Date of Issue:
11 January 2017

SAFETY DATA SHEET

1. Substance and Source Identification

Product Identifier

SRM Number: 1680b
SRM Name: Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 500 µmol/mol)
Other Means of Identification: Not applicable.

Recommended Use of This Material and Restrictions of Use

This Standard Reference Material (SRM) is a primary gas mixture of carbon monoxide in nitrogen provided as a compressed gas in a DOT 3AL-specification aluminum (6061 alloy) cylinder equipped with a CGA-350 brass valve at a nominal pressure of 12.4 Pa (1800 psi). This cylinder with a water volume of 6 L provides the user with 0.73 m^3 (25.8 ft^3) of useable mixture. NIST recommends that this cylinder **NOT** be used below 0.7 MPa (100 psi).

Company Information

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Standard Reference Materials Program
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Gaithersburg, Maryland 20899-2300

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1-800-424-9300 (North America)
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2. Hazards Identification

Classification

Physical Hazard: Compressed Gas.
Health Hazard: Simple Asphyxiant.

Label Elements

Symbol

Signal Word
WARNING

Hazard Statement(s)

H280 Contains gas under pressure; may explode if heated.
------ May displace oxygen and cause rapid suffocation.

Precautionary Statement(s)

P410 + P403 Protect from sunlight. Store in a well-ventilated place.

Hazards Not Otherwise Classified: Not applicable.

Ingredients(s) with Unknown Acute Toxicity: Not applicable.

3. Composition and Information on Hazardous Ingredients

Substance: Carbon monoxide in nitrogen, compressed gas

Other Designations:

Carbon Monoxide**:** Carbon oxide, CO.
Nitrogen**:** Dinitrogen, nitrogen compressed.

Components are listed in compliance with OSHA's 29 CFR 1910.1200; for the actual values see the Certificate of Analysis.

Hazardous Components	CAS Number	EC Number (EINECS)	Nominal Mass Concentration (%)
Nitrogen	7727-37-9	231-783-9	>99
Carbon Monoxide	630-08-0	211-128-3	0.05

4. FIRST AID MEASURES

Description of First Aid Measures:

Inhalation: If adverse effects occur, remove to uncontaminated area. If not breathing, give artificial respiration or oxygen by qualified personnel. Seek immediate medical attention.

Skin Contact: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed.

Eye Contact: Immediately flush eyes, including under the eyelids with copious amounts of water for at least 15 minutes. Seek immediate medical attention.

Ingestion: Ingestion of a gas is unlikely. As this product is a gas, refer to the inhalation section.

Most Important Symptoms/Effects, Acute and Delayed: Harmful if inhaled, blood damage, difficulty breathing, and suffocation.

Indication of any immediate medical attention and special treatment needed, if necessary: If any of the above symptoms are present, seek immediate medical attention.

5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Negligible fire hazard applicable to the identified NIST cylinder. Cylinders may rupture or explode if exposed to heat. See Section 9, "Physical and Chemical Properties" for flammability properties.

Extinguishing Media:
Suitable: Use extinguishing media appropriate to the surrounding fire.
Unsuitable: None listed.

Specific Hazards Arising from the Chemical: Oxides of nitrogen, oxides of carbon.

Special Protective Equipment and Precautions for Fire-Fighters: Move cylinder from fire area if it can be done without personal risk. Avoid inhalation of material or combustion byproducts. Wear full protective clothing and NIOSH approved self-contained breathing apparatus (SCBA).

NFPA Ratings (0 = Minimal; 1 = Slight; 2 = Moderate; 3 = Serious; 4 = Severe)

Health = 1 Fire = 0 Reactivity = 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures: Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment; see Section 8, "Exposure Controls and Personal Protection". Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.

Methods and Materials for Containment and Clean up: Stop leak if possible without personal risk. Isolate hazard area and deny entry. Stay upwind and keep out of low areas.

7. HANDLING AND STORAGE

Safe Handling Precautions: Use only with adequate ventilation. Do not puncture or incinerate container. Close valve after each use and when empty. Keep value protection cap on cylinder when not in use.

Storage: Store and handling in accordance with all current regulations and standards. Secure cylinder to prevent physical damage. Keep separated from incompatible substances (oxidizing materials, halogens, metal oxides, metals, combustible materials, lithium). Store in well-ventilated area. Subject to storage regulations, OSHA 29 CFR 1910.101.

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits			
Components	**OSHA (PEL)**	**ACGIH (TLV)**	**NIOSH (REL)**
Nitrogen	No occupational exposure limits	Simple asphyxiant	No occupational exposure limits
Carbon monoxide	TWA: 55 mg/m^3 (50 ppm)	TWA: 30 mg/m^3 (25 ppm)	TWA: 40 mg/m^3 (35 ppm) IDLH: 1375 mg/m^3 (1200 ppm) Ceiling: 229 mg/m^3 (200 ppm)

Engineering Controls: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

Personal Protection: In accordance with OSHA 29 CFR 1910.132, subpart I, wear appropriate Personal Protective Equipment (PPE) to minimize exposure to this material.

