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Carbon Dioxide

CO_2 44.01

Carbon dioxide CAS RN®: 124-38-9.

DEFINITION

Carbon Dioxide contains NLT 99.0%, by volume, of carbon dioxide (CO_2).

[NOTE—The following tests are designed to reflect the quality of Carbon Dioxide in both its vapor and liquid phases, which are present in previously unopened cylinders. Reduce the container pressure by means of a regulator. Withdraw the specimens for the tests with the least possible release of Carbon Dioxide consistent with proper purging of the sampling apparatus. Measure the gases with a gas volume meter downstream from the detector tubes to minimize contamination or change of the specimens.]

IDENTIFICATION

• **A.**

Sample: 100 ± 5 mL, released from the vapor phase of the contents of the container

Analysis: Pass the *Sample* through a carbon dioxide detector tube (see *Reagents, Indicators, and Solutions*) at the rate specified for the tube.

Acceptance criteria: The indicator change extends throughout the entire indicating range of the tube.

ASSAY

• **PROCEDURE**

[NOTE—Sampling for this *Assay* may be done from the vapor phase for convenience, but this method results in more residual volume. If the specification of 1 mL is exceeded from the vapor phase, a liquid specimen may be taken.]

Sample: 100.0 mL of specimen taken from the liquid phase, as directed in the test for *Nitrogen Dioxide*

Analysis: Assemble a 100-mL gas buret, provided with a leveling bulb and two-way stopcock, and a gas absorption pipet of suitable capacity by connecting the pipet to one of the buret outlets. Fill the buret with slightly acidified water (turned pink with methyl orange), and fill the pipet with potassium hydroxide solution (1 in 2). By manipulation of the leveling bulb and leveling water, draw the potassium hydroxide solution to fill the pipet and capillary connection up to the stopcock. Fill the buret with the leveling water, and draw it through the other stopcock opening in such a manner that all gas bubbles are eliminated from the system. Draw the *Sample* into the buret. By raising the leveling bottle, force the measured specimen into the pipet. The absorption may be facilitated by rocking the pipet or by flowing the specimen between pipet and buret. Draw any residual gas into the buret, and measure its volume.

Acceptance criteria: NMT 1.0 mL of gas remains (NLT 99.0%, by volume, of CO_2).

IMPURITIES

• **NITROGEN DIOXIDE**

Sample: 550 ± 50 mL, obtained as directed in the *Analysis*

Analysis: Arrange the container so that when its valve is opened, a portion of the liquid phase of the contents is released through a piece of tubing of sufficient length to allow all of the liquid to vaporize during passage through it, and to prevent frost from reaching the inlet of the detector tube. Release into the tubing a flow of liquid sufficient to provide 550 mL of the vaporized specimen plus any excess necessary to ensure adequate flushing of air from the system. Pass 550 ± 50 mL of this gas through a nitric oxide–nitrogen dioxide detector tube (see *Reagents, Indicators, and Solutions*) at the rate specified for the tube.

Acceptance criteria: NMT 2.5 ppm

• **LIMIT OF AMMONIA**

Sample: 1050 ± 50 mL of the gas obtained as directed in the test for *Nitrogen Dioxide*

Analysis: Proceed with Carbon Dioxide as directed in the test for *Nitrogen Dioxide*, except pass 1050 ± 50 mL of this gas through an ammonia detector tube (see *Reagents, Indicators, and Solutions*) at the rate specified for the tube.

Acceptance criteria: NMT 0.0025%

• **LIMIT OF HYDROGEN SULFIDE**

Sample: 1050 ± 50 mL, released from the vapor phase

Analysis: Pass 1050 ± 50 mL, released from the vapor phase, through a hydrogen sulfide detector tube (see *Reagents, Indicators, and Solutions*) at the rate specified for the tube.

Acceptance criteria: NMT 1 ppm

• **LIMIT OF NITRIC OXIDE**

Sample: 550 ± 50 mL, released from the vapor phase

Analysis: Pass 550 ± 50 mL, released from the vapor phase, through a nitric oxide–nitrogen dioxide detector tube (see *Reagents, Indicators, and Solutions*) at the rate specified for the tube.

Acceptance criteria: NMT 2.5 ppm

- **Carbon Monoxide**

Sample: 1050 ± 50 mL, released from the vapor phase of the contents of the container

Analysis: Pass 1050 ± 50 mL, released from the vapor phase of the contents of the container, through a carbon monoxide detector tube (see *Reagents, Indicators, and Solutions*) at the rate specified for the tube.

Acceptance criteria: NMT 0.001%

- **Sulfur Dioxide**

Sample: 1050 ± 50 mL, obtained as directed in the test for *Nitrogen Dioxide*

Analysis: Proceed with Carbon Dioxide as directed in the test for *Nitrogen Dioxide*, except to pass 1050 ± 50 mL through a sulfur dioxide detector tube (see *Reagents, Indicators, and Solutions*) at the rate specified for the tube.

Acceptance criteria: NMT 5 ppm

SPECIFIC TESTS

- **Water Determination**

Analysis: Flush the regulator that has been flushed with 5 L or more of the gas specimen. Pass 50 ± 5 L, released from the vapor phase, through a water vapor detector tube connected to the regulator with a minimum length of metal or polyethylene tubing. Measure the gas passing through the detector tube with a gas flowmeter set at a flow rate of 2 L/min.

Acceptance criteria: NMT 150 mg/m^3

ADDITIONAL REQUIREMENTS

- **Packaging and Storage:** Preserve in cylinders.

Auxiliary Information - Please check for your question in the FAQs before contacting USP.

Topic/Question	Contact	Expert Committee
CARBON DIOXIDE	Documentary Standards Support	SM52020 Small Molecules 5

Chromatographic Database Information: Chromatographic Database

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