Magnesium

Dr. Paul Lohmann®

High value mineral salts

www.lohmann4minerals.com

Magnesium

Magnesium is an essential mineral. Approx. 60 % is found in the skeleton and the teeth, bound in the form of hydroxyapatite constributing to bone stabilization as storage for the bone matrix. It acts as Magnesium storage at the same time. Magnesium contained in cells is vitally important as an essential cofactor for more than 600 enzymatic reactions which are necessary for the regulation of various biochemical reactions in the body.[1, 2]

Physiology

Magnesium takes part in virtually all metabolic processes and it's also of major importance for the neuromuscular and cardiovascular system. It influences muscle contraction, the breakdown and utilization of carbohydrates, lipids, nucleic acid and proteins, as well as the storage and release of hormones and neurotransmitters.[1]

Physiological functions[1, 2, 3]	
◆ Stabilization (in the form of hydroxyapatite) ◆ Mineralization ◆ Growth	◆ Bones/Teeth
Protein and nucleic acid synthesis	◆ Enzymes
Storage and release of hormones and neurotransmitters	
Energy metabolism ◆ Glucose phosphorylation ◆ Influences the effect of insulin	
DNA translation and RNA transcription	
Impulse transmission/saltatory conduction ◆ Regulation of receptor sensitivity	◆ Nerves
Physiological calcium channel blocker ◆ Muscle contraction/relaxation ◆ Blocking Ca^{2+} ion channels: Inhibiting electrochemical stimuli on cardiac muscles, skeletal and smooth muscles ◆ Converting chemical energy to mechanical energy ◆ Neurotransmitter release	◆ Muscles ◆ Cardiac, skeletal and smooth muscles
◆ Regulating membrane permeability (Ca, K, Na transport) ◆ Stabilizing cell membranes (cell adhesion)	◆ Cells/ Membranes
Reducing thrombocyte aggregation	◆ Blood

Health Claims[8]

Magnesium contributes to the maintenance of important body functions:

- Normal teeth and bones
- Decrease in tiredness/fatigue
- Normal muscle function
- Functioning nervous system
- Energy metabolism
- Protein synthesis

Magnesium and nutrition

Developing nutritional supplements or fortifying food with bioavailable Magnesium Salts can help to prevent deficiencies. Magnesium Salts that are easily dissolved in liquid are absorbed more quickly by the intestine than less soluble forms. Studies have shown that organically bound Magnesium such as Magnesium Citrate, Magnesium Aspartate and Magnesium Lactate are especially bioavailable.[4, 5]

Inhibitors[1, 6, 7]	Promoters[1, 6, 7]
Free fatty acids	Fructose
Fiber	Protein
Zinc	Glucagon
Oxalate	Insulin
Phytate	Aldosterone
Alcohol	

Metabolism

The Magnesium bound in the skeleton is in a solution equilibrium with the Magnesium outside the cells. In addition, the Magnesium homeostasis is also regulated by the intestine and kidneys.[1]

The major share of Magnesium is absorbed in the small intestine by a passive, paracellular mechanism driven by an electrochemical gradient. The rate of absorption mainly depends on the Magnesium status. The lower the Magnesium level, the higher the absorption rate. If there is a low supply, the Magnesium is absorbed via transcellular transport. Excess Magnesium is excreted.[2, 3]

Use in prevention and therapy[1, 2, 3, 11, 12, 13]

- Muscle cramps/pain
- Migraines
- Poor concentration, nervousness
- Cardiovascular diseases
- High blood pressure
- Osteoporosis
- Diabetes type II

Requirement/Deficit

An imbalance in the Magnesium status can lead to neuro-muscular, cardiovascular and/or neurological disorders.

Intake recommendations

The reference quantity in Europe for the daily intake of minerals (nutrient reference value = NRV) is 375 mg/d for adults[9]. A continuous intake throughout the day is beneficial.

