MAGNESIUM DIHYDROGEN DIPHOSPHATE

New specifications prepared at the 76th JECFA (2012) and published in FAO JECFA Monographs 13 (2012). No ADI was established. A group MTDI of 70 mg/kg bw, expressed as phosphorus from all food sources, was established at the 26th JECFA (1982).

SYNONYMS Acid magnesium pyrophosphate, monomagnesium dihydrogen pyrophosphate; magnesium diphosphate, INS No. 450 (ix)

DEFINITION Magnesium dihydrogen diphosphate is the acidic magnesium salt of diphosphoric acid. It is manufactured by adding an aqueous dispersion of magnesium hydroxide slowly to phosphoric acid, until a molar ratio about 1:2 between Mg and P is reached. The temperature is held under 60^{o} during the reaction. About 0.1% hydrogen peroxide is added to the reaction mixture and the slurry is then dried and milled.

Chemical names	Monomagnesium dihydrogen diphosphate
C.A.S. number	20768-12-1
Chemical formula	$MgH_2P_2O_7$
Formula weight	200.25
Assay	Not less than 68.0% and not more than 70.5% expressed as P_2O_5 Not less than 18.0% and not more than 20.5% expressed as MgO

DESCRIPTION White crystals or powder

FUNCTIONAL USES Acidifier, stabilizer, raising agent

CHARACTERISTICS

IDENTIFICATION

Solubility (Vol. 4)	Slightly soluble in water, practically insoluble in ethanol
Test for magnesium (Vol. 4)	Passes test

PURITY

Loss on ignition (Vol. 4)	Not more than 12% (800°, 0.5 h)
Orthophosphate	Not more than 4% as $(PO_4)^{3-}$ See description under TESTS
Calcium (Vol. 4)	Not more than 0.4% Determine using an AAS/ICP-AES technique appropriate to the specified level. The selection of sample size and method of sample preparation may be based on principles of methods described in Volume 4 (under “General Methods, Metallic Impurities”).
Fluoride (Vol. 4)	Not more than 20 mg/kg Method III; use an appropriate sample size and appropriate volumes of standard solution for the construction of standard curve.
Aluminium (Vol. 4)	Not more than 50 mg/kg Determine using an AAS/ICP-AES technique appropriate to the specified level. The selection of sample size and method of sample preparation may be based on principles of methods described in Volume 4 (under “General Methods, Metallic Impurities”).
Arsenic (Vol. 4)	Not more than 1 mg/kg Determine using an AAS (Hydride generation technique) appropriate to the specified level. The selection of sample size and method of sample preparation may be based on principles of methods described in Volume 4 (under “General Methods, Metallic Impurities”).
Cadmium (Vol. 4)	Not more than 1 mg/kg Determine using an AAS (Electrothermal atomization technique) appropriate to the specified level. The selection of sample size and method of sample preparation may be based on principles of methods described in Volume 4 (under “General Methods, Metallic Impurities”).
Lead (Vol. 4)	Not more than 1 mg/kg Determine using an AAS (Electrothermal atomization technique) appropriate to the specified level. The selection of sample size and method of sample preparation may be based on principles of methods described in Volume 4 (under “General Methods, Metallic Impurities”).

TESTS

PURITY TESTS

Orthophosphate

Determination of orthophosphate by Ion Chromatography with suppressed conductivity detection

Principle:
Orthophosphate in magnesium dihydrogen diphosphate is separated on an ion-exchange column with potassium hydroxide as eluent and detected using conductivity detector.

Equipment and Reagents:
Ion chromatograph with gradient pump, autosampler, anion self regenerating suppressor (ASRS) and conductivity detector, Dionex ICS 2000 or equiv.
Sodium phosphate, dibasic, Analytical grade, Aldrich or equiv.
Tetrasodium pyrophosphate decahydrate, Analytical grade, Fluka or equiv.
Potassium hydroxide, Analar grade, BDH or equiv.
Deionized water (18 MΩ.cm)

Preparation of standard and sample solutions:
Stock mixed standard solution: Accurately weigh calculated quantities to get about 25 mg of orthophosphate (PO_4^{3-}) and 30 mg of pyrophosphate ($P_2O_7^{4-}$), quantitatively transfer into a 100-ml volumetric flask and make up to volume with deionized water.

Working mixed standard solutions: Pipette 5, 10, 15, 20, 25 ml of stock mixed standard solution into a series of 50-ml volumetric flasks and make up to volume with deionized water.

Preparation of sample: Accurately weigh about 0.100 g of magnesium dihydrogen diphosphate, quantitatively transfer into a 100-ml volumetric flask, dissolve and make upto volume with deionized water.

Chromatographic conditions:
Column: Ion-exchange column, Dionex Ion Pac AS 16 (2 x 250 mm) with guard column Ion Pac AG 16 (2 x 50 mm) or equiv.
Detector: Conductivity detector
Eluent: Potassium hydroxide: 80 mM in deionized water (18 MΩ.cm)
Gradient Conditions: Eluent A: Potassium hydroxide solution (80m mM) in deionized water; Eluent B: Deionized water: Start gradient by mixing eluent A and B in proportions to get eluent concentration of about 30 mM and increase to 80 mM over a period of 13-15 min. Adjust gradient conditions to separate ortho, pyro and triphosphate by injecting 10 µl of sample solution.

Flow rate: 0.25 ml/min.

Injection volume: 10 µl

Inject 10 µl each of working mixed standard solutions and construct standard curve. Inject sample and calculate the concentration of orthophosphate from the standard curve and weight of sample taken.

METHOD OF ASSAY

Determination of phosphorous as phosphorous pentoxide (P_2O_5)

Determine phosphorous using ICP-AES technique appropriate to the specified level. Set instrument parameters as specified by the instrument manufacturer and use the analytical line for P(213.618 nm). The selection of sample size and method of sample preparation may be based on principles of methods described in Volume 4. Determine the phosphorous percentage (P%) in the sample and calculate phosphorous pentoxide using the formula:

$$P_2O_5, \%w/w = P\% \times 4.983$$

Determination of magnesium as magnesium oxide (MgO)

Determine magnesium using ICP-AES technique appropriate to the specified level. Set instrument parameters as specified by the instrument manufacturer and use the analytical line for Mg (279.078 nm). The selection of sample size and method of sample preparation may be based on principles of methods described in Volume 4. Determine the magnesium percentage (Mg%) in the sample and calculate magnesium oxide using the formula:

$$MgO, \%w/w = Mg\% \times 1.658$$