Respiratory Protection: If workplace conditions warrant a respirator, a respiratory protection program that meets OSHA 29 CFR 1910.134 must be followed. Refer to NIOSH 42 CFR 84 for applicable certified respirators.

Eye/Face Protection: Wear safety goggles. An eye wash station should be readily available near areas of use.

Skin and Body Protection: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Chemical-resistant gloves should be worn at all times when handling chemicals.

9. PHYSICAL AND CHEMICAL PROPERTIES

Descriptive Properties	Nitrogen (>99 %)	Carbon Monoxide (0.05%)
Appearance (physical state, color, etc.)	colorless compressed gas	colorless compressed gas
Molecular Formula	N_2	CO
Molar Mass (g/mol)	28	28.01
Odor	odorless	odorless
Odor threshold	not available	not available
pH	not applicable	not available
Evaporation rate	not applicable	not available
Melting point/freezing point	–210 ºC (–346 ºF)	–199 ºC (–326 ºF)
Relative Density (g/L)	1.2506	1.25 at 0 ºC
Vapor Pressure (mmHg)	760 at –196 ºC	760 at –191 ºC
Vapor Density (air = 1)	0.967	0.968
Viscosity (cP)	0.01787 at 27 ºC	0.01657 at 0 ºC
Solubility(ies)	water, 1.6 % at 20 ºC; liquid ammonia	water, 2.3 % at 20 ºC; alcohol, benzene, acetic acid, ethyl acetate, chloroform
Partition coefficient (n-octanol/water)	not available	not available
Thermal Stability Properties		
Autoignition Temperature	not applicable	609 ºC to 650 ºC (1128 ºF to 1202 ºF)
Thermal Decomposition	not applicable	not available
Initial boiling point and boiling range	–196 ºC (–321 ºF)	not available
Explosive Limits, LEL	not applicable	12 % to 12.5 %
Explosive Limits, UEL	not applicable	74 %
Flash Point	not applicable	not available
Flammability (solid, gas)	not applicable	not available

10. STABILITY AND REACTIVITY

Reactivity: Stable at normal temperature and pressure.

Stability: X Stable _____ Unstable

Possible Hazardous Reactions: None listed.

Conditions to Avoid: Avoid heat, flames, sparks, and other sources of ignition. Minimize contact with material. Containers may rupture or explode if exposed to heat.

Incompatible Materials: Oxidizing materials, halogens, metal oxides, metals, combustible materials, lithium.

Fire/Explosion Information: See Section 5, "Fire Fighting Measures".

Hazardous Decomposition: Miscellaneous decomposition products.

Hazardous Polymerization: _____ Will Occur __X__ Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Exposure: __X__ Inhalation _____ Skin _____ Ingestion

Symptoms Related to the Physical, Chemical and Toxicological Characteristics: Nausea, vomiting, chest pain, difficulty breathing, irregular heartbeat, headache, disorientation, emotional disturbances, pain in extremities, tremors, loss of coordination, hearing loss, and visual disturbances.

Potential Health Effects (Acute, Chronic and Delayed)

Inhalation

Carbon Monoxide: Acute and chronic exposure may result in changes in body temperature, change in blood pressure, eye damage, suffocation, blood disorders, convulsions, unconsciousness, coma, and death. Chronic exposure may also result in heart damage, nerve damage, birth defects, and brain damage.

Nitrogen: Nitrogen compressed gas is a simple asphyxiant. Release in an enclosed space may result in asphyxiation. The symptoms of asphyxia depend on the rapidity with which the oxygen deficiency develops and how long it continues. In sudden acute asphyxia, unconsciousness may be immediate. With slow development, there may be rapid respiration and pulse, air hunger, dizziness, reduced awareness, tightness in the head, tingling sensations, incoordination, faulty judgment, emotional instability, and rapid fatigue. As the asphyxia progresses, nausea, vomiting, collapse, unconsciousness, convulsions, deep coma, and death are possible.

Skin Contact: No information on significant adverse effects.

Eye Contact: Exposure may result in irritation, blurred vision.

Ingestion: Ingestion of a gas is unlikely under normal conditions of use. As this product is a gas, refer to the inhalation section.

Numerical Measures of Toxicity

Acute Toxicity: Not classified, concentration of carbon monoxide is below cut off value of 1 %.
Carbon monoxide; Rat, Inhalation LC50: 1807 ppm (4 h)
Nitrogen; Simple asphyxiant

Skin Corrosion/Irritation: Not applicable.

Serious Eye damage/ Eye irritation: Not applicable.

Respiratory Sensitization: No data available.

Skin Sensitization: No data available.