Magnesium deficiency

A deficiency of Magnesium (hypomagnesemia) can be innate or occur due to insufficient supply, reduced resorption, increased excretion or medication. Hypomagnesemia can lead to cardiac arrhythmia, anorexia, lethargy, weakness, agitation, muscle spasms, tremors and muscle cramps.[3, 10, 11]

API Documentation

Drug substance documentation is required by health authorities for the submission of pharmaceuticals with Magnesium Salts as an Active Pharmaceutical Ingredient (API). In order to enable this submission and simplify the process, 6 CEPs (Certificate of Suitability to the European Pharmacopeia) and globally more than 30 DMFs (Drug Master Files) are available.

List of current Magnesium CEPs

Substance	CEP no.
Magnesium Aspartate Dihydrate	CEP 2013-042
Magnesium Carbonate, heavy	CEP 2008-071
Magnesium Carbonate, light	CEP 2010-062
Magnesium Citrate	CEP 2009-017
Magnesium Citrate Nonahydrate	CEP 2011-036
Magnesium Hydroxide	CEP 2013-020

Legal Considerations

In the EU, various Magnesium Salts are permitted for the fortification of foods, infant formula and follow-on formula, processed cereal-based foods as well as food for special medical purposes, food for weight-controlled diets and food supplements.

The EFSA has approved several health claims for Mineral Salts. Due to the various effects on the human body and the good basis of evidence, 10 health claims have been approved for Magnesium.

Magnesium	Food*	Food Supple-ments**	Infant formulae and follow-on formulae***	Processed cereals-based foods and baby foods for infants and young children***	Food for special medical purposes***	Total diet replacement for weight control***
Magnesium acetate	✔	✔			✔	✔
Magnesium acetyl taurate		✔				
Magnesium bisglycinate		✔			✔	✔
Magnesium carbonate	✔	✔	✔	✔	✔	✔
Magnesium chloride	✔	✔	✔	✔	✔	✔
Magnesium gluconate	✔	✔	✔	✔	✔	✔
Magnesium glycerophosphate	✔	✔		✔	✔	✔
Magnesium hydroxide	✔	✔	✔	✔	✔	✔
Magnesium potassium citrate	✔	✔			✔	✔
Magnesium lactate	✔	✔		✔	✔	✔
Magnesium L-ascorbate		✔				
Magnesium L-aspartate					✔	
Magnesium L-lysinate		✔				
Magnesium L-pidolate		✔			✔	✔
Magnesium malate		✔				
Magnesium oxide	✔	✔	✔	✔	✔	✔
Magnesium pyruvate		✔				
Magnesium salts of citric acid	✔	✔	✔	✔	✔	✔
Magnesium salts of orthophosphoric acid	✔	✔	✔	✔	✔	✔
Magnesium succinate		✔				
Magnesium sulphate	✔	✔	✔	✔	✔	✔
Magnesium taurate		✔				

blue = in the Dr. Paul Lohmann® portfolio

* Regulation (EC) No 1925/2006 of the European Parliament and of the Council on the addition of vitamins and minerals and of certain other substances to foods

** Directive 2002/46/EC of the European Parliament and of the Council on the approximation of the laws of the Member States relating to food supplements

*** Regulation (EU) No 609/2013 of the European Parliament and of the Council on food intended for infants and young children, food for special medical purposes, and total diet replacement for weight control

