Sodium Carbonate

1 Nonproprietary Names

BP: Sodium Carbonate
JP: Dried Sodium Carbonate
PhEur: Sodium Carbonate
USP–NF: Sodium Carbonate

2 Synonyms

Bisodium carbonate; calcined soda; carbonic acid disodium salt; Cenzias de Soda; crystol carbonate; disodium carbonate; E500i; *Gran-Plus*; natrii carbonas anhydricus; *Novacarb*; soda ash; soda calcined; *Sodium Carbonate IPH*.

3 Chemical Name and CAS Registry Number

Sodium carbonate anhydrous [497-19-8]
Sodium carbonate monohydrate [5968-11-6]
Sodium carbonate decahydrate [6132-02-1]

4 Empirical Formula and Molecular Weight

Na_2CO_3 105.9$Na_2CO_3 \cdot H_2O$ 124.0$Na_2CO_3 \cdot 10H_2O$ 286.1

5 Structural Formula

See Section 4.

6 Functional Category

Alkalizing agent; buffering agent; dispersing agent; tablet and capsule diluent.

7 Applications in Pharmaceutical Formulation or Technology

Sodium carbonate is used as an alkalizing agent in injectable, ophthalmic, oral, and rectal formulations.[1]

In effervescent tablets or granules, sodium carbonate is used in combination with an acid, typically citric acid or tartaric acid.[2] When the tablets or granules come into contact with water, an acid–base reaction occurs in which carbon dioxide gas is produced and the product disintegrates.[3] Raw materials with low moisture contents are required to prevent the early triggering of the effervescent reaction.[3]

As an alkalizing agent, concentrations of sodium carbonate between 2% and 5% w/w are used in compressed tablet formulations.[2,4] As an effervescent agent, concentrations of sodium carbonate up to 10% w/w can be used.[3]

8 Description

Sodium carbonate occurs as a white, almost white, or colorless inorganic salt, produced as crystalline powder or granules. It is hygroscopic and odorless.

9 Pharmacopeial Specifications

See Table I.

Table I: Pharmacopeial specifications for sodium carbonate.

Test	JP XVII	PhEur 9.2	USP 40–NF 35 S1
Identification	+	+	+
Characters	–	+	–
Appearance of solution	+	+	–
Alkali hydroxides and bicarbonates	–	+	–
Chlorides	≤0.071%	≤125 ppm	–
Sulfates	–	≤250 ppm	–
Arsenic	≤3.1 ppm	≤5 ppm	–
Iron	–	≤50 ppm	–
Heavy metals	≤20 ppm	–	≤10 ppm
Loss on drying	≤2.0%	≤1.0%	≤0.5%
Assay (dried basis)	>99.0%	99.5–100.5%	99.5–100.5%

10 Typical Properties

Acidity/alkalinity

Strongly alkaline;
pH = 11.37 (1% w/v aqueous solution at 25°C);
pH = 11.58 (5% w/v aqueous solution at 25°C);
pH = 11.70 (10% w/v aqueous solution at 25°C).[5]

See also Figure 1.[6]

Hygroscopicity One mole of sodium carbonate will gradually absorb 1 mole of water (approximately 15%) on exposure to air.

Melting point 851°C

Refractive index n_D^{20} = 1.3341 at 1.0% w/w solution; 1.3440 at 5.0% w/w solution; 1.3547 at10.0% w/w solution.[7]

Solubility Freely soluble in water, with solubility initially increasing with temperature and then settling at 30.8% w/w above 80°C[6] (*see* Figure 2). Soluble in glycerin; practically insoluble in ethanol (95%).

Specific gravity 2.53

Spectroscopy

IR spectrum *see* Figure 3.

Raman spectrum *see* Figure 4.

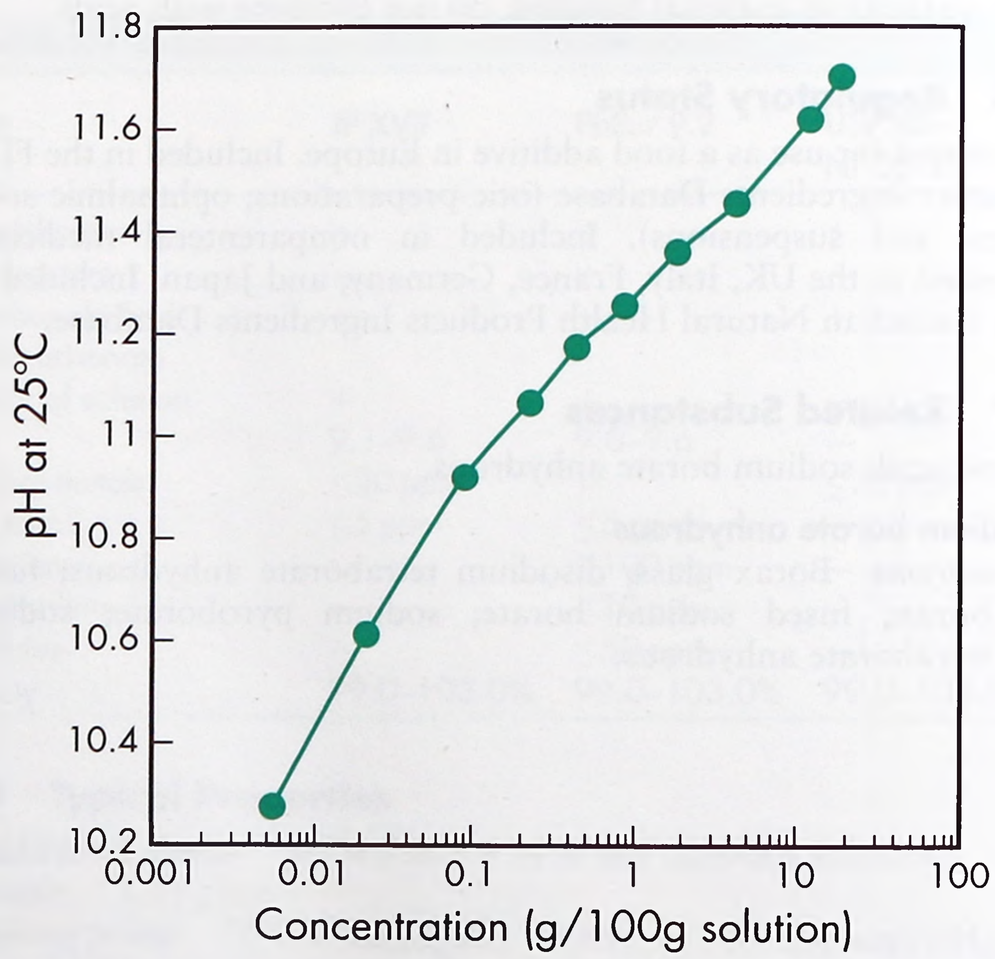

Figure 1: pH of sodium carbonate in water at 25°C.[5] Adapted with permission.