Magnesium Oxide

1 Nonproprietary Names

BP: Heavy Magnesium Oxide
Light Magnesium Oxide

JP: Magnesium Oxide

PhEur: Magnesium Oxide, Heavy
Magnesium Oxide, Light

USP-NF: Magnesium Oxide

See Section 8.

2 Synonyms

Calcined magnesia; calcinated magnesite; *Descote*; E530; *Magcal*; *Magchem 100*; *Maglite*; magnesia; magnesia monoxide; magnesia usta; magnesii oxidum leve; magnesii oxidum ponderosum; *Magnyox*; *Marmag*; *Oxymag*; periclase.

3 Chemical Name and CAS Registry Number

Magnesium oxide [1309-48-4]

4 Empirical Formula and Molecular Weight

MgO 40.30

5 Structural Formula

See Section 4.

6 Functional Category

Anticaking agent; emulsifying agent; glidant; tablet and capsule diluent; tonicity agent.

7 Applications in Pharmaceutical Formulation or Technology

Magnesium oxide is used as an alkaline diluent in solid dosage forms to modify the pH of tablets.[1] It can be added to solid-dosage forms to bind excess water and keep the granulation dry. In combination with silica, magnesium oxide can be used as an auxiliary glidant.[2]

8 Description

Two forms of magnesium oxide exist: a bulky form termed light magnesium oxide and a dense form termed heavy magnesium oxide. The USP 40–NF 35 S1 and JP XVII define both forms in a single monograph, while the BP 2017 and PhEur 9.2 have separate monographs for each form. The JP XVII states that when 5 g of magnesium oxide has a volume not more than 30 mL, it may be labeled heavy magnesium oxide. For the heavy variety, 15 g has an apparent volume before settling of not more than 60 mL; for the light variety, 15 g has an apparent volume before settling of not more than 100 mL as defined by the BP 2017 and PhEur 9.2.

Both forms of magnesium oxide occur as fine, white, odorless powders. Magnesium oxide possesses a cubic crystal structure, though the BP 2017 and PhEur 9.2 describe the appearance of light magnesium oxide as an amorphous powder.

9 Pharmacopeial Specifications

See Table I.

Table I: Pharmacopeial specifications for magnesium oxide.

Test	JP XVII	PhEur 9.2	USP 40–NF 35 S1
Identification	+	+	+
Characters	–	+	–
Loss on ignition	≤10.0%	≤8.0%	≤10.0%
Color of solution	–	+	–
Free alkali and soluble salts	≤0.5%	--	≤2.0%
Soluble substances	–	≤2.0%	–
Acid-insoluble substances	≤0.1%	≤0.1%	≤0.1%
Arsenic	≤10 ppm	≤4 ppm	–
Calcium	–	≤1.5%	≤1.1%
Calcium oxide	≤1.5%	–	–
Carbonate	+	–	–
Heavy metals	≤40 ppm	–	≤20 ppm
Iron	≤500 ppm	+	≤0.05%
Heavy magnesium oxide	–	≤0.07%	–
Light magnesium oxide	–	≤0.1%	–
Chloride	–	+	–
Heavy magnesium oxide	–	≤0.1%	–
Light magnesium oxide	–	≤0.15%	–
Fluoride	≤0.08%	–	–
Sulfate	–	≤1.0%	–
Bulk density	–	+	+
Heavy magnesium oxide	–	≥0.25g/ml	–
Light magnesium oxide	–	≤0.15g/ml	–
Assay	≥96.0%	98.0–100.5%	96.0–100.5%

10 Typical Properties

Acidity/alkalinity pH = 10.3 (saturated aqueous solution)

Boiling point 3600°C

Melting point 2800°C

Particle size distribution 99.98% less than 45 μm in size (light magnesium oxide).

Refractive index 1.735

Solubility Soluble in dilute acids and ammonium salt solutions; very slightly soluble in pure water (≈0.0086 g/100 mL at 30°C; solubility is increased by carbon dioxide); practically insoluble in ethanol (95%).

Specific gravity 3.58 g/cm^3 at 25°C (heavy magnesium oxide).

Spectroscopy

NIR spectrum *see* Figure 1.

11 Stability and Storage Conditions

Magnesium oxide is stable at normal temperatures and pressures; however, it is hygroscopic, rapidly absorbing water and carbon dioxide on exposure to the air. Absorption occurs more readily with the light form than the heavy form. Magnesium hydroxide is formed in the presence of water.

The bulk material should be stored in an airtight container in a cool, dry place.