Magnesium – Our Product Range

Product	Product no.	Quality	Physical appearance
Magnesium Acetate, anhydrous	511092001	chem. pure	very fine powder
	511092002		powder
Magnesium Acetate 4-hydrate	511019002	chem. pure	crystals
	511019405	ACS	
	511019004	Ph.Eur. | BP | DAC	
	511019001	Ph.Eur.; Low in Endotoxins	
	511019007	chem. pure	
Magnesium Acetate Solution	511091001	chem. pure	solution, approx. 50 %
Magnesium L-Ascorbate 2-hydrate	501046200	food quality | chem. pure	powder
	501046201	food supplement	gran. powder
Magnesium DL-Hydrogen Aspartate 4-hydrate	501064003	DAB	powder
	501064002		crystals
	501064004		granules
	501064001	DAB; Low in Endotoxins	powder
Magnesium L-Aspartate 2-hydrate	501065004	chem. pure	crystalline powder
Magnesium L-Hydrogen Aspartate 2-hydrate	501061001	chem. pure	powder
	501061006	Ph.Eur.	
	501061005		fine granules
Magnesium Bisglycinate	505083001	food supplement | chem. pure Citric acid is used as stabilizing agent during processing	powder
Magnesium Carbonate, heavy BD approx. 500 g/l	503036001	Ph.Eur. | USP | BP | FCC | E 504 | food supplement | JECFA | Ph.Franc.X	powder
Magnesium Carbonate, heavy BD 500 g/l	503036002	Ph.Eur. | FCC	
Magnesium Carbonate, heavy BD approx. 450 g/l	503036023	Ph.Eur. | Ph.Franc.X | E 504 | food supplement	
Magnesium Carbonate, medium heavy – BD approx. 300 g/l	503036022	Ph.Eur. | USP | FCC | E 504 | chem. pure	
Magnesium Carbonate, light BD < 150 g/l	503036012	Ph.Eur. | USP | BP | FCC | E 504 | food supplement | chem. pure	
Magnesium Carbonate, light BD approx. 120 g/l	503036009	Ph.Eur. | USP	
Magnesium Carbonate DC 97GA – BD approx. 450 g/l	503036035	with 3 % gum arabic complies with the requirements of Ph.Eur. | USP/NF | FCC | E 414	granules, directly compressible
Magnesium Carbonate DC 90S BD approx. 600 g/l	503036016	E 504(ii) | food supplement with 10 % corn starch Ph.Eur. | USP/NF	granules, directly compressible
Magnesium Carbonate DC 90S/C BD approx. 500 g/l	503036017	Ph.Eur. | USP/NF | E 504 with 10 % corn starch Ph.Eur. | USP/NF	coarse granules, directly compressible
Magnesium Carbonate DC 90S/F BD approx. 500 g/l	503036018	Ph.Eur. | USP/NF | E 504 with 10 % corn starch Ph.Eur. | USP/NF	fine granules, directly compressible
Magnesium Chloride 6-hydrate	522030220	Ph.Eur. | BP | USP | FCC | E 511	crystals
Magnesium Citrate	503088001	food quality	powder
	503088002	Ph.Franc.X	
	503088003		fine granules
Magnesium Citrate, sour	503086001	chem. pure	powder
Magnesium Citrate Malate	512093001	chem. pure	powder
Magnesium Potassium Citrate	502011001	food quality | food supplement	crystalline powder

Product	Color	Flavor	Metal content (per 100 g)	Solubility 20°C	pH (1 % solution/ *suspension)
Magnesium Acetate, anhydrous	white to yellowish-white white	exothermic, bitter slightly bitter, slightly acetic	approx. 17 % Mg	+ ++	approx. 8–10
Magnesium Acetate 4-hydrate	white	bitter, slightly sour	approx. 11 % Mg	++	approx. 8
Magnesium Acetate Solution	–	bitter, slightly sour	approx. 5.5 % Mg	++	approx. 7–8 (50 % solution)
Magnesium L-Ascorbate 2-hydrate	yellowish	neutral	approx. 5.5 % Mg	++	approx. 6–7
Magnesium DL-Hydrogen Aspartate 4-hydrate	white	neutral	approx. 6 % Mg	– –	approx. 5.5–7.5
Magnesium L-Aspartate 2-hydrate	white		approx. 11 % Mg	+	approx. 10
Magnesium L-Hydrogen Aspartate 2-hydrate	white	bitter	approx. 7.5 % Mg	++	approx. 6–8
Magnesium Bisglycinate	white	exothermic, sweet, fishy	approx. 10.5 % Mg	+	approx. 9.5–10.5
Magnesium Carbonate, heavy BD 500 g/l Magnesium Carbonate, heavy BD approx. 450 g/l Magnesium Carbonate, medium heavy – BD approx. 300 g/l Magnesium Carbonate, light BD < 150 g/l Magnesium Carbonate, light BD approx. 120 g/l	white	sandy, neutral	approx. 25 % Mg	– –	approx. 10
Magnesium Carbonate DC 97GA – BD approx. 450 g/l	white	sandy, neutral	approx. 24 % Mg	– –	approx. 10
Magnesium Carbonate DC 90S BD approx. 600 g/l	white	sandy, neutral	approx. 22.5 % Mg	– –	approx. 10
Magnesium Carbonate DC 90S/C BD approx. 500 g/l	white	sandy, neutral	approx. 22.5 % Mg	– –	approx. 10
Magnesium Carbonate DC 90S/F BD approx. 500 g/l	white	sandy, neutral	approx. 22.5 % Mg	– –	approx. 10
Magnesium Chloride 6-hydrate	colorless	bitter, salty	approx. 12 % Mg	++	approx. 5–6
Magnesium Citrate	white	sour	approx. 10 % Mg	– + +	approx. 4
Magnesium Citrate, sour	white	sour	approx. 7 % Mg	+	approx. 3–4
Magnesium Citrate Malate	white to yellowish-white	sourish, sandy, slightly bitter	approx. 14 % Mg	++	approx. 5–6
Magnesium Potassium Citrate	white	neutral	approx. 26 % K; approx. 4 % Mg	++	approx. 7

