smoking and the use of proper electrical equipment.
- Occupational exposure limits:
ACGIH, 8 hr, TLV-TWA - 25 ppm
OSHA, 8 hr, PEL - 50 ppm

Consumer Use:

- Carbon monoxide is transported by pipeline, so exposure to direct consumers is not anticipated.

Additional Sources of Information

- Air Liquide Gas Encyclopedia
- Air Liquide Safety Data Sheets
- American Chemistry Council
- Compressed Gas Association (G-5.7)

Contact Information

For matters related to health, safety, security, environment or Responsible Care® commitments, contact us by phone at 713-438-6721 or by [email](#).