Germ Cell Mutagenicity: Not classified.
Carbon monoxide; Mouse: 1500 ppm (10 min)

Carcinogenicity: Not classified.
Listed as a Carcinogen/Potential Carcinogen _____ Yes __X__ No

Nitrogen and carbon monoxide are not listed by NTP, IARC or OSHA as a carcinogen.

Reproductive Toxicity: Not classified, concentration of carbon monoxide is below cut off value of 0.1 %.
Carbon monoxide; Rat, Inhalation TCLo: 103 mg/m^3 (pregnant, 1 d to 22 d).

Specific Target Organ Toxicity, Single Exposure: Not classified.

Specific Target Organ Toxicity, Repeated Exposure: Not classified, concentration of carbon monoxide is below cut off value of 1 %.

Aspiration Hazard: No data available.

12. ECOLOGICAL INFORMATION

Ecotoxicity Data:

Carbon Monoxide

Minnows and sunfish species, lethal dose: 1.5 ppm (1 h to 6 h, fresh water)

Persistence and Degradability: No data available.

Bioaccumulative Potential: No data available.

Mobility in Soil: No data available.

Other Adverse effects: No data available.

13. DISPOSAL CONSIDERATIONS

Waste Disposal: Dispose of waste in accordance with all applicable federal, state, and local regulations. Carbon monoxide subject to disposal regulations, U.S. EPA 40 CFR 262, Hazardous Waste Number: D001.

14. TRANSPORTATION INFORMATION

U.S. DOT and IATA: UN1956; Compressed gas, n.o.s. (carbon monoxide in nitrogen); Hazard Class 2.2.

15. REGULATORY INFORMATION

U.S. Regulations:

CERCLA Sections 102a/103 (40 CFR 302.4): Identified cylinder not regulated.

SARA Title III Section 302 (40 CFR 355.30): Identified cylinder not regulated.

SARA Title III Section 304 (40 CFR 355.40): Identified cylinder not regulated.

SARA Title III Section 313 (40 CFR 372.65): Identified cylinder not regulated.

OSHA Process Safety (29 CFR 1910.119): Identified cylinder not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE HEALTH:	Yes.
CHRONIC HEALTH:	No.
FIRE:	No.
REACTIVE:	No.
PRESSURE:	Yes.

State Regulations:

California Proposition 65: WARNING! This product contains a chemical (carbon monoxide) known to the state of California to cause reproductive/developmental effects.

U.S. TSCA Inventory: Carbon monoxide and nitrogen are listed.

TSCA 12(b), Export Notification: No components are listed.

Canadian Regulations: WHMIS Information is not provided for this material.

16. OTHER INFORMATION

Issue Date: 11 January 2017

Sources: ChemADVISOR, Inc., MSDS, *Nitrogen, Compressed Gas*, 09 December 2015.

ChemADVISOR, Inc., MSDS, *Carbon Monoxide*, 09 December 2015.

National Oceanic and Atmospheric Agency, CAMEO Chemicals Database, *Carbon Monoxide* CAS No. 630-08-0, CRIS Code: CMO; available at https://cameochemicals.noaa.gov/chemical/335 (accessed Jan 2017).

Key of Acronyms:

ACGIH	American Conference of Governmental Industrial Hygienists	NRC	Nuclear Regulatory Commission
ALI	Annual Limit on Intake	NTP	National Toxicology Program
CAS	Chemical Abstracts Service	OSHA	Occupational Safety and Health Administration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	PEL	Permissible Exposure Limit
CFR	Code of Federal Regulations	RCRA	Resource Conservation and Recovery Act
DOT	Department of Transportation	REL	Recommended Exposure Limit
EINECS	European Inventory of Existing Commercial Chemical Substances	RQ	Reportable Quantity
EPCRA	Emergency Planning and Community Right-to-Know Act	RTECS	Registry of Toxic Effects of Chemical Substances
IARC	International Agency for Research on Cancer	SARA	Superfund Amendments and Reauthorization Act
IATA	International Air Transport Association	SCBA	Self-Contained Breathing Apparatus
IDLH	Immediately Dangerous to Life and Health	SRM	Standard Reference Material
LC50	Lethal Concentration	STEL	Short Term Exposure Limit
LD50	Median Lethal Dose or Lethal Dose, 50 %	TLV	Threshold Limit Value
LEL	Lower Explosive Limit	TPQ	Threshold Planning Quantity
MSDS	Material Safety Data Sheet	TSCA	Toxic Substances Control Act
NFPA	National Fire Protection Association	TWA	Time Weighted Average
NIOSH	National Institute for Occupational Safety and Health	UEL	Upper Explosive Limit
NIST	National Institute of Standards and Technology	WHMIS	Workplace Hazardous Materials Information System

Disclaimer: Physical and chemical data contained in this SDS are provided only for use in assessing the hazardous nature of the material. The SDS was prepared carefully, using current references; however, NIST does not certify the data in the SDS. The certified values for this material are given in the NIST Certificate of Analysis.

Users of this SRM should ensure that the SDS in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at http://www.nist.gov/srm.