++ > 100 g/l + 10 – 100 g/l – 1 – 10 g/l – – < 1 g/l

The solubility specified here was measured in water.
The solubility is influenced by many factors in the application.

Magnesium – Our Product Range

Product	Product no.	Quality	Physical appearance
Magnesium Hydrogen Citrate	503033001	Erg.B.6 | DAC | food quality | food supplement	powder
	503033010	DAC (Ni max. 5 ppm)	
	503033004	Erg.B.6 | DAC | food supplement	fine granules
Trimagnesium Dicitrate, anhydrous	503043001	Ph.Eur. | USP | DAC | chem. pure	powder
	503043002	Ph.Eur. | USP | DAC | food quality | food supplement | chem. pure	
	503043009	Ph.Eur.	
	503043003	DAC | USP | food quality	micronized powder
Trimagnesium Dicitrate, anhydrous DC 100 – BD approx. 700 g/l	503043007	food supplement	granules, directly compressible
	503043010	Ph.Eur. | USP	
Trimagnesium Dicitrate, anhydrous DC 95M – BD approx. 650 g/l	503043012	Food supplement with 5 % maltodextrin USP | Ph.Eur. | FCC	granules, directly compressible
Trimagnesium Dicitrate 9-hydrate	503042004	chem. pure	powder
	503042002	Ph.Eur. | USP | DAC | food quality	
	503042003	Ph.Eur. | USP | DAC	micronized powder
Trimagnesium Dicitrate 9-hydrate DC 100 – BD approx. 650 g/l	503042005	Ph.Eur.	granules, directly compressible
Trimagnesium Dicitrate 9-hydrate DC 95CA – BD approx. 500 g/l	503042007	Ph.Eur. | USP with 5 % citric acid complies with the limits of Ph.Eur. | USP | E 330	granules, directly compressible
Trimagnesium Dicitrate 9-hydrate DC 95M	503042008	Ph.Eur. with 5 % maltodextrin USP | Ph.Eur. | FCC	granules, directly compressible
Trimagnesium Dicitrate 12-hydrate	503044002	Ph.Eur. | USP | DAC | food quality | chem. pure	powder
Magnesium Formate 2-hydrate	502070001	chem. pure	crystalline powder
	502070002	chem. pure special quality for tobacco industry	fine powder
Magnesium Fumarate 4-hydrate	505037001	food quality | chem. pure	powder
Magnesium Gluconate	503074000	USP | JECFA	powder
	503074001	Ph.Eur. | USP | FCC	
	503074003		
	503074004	Ph.Eur., Low in Endotoxins	
	503074002	Ph.Eur. | USP | FCC	fine powder
Magnesium L-Glutamate 4-hydrate	501031002	Low in Endotoxins	powder
Magnesium Glycerophosphate	512048003	Ph.Eur. | BP | food supplement	powder
	512048001	BPC	
	512048004	Ph.Eur. | BP	micronized powder
	512048002	BPC	fine powder
	512048220	Ph.Eur.	granules
Magnesium Glycerophosphate, Solution	512078001	chem. pure	solution, approx. 50 %
Magnesium Hydroxide, heavy – BD approx. 550 g/l	503035002	Ph.Eur. | BP | USP | BPC | JPC | Ph.Franc. | FCC | E 528 | food supplement	powder
	503035004	Ph.Eur. | USP | E 528 | chem. pure	fine powder
Magnesium Hydroxide, light – BD approx. 350 g/l	503035010	Ph.Eur. | USP	powder
	503035013	USP	fine powder
Magnesium Hydroxide	503035007	Ph.Eur.	powder
Magnesium Hydroxide	503035005	Ph.Eur. | USP	fine powder
Magnesium Hydroxide	503035011	Ph.Eur.	fine powder
Magnesium Hydroxide DC 90S – BD approx. 550 g/l	503035014	Ph.Eur. | USP | FCC | E 528 with 10 % corn starch Ph.Eur. | USP/NF	granules, directly compressible
Magnesium Hydroxide Gel	503038003	USP	Paste/Gel
Magnesium Lactate, anhydrous	512081001	chem. pure	powder
Magnesium Lactate 2-hydrate	512021002	food quality | chem. pure	fine-grained powder
	512021002	Ph.Eur. | food supplement	crystalline powder
	512021007	Ph.Eur.	micronized powder

