Sodium Phosphate, Monobasic

1 Nonproprietary Names

BP: Anhydrous Sodium Dihydrogen Phosphate
Sodium Dihydrogen Phosphate Monohydrate
Sodium Dihydrogen Phosphate Dihydrate

PhEur: Sodium Dihydrogen Phosphate Dihydrate

USP–NF: Monobasic Sodium Phosphate

Note that the BP 2017 contains three separate monographs for the anhydrous, the monohydrate, and the dihydrate; the PhEur 9.2 contains a single monograph for the dihydrate; and the USP 40–NF 35 S1 contains one monograph for the anhydrous, the monohydrate and the dihydrate. *See also* Section 8.

2 Synonyms

Acid sodium phosphate; E339; *Kalipol 32*; monosodium orthophosphate; monosodium phosphate; natrii dihydrogenophosphas dihydricus; phosphoric acid, monosodium salt; primary sodium phosphate; sodium biphosphate; sodium dihydrogen orthophosphate; sodium dihydrogen phosphate.

3 Chemical Name and CAS Registry Number

Anhydrous monobasic sodium phosphate [7558-80-7]

Monobasic sodium phosphate monohydrate [10049-21-5]

Monobasic sodium phosphate dihydrate [13472-35-0]

4 Empirical Formula and Molecular Weight

NaH_2PO_4 119.98
$NaH_2PO_4 \cdot H_2O$ 137.99
$NaH_2PO_4 \cdot 2H_2O$ 156.01

5 Structural Formula

See Section 4.

6 Functional Category

Buffering agent; complexing agent.

7 Applications in Pharmaceutical Formulation or Technology

Monobasic sodium phosphate is used in a wide variety of pharmaceutical formulations as a buffering agent and as a complexing agent.

Monobasic sodium phosphate is also used in food products, for example, in baking powders, and as a dry acidulant and sequestrant.

8 Description

The USP 40–NF 35 S1 states that monobasic sodium phosphate contains one or two molecules of water of hydration or is anhydrous.

The hydrated forms of monobasic sodium phosphate occur as odorless, colorless or white, slightly deliquescent crystals. The anhydrous form occurs as a white crystalline powder or granules.

9 Pharmacopeial Specifications

See Table I.

Table I: Pharmacopeial specifications for sodium phosphate, monobasic.

Test	PhEur 9.2	USP 40–NF 35 S1
Identification	+	+
Characters	+	–
Appearance of solution	+	–
Aluminum, calcium and related elements	–	+
Arsenic	≤2 ppm	≤8 ppm
Chloride	≤200 ppm	≤0.014%
Insoluble substances	–	≤0.2%
Heavy metals	–	≤0.002%
Iron	≤10 ppm	–
pH	4.2–4.5	4.1–4.5
Reducing substances	+	–
Sulfate	≤300 ppm	≤0.15%
Water	+	+
Anhydrous	–	≤2.0%
Monohydrate	–	10.0–15.0%
Dihydrate	21.5–24.0%	18.0–26.5%
Assay (dried basis)	98.0–100.5%	98.0–103.0%

10 Typical Properties

Acidity/alkalinity pH = 4.1–4.5 for a 5% w/v aqueous solution of the monohydrate at 25°C.

Density 1.915 g/cm^3 for the dihydrate.

Dissociation constant pK_a = 2.15 at 25°C

Solubility Soluble 1 in 1 of water; very slightly soluble in ethanol (95%).

Spectroscopy

IR spectrum *see* Figure 1.

NIR spectra *see* Figures 2 and 3.

Raman spectrum *see* Figure 4.

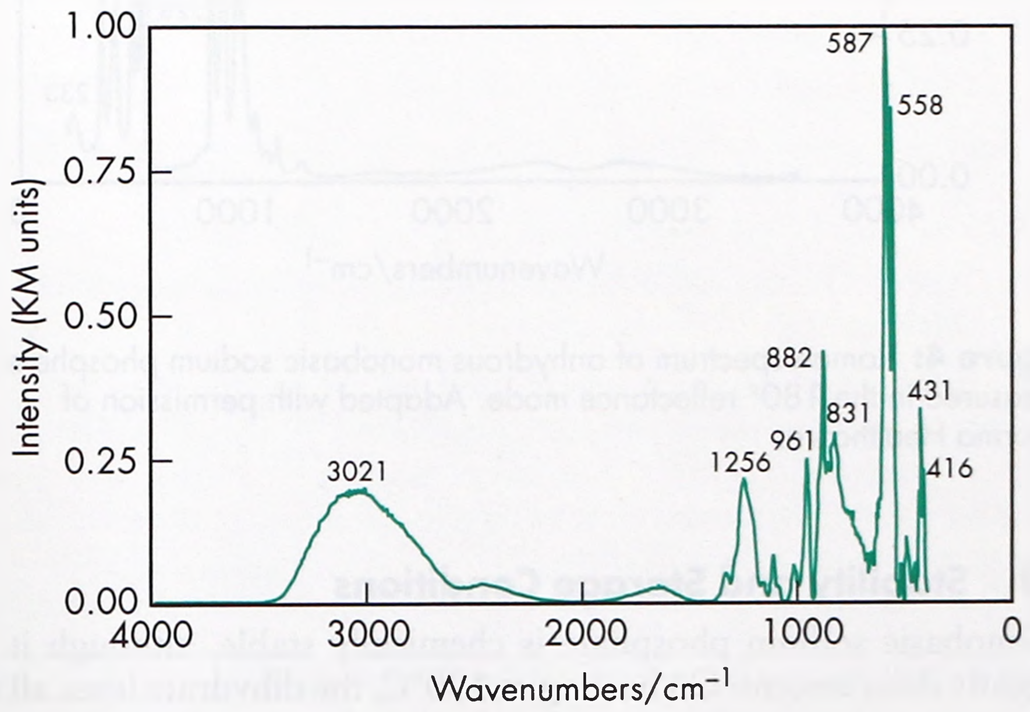

Figure 1: Infrared spectrum of anhydrous monobasic sodium phosphate measured by diffuse reflectance. Adapted with permission of Informa Healthcare.