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22 Date of Revision

4 May 2017.

Carbon Dioxide

1 Nonproprietary Names

BP: Carbon Dioxide
JP: Carbon Dioxide
PhEur: Carbon Dioxide
USP–NF: Carbon Dioxide

2 Synonyms

Carbonei dioxidum; carbonic acid gas; carbonic anhydride; E290.

3 Chemical Name and CAS Registry Number

Carbon dioxide [124-38-9]

4 Empirical Formula and Molecular Weight

CO_2 44.01

5 Structural Formula

See Section 4.

6 Functional Category

Aerosol propellant; air displacement; solvent.

7 Applications in Pharmaceutical Formulation or Technology

Carbon dioxide and other compressed gases such as nitrogen and nitrous oxide are used as propellants for topical pharmaceutical aerosols. They are also used in other aerosol products that work satisfactorily with the coarse aerosol spray that is produced with compressed gases, e.g. cosmetics, furniture polish, and window cleaners.[1–3]

The advantages of compressed gases as aerosol propellants are that they are less expensive; are of low toxicity; and are practically odorless and tasteless. Also, in comparison to liquefied gases, their pressures change relatively little with temperature. However, the disadvantages of compressed gases are that there is no reservoir of propellant in the aerosol and pressure consequently decreases as the product is used. This results in a change in spray characteristics. Additionally, if a product that contains a compressed gas as a propellant is actuated in an inverted position, the vapor phase, rather than the liquid phase, is discharged. Most of the propellant is contained in the vapor phase and therefore some of the propellant will be lost and the spray characteristics will be altered. Also, sprays produced using compressed gases are very wet. Valves, such as the vapor tap or double dip tube, are currently available and will overcome these problems.

Carbon dioxide is also used to displace air from pharmaceutical products by sparging and hence to inhibit oxidation. As a food additive it is used to carbonate beverages and to preserve foods such as bread from spoilage by mold formation, the gas being injected into the space between the product and its packaging.[4,5]

Solid carbon dioxide is also widely used to refrigerate products temporarily, while liquid carbon dioxide, which can be handled at temperatures up to 31°C under high pressure, is used as a solvent for flavors and fragrances, primarily in the perfumery and food manufacturing industries.

8 Description

Carbon dioxide occurs naturally as approximately 0.03% v/v of the atmosphere. It is a colorless, odorless, noncombustible gas with a faint acid taste. Solid carbon dioxide, also known as dry ice, is usually encountered as white-colored pellets or blocks.