Product	Color	Flavor	Metal content (per 100 g)	Solubility 20°C	pH (1 % solution/ *suspension)
Magnesium Hydrogen Citrate	white	sour	approx. 8.5 % Mg	++	approx. 4
Trimagnesium Dicitrate, anhydrous	white	slightly sweet, slightly bitter	approx. 15 % Mg	+ ++ +	approx. 7
Trimagnesium Dicitrate, anhydrous DC 100 – BD approx. 700 g/l	white to cream	slightly sweet, slightly bitter	approx. 15 % Mg	++	approx. 7
Trimagnesium Dicitrate, anhydrous DC 95M – BD approx. 650 g/l	white to off-white	slightly sweet/bitter, exothermic, sandy	approx. 14 % Mg	–	approx. 7
Trimagnesium Dicitrate 9-hydrate	white	slightly sweet, slightly bitter	approx. 12 % Mg	– –	approx. 7–8
Trimagnesium Dicitrate 9-hydrate DC 100 – BD approx. 650 g/l	white		approx. 12 % Mg	– –	approx. 7–8
Trimagnesium Dicitrate 9-hydrate DC 95CA – BD approx. 500 g/l	white		approx. 11 % Mg	– –	
Trimagnesium Dicitrate 9-hydrate DC 95M	white to off-white	neutral	approx. 11 % Mg	– –	approx. 7
Trimagnesium Dicitrate 12-hydrate	white to cream	slightly sweet, slightly bitter	approx. 11 % Mg	– –	approx. 7
Magnesium Formate 2-hydrate	white	sour, bitter	approx. 16 % Mg	– –	approx. 6.5–7
Magnesium Fumarate 4-hydrate	white	bitter, salty, floury	approx. 11 % Mg	– –	approx. 8.5–9.5
Magnesium Gluconate	white	sweet, slightly bitter	approx. 5.5 % Mg	–	approx. 6–7
Magnesium L-Glutamate 4-hydrate	white to yellowish-white	umami	approx. 6 % Mg	++	
Magnesium Glycerophosphate	white	sandig, neutral	approx. 10.5 % Mg; approx. 13.5 % P	+ – – – –	approx. 7–8.5
Magnesium Glycerophosphate, Solution	slightly yellowish	neutral	approx. 3.3 % Mg	Solution	approx. 4
Magnesium Hydroxide, heavy – BD approx. 550 g/l					
Magnesium Hydroxide, light – BD approx. 350 g/l	white	neutral	approx. 41 % Mg	– –	approx. 10–10.5
Magnesium Hydroxide					
Magnesium Hydroxide					
Magnesium Hydroxide					
Magnesium Hydroxide DC 90S – BD approx. 550 g/l	white	neutral	approx. 37 % Mg	– –	
Magnesium Hydroxide Gel	white	neutral	approx.31 % Mg $(OH)_2$	– –	approx. 10
Magnesium Lactate, anhydrous	white	exothermic, sweet, sandy	approx. 12 % Mg	–	approx. 6–7
Magnesium Lactate 2-hydrate	white white to cream	slightly sourish	approx. 10 % Mg	– – 	approx. 6.5–7

