COEI-1-DIOCAR Carbon dioxide

Carbonic anhydride

Carbonei dioxydum

CO_2 = 44.01

SIN No. 290

1. Objective, origin and scope of application

Carbon dioxide is used in gaseous form, either pure or mixed with nitrogen, in procedures designed to render inert.

2. Labelling

The label should indicate the nature and purity of the gaz, even when used in mixtures, as well as its safety and storage conditions.

3. Properties

Carbon dioxide gas is colorless and odorless. Its aqueous solution has a slightly acidic taste. At a temperature of 0 °C and under a pressure of 760 mm of mercury, 1 l of carbon dioxide weighs 1.977 g.

At a temperature of 20 °C and under a pressure of 760 mm of mercury, 1 l of water dissolves 878 ml of carbon dioxide, or 1.736 g of CO_2.

If a flame is placed in a tube of carbon dioxide, the flame is extinguished.

Fill a 50 ml test tube with carbon dioxide. Shake with 10 ml of barium hydroxide solution. A white precipitate will form, which becomes soluble with effervescence by a dilute acetic acid solution (10 pp 100) (R).

4. Tests

Total purity of carbon dioxide should be 99 parts per 100 by volume.

Testing for and quantitative determination of gaseous impurities can be performed by gas phase chromatography. The method is described in the Annex.

Carbon dioxide determination can also be accomplished using the following chemical tests.

For the following tests, tubes containing carbon dioxide should be kept at ambient temperature for at least 6 hours prior to sampling. Volumes to be sampled are calculated by taking temperature and pressure into account, which are indicated here to be 0 °C and 760 mm of mercury.

4.1. Sulfuric Acid and Sulfur Dioxide

Let 1000 ml carbon dioxide flow, during 15 minutes at a constant speed, into 50 ml of water that has recently been boiled and cooled to room temperature. The feed tube should have an orifice whose diameter is approximately 1 mm and which is immersed to within 2 mm of the bottom of the water container which has a height of 12-14 cm. After the flow of gas is completed, pour the liquid in bucket A of a comparator and add 0.05 ml of methyl orange solution (R). To bucket B, which contains 50 ml of recently boiled and cooled water, add 1 ml of 0.01 M hydrochloric acid solution, then 0.05 ml of methyl orange solution (R). The red tint in bucket A should not be darker than that of the liquid in bucket B.

4.2. Hydrogen Sulfide, Hydrogen Phosphide, Arsine and Organic Reducing Substances

Under the same conditions as those in the preceding test, let 1000 ml of carbon dioxide flow into a mixture of 10 ml of ammoniacal silver nitrate solution (R), 3 ml of concentrated ammonium hydroxide (R) and 15 ml of distilled water. There should be no clouding or brown color as compared to an identical control solution through which no carbon dioxide gas flowed.

4.3. Oxygen

For oxygen determination tests (see «Nitrogen»), pierce the stopper of a flask with a 8/10 mm hypodermic needle (take care not to dip the needle into the liquid). This needle will allow gas to escape after bubbling. Next, insert a second hypodermic needle of the same size to feed the expanding gas into the liquid. After a minute of bubbling, there should be no significant colorating. In the presence of oxygen, the liquid will rapidly turn blue and the color become more intense over time.

4.4. Carbon Monoxide

The limiting carbon monoxide content as determined using the method described in the annex is 10 µl/l/

4.5. Oil

The limiting oil content as expressed by the quantitiy absorbed by a suitable trap, as described in the technique described in the annex, is 0.1 mg/l.

4.6. Quantitative Analysis

Place approximately 100 ml of carbon dioxide, measured with precision, in a graduated volumetric flask turned over on a mercury

tank or a graduated gas burette filled with mercury. Using a curved pipette on the mercury tank or by exerting pressure of mercury using an appropriate device, force the gas into a tube or absorber tank containing a sufficient quantity of an aqueous solution which contains 40 g of potassium hydroxide (R) per 100 ml. Shake for 5 minutes to ensure efficacious contact between the liquid and the gas. Again, feed the gas freed from the aqueous liquid to the graduated flask or the burette. Read the residual volume at the same temperature and under the same pressure as those at which the sample was measured. Once again, place the residual gas in contact with the alkaline solution and take a second residual volume reading to verify absorption was complete. There should be no more than 1 pp 100 of non-absorbable gas.

5. Storage

Carbon dioxide is stored in steel canisters which are painted gray. The strength of these canisters should be periodically checked.