Sodium Metabisulfite

1 Nonproprietary Names

BP: Sodium Metabisulfite

JP: Sodium Pyrosulfite

PhEur: Sodium Metabisulfite

USP–NF: Sodium Metabisulfite

2 Synonyms

Disodium disulfite; disodium pyrosulfite; disulfurous acid, sodium salt; E223; natrii disulfis; natrii metabisulfis; sodium acid sulfite; sodium disulfite; sodium pyrosulfite.

3 Chemical Name and CAS Registry Number

Sodium pyrosulfite [7681-57-4]

4 Empirical Formula and Molecular Weight

$Na_2S_2O_5$ 190.1

Sodium metabisulfite contains 24.19% sodium, 42.08% oxygen, and 33.73% sulfur.

5 Structural Formula

See Section 4.

6 Functional Category

Antimicrobial preservative; antioxidant.

7 Applications in Pharmaceutical Formulation or Technology

Sodium metabisulfite is used as an antioxidant in oral, parenteral, and topical pharmaceutical formulations, at concentrations of 0.01–1.0% w/v, and at a concentration of approximately 27% w/v in intramuscular injection preparations. Primarily, sodium metabisulfite is used in acidic preparations; for alkaline preparations, sodium sulfite is usually preferred; *see* Section 18. Sodium metabisulfite also has some antimicrobial activity, which is greatest at acid pH, and may be used as a preservative in oral preparations such as syrups.

Sodium metabisulfite usually contains small amounts of sodium sulfite and sodium sulfate.

8 Description

Sodium metabisulfite occurs as colorless, prismatic crystals or as a white to creamy-white crystalline powder that has the odor of sulfur dioxide and an acidic, saline taste. Sodium metabisulfite crystallizes from cold water as a hydrate containing seven equivalents of water per mole.

9 Pharmacopeial Specifications

See Table I.

Table I: Pharmacopeial specifications for sodium metabisulfite.

Test	JP XVII	PhEur 9.2	USP 40–NF 35 S1
Identification	+	+	+
Characters	—	+	—
Appearance of solution	+	+	—
pH (5% w/v solution)	—	3.5–5.0	—
Chloride	—	—	≤0.05%
Thiosulfate	+	+	≤0.05%
Arsenic	≤4 ppm	≤5 ppm	—
Heavy metals	≤20 ppm	—	≤20 ppm
Iron	≤20 ppm	≤20 ppm	≤20 ppm
Assay (as $Na_2S_2O_5$)	≥95.0%	95.0–100.5%	—
Assay (as SO_2)	—	—	65.0–67.4%

10 Typical Properties

Acidity/alkalinity pH = 3.5–5.0 for a 5% w/v aqueous solution at 20°C.

Melting point Sodium metabisulfite melts with decomposition at less than 150°C.

Osmolarity A 1.38% w/v aqueous solution is isoosmotic with serum.

Solubility *see* Table II.

Specific gravity 1.48

Spectroscopy

IR spectrum *see* Figure 1.

NIR spectrum *see* Figure 2.

Raman spectrum *see* Figure 3.

11 Stability and Storage Conditions

On exposure to air and moisture, sodium metabisulfite is slowly oxidized to sodium sulfate with disintegration of the crystals.[1] Addition of strong acids to the solid liberates sulfur dioxide.

In water, sodium metabisulfite is immediately converted to sodium (Na^+) and bisulfite (HSO_3^-) ions. Aqueous sodium metabisulfite solutions also decompose in air, especially on heating. Solutions that are to be sterilized by autoclaving should be filled into containers in which the air has been replaced with an inert gas, such as nitrogen. The addition of dextrose to aqueous sodium metabisulfite solutions results in a decrease in the stability of the metabisulfite.[2]

The bulk material should be stored in a well-closed container, protected from light, in a cool, dry place.

12 Incompatibilities

Sodium metabisulfite reacts with sympathomimetics and other drugs that are *ortho*- or *para*-hydroxybenzyl alcohol derivatives to form sulfonic acid derivatives possessing little or no pharmacological activity. The most important drugs subject to this inactivation are epinephrine (adrenaline) and its derivatives.[3] In addition, sodium metabisulfite is incompatible with chloramphenicol owing to a more complex reaction;[3] it also inactivates cisplatin in solution.[4,5]

It is incompatible with phenylmercuric acetate when autoclaved in eye drop preparations.[6]

Sodium metabisulfite may react with the rubber caps of multidose vials, which should therefore be pretreated with sodium metabisulfite solution.[7]

13 Method of Manufacture

Sodium metabisulfite is prepared by saturating a solution of sodium hydroxide with sulfur dioxide and allowing crystallization to occur; hydrogen is passed through the solution to exclude air. Sodium metabisulfite may also be prepared by saturating a solution of