++ > 100 g/l + 10 – 100 g/l – 1 – 10 g/l – – < 1 g/l

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Magnesium – Our Product Range

Product	Product no.	Quality	Physical appearance
Magnesium Lactate 2-hydrate DC 100 – BD approx. 650 g/l	512021006	Ph.Eur. | food quality	granules, directly compressible
Magnesium DL-Malate	503090003	food supplement	powder
Magnesium Nitrate 6-hydrate	515041001	chem. pure	crystals
Magnesium Nitrate Solution	515051600	chem. pure	solution; approx. 50 %
	515051001		solution; approx. 65 %
	515051003		
Magnesium Oxalate 2-hydrate	515029001	chem. pure	powder
Magnesium Oxide, heavy – BD approx. 500 g/l	503046001	Ph.Eur. | USP | BP | FCC | E 530	powder
Magnesium Oxide, heavy – BD approx. 500 g/l	503046130	JECFA	powder
Magnesium Oxide, heavy – BD approx. 500 g/l	503046120	Ph.Eur. | FCC	fine powder
Magnesium Oxide, medium heavy – BD approx. 200 g/l	503046002	Ph.Eur. | USP | FCC | E 530 | food supplement | chem. pure	powder
	503046026		
Magnesium Oxide, light – BD approx. < 150 g/l	503046011	Ph.Eur. | USP | BP | FCC | E 530 | JECFA	powder
Magnesium Oxide, light – BD approx. 130 g/l	503046007	Ph.Eur. | BP | USP | FCC | E 530	powder
	503046025		
Magnesium Oxide, microencapsulated	503046020	Ph.Eur. | BP | USP | FCC | E 530 with 40 % hydrogenated palm oil	fine granules
Magnesium Peroxide	515071001	BPC	powder
	515072001	chem. pure	
	515073001	Ph.Eur. | Ph.Franc. | Ph.Helv. | chem. pure	powder, light
	515073002	chem. pure	powder, heavy
Magnesium Hydrogen Phosphate 3-hydrate	503057001	DAB | FCC | E 343(ii) | food supplement | Erg.B.6 | JECFA	powder
	503057002	DAB | FCC	fine powder
	503057003	DAB	micronized powder
Trimagnesium Phosphate 5-hydrate	503056004	BPC	powder
	503056001	USP | FCC | chem. pure	
	503056002	FCC | food quality	fine powder
Trimagnesium Phosphate 8-hydrate	503056003	FCC | JSFA	powder
Magnesium Propionate	502026002	food quality | chem. pure	powder
Magnesium Trisilicate	515040100	analyzed according to BP	powder, BD approx. 300 g/l
		analyzed according to USP	powder
		analyzed according to Ph.Eur.	fine powder; BD approx. 300 g/l
Magnesium Trisilicate DC 90S – BD approx. 450 g/l	515040004	Ph.Eur. | USP with approx. 10 % corn starch Ph.Eur.	granules, directly compressible
Magnesium Stearate	515037000	vegetable grade; Ph.Eur. | USP | NF | BP | E 470-b	fine powder
Magnesium Sulfate, dried	522015001	BP	powder
	522015005	USP | DPL-BioPharm | FCC | food supplement	
	522015007	chem. pure	
	522015003	Ph.Helv.	
	522015002	DAB | DAC	
Magnesium Sulfate 7-hydrate	522014004	analyzed according to Ph.Eur.	crystals
	522014300	Ph.Eur. | USP	
	522014002	Ph.Eur.; Low in Endotoxins	
	522014005	FCC | complies with the limits of USP 42	crystalline powder
	522014009	DPL-BioPharm | Ph.Eur. | USP	
Magnesium Tartrate 2.5-hydrate	512008001	chem. pure	powder

Product	Color	Flavor	Metal content (per 100 g)	Solubility 20°C	pH (1 % solution/ *suspension)
Magnesium Lactate 2-hydrate DC 100 – BD approx. 650 g/l	white	neutral	approx. 10 % Mg	–	
Magnesium DL-Malate	white to yellowish-white	sour, sandy	approx. 11.5 % Mg	– –	approx. 5
Magnesium Nitrate 6-hydrate	colorless	salty, slightly bitter	approx. 9.5 % Mg	++	approx. 6
Magnesium Nitrate Solution	yellowish	salty, slightly bitter	approx. 4.5 % Mg approx. 6 % Mg	++	approx. 2.5
Magnesium Oxalate 2-hydrate	white	neutral	approx. 16 % Mg	– –	approx. 10
Magnesium Oxide, heavy – BD approx. 500 g/l	white	neutral	approx. 58 % Mg	– –	approx. 10–11
Magnesium Oxide, heavy – BD approx. 500 g/l					
Magnesium Oxide, heavy – BD approx. 500 g/l					
Magnesium Oxide, medium heavy – BD approx. 200 g/l					
Magnesium Oxide, light – BD approx. < 150 g/l					
Magnesium Oxide, light – BD approx. 130 g/l					
Magnesium Oxide, microencapsulated	white to off-white	neutral	approx. 35 % Mg	– –	approx. 7
Magnesium Peroxide	white	neutral	approx. 15 % MgO_2 approx. 20 % MgO_2 approx. 25 % MgO_2	– –	approx. 11
Magnesium Hydrogen Phosphate 3-hydrate	white	sandy, neutral	approx. 14 % Mg; approx. 18 % P	– –	approx. 8
Trimagnesium Phosphate 5-hydrate	white	neutral	approx. 20 % Mg; approx. 17 % P approx. 20.5 % Mg; approx. 17.5 % P	– –	approx. 8–9
Trimagnesium Phosphate 8-hydrate	white	neutral	approx. 18 % Mg; approx. 15 % P	– –	approx. 8–9
Magnesium Propionate	white	sweet, fishy	approx. 13.5 % Mg	– –	approx. 10–10.5
Magnesium Trisilicate	white	earthy	approx. 13 % Mg	– –	approx. 9*
Magnesium Trisilicate DC 90S – BD approx. 450 g/l	white	earthy	approx. 15 % Mg	– –	approx. 10
Magnesium Stearate	white	mild	approx. 4 % Mg	– –	approx. 8*
Magnesium Sulfate, dried	white	bitter, adstringent	approx. 13 % Mg; 30–38 % H_2O approx. 15 % Mg; 22–28 % H_2O approx. 16 % Mg; approx. 20 % H_2O approx. 15.5 % Mg; 22.5–25 % H_2O approx. 14 % Mg; 26–32 % H_2O	++	approx. 6–7
Magnesium Sulfate 7-hydrate	colorless	bitter	approx. 10 % Mg	++	approx. 6–7 approx. 6.5 (5 %)
Magnesium Tartrate 2.5-hydrate	white	neutral	approx. 11 % Mg		

++ > 100 g/l + 10 – 100 g/l – 1 – 10 g/l – – < 1 g/l

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Our best Performers

Magnesium compounds	Properties	Application areas
Magnesium Acetate	◆ Soluble active pharmaceutical ingredient (DMF) for use in parenteral nutrition	Pharmaceutical products
Magnesium L-Ascorbate	◆ Buffered, easily digestible form of ascorbic acid	Nutritional supplements
	◆ Approved in the EU as a source for Magnesium and vitamin C in dietary supplements	
Magnesium L-Aspartate	◆ Magnesium Salt of aspartic acid as an active pharmaceutical ingredient (CEP) for the treatment of a Magnesium deficiency	Pharmaceutical products
Magnesium Bisglycinate	◆ Amino acid chelate	Nutritional supplements
	◆ Excellent bioavailability	
Magnesium Carbonate	◆ Acidity regulator and anti-caking agent	Food applications
	◆ Magnesium source for the fortification of foods	
	◆ Easily soluble in acidic media	
	◆ Available in different bulk densities	
	◆ Neutral taste	
	◆ Active pharmaceutical ingredient (CEP/DMF) for antacids and laxatives	Pharmaceutical products
	◆ Excipients for tablets and capsules (DC granules)	
	◆ Absorbent and clumping inhibitor in antiperspirants and hair care products	Cosmetic products
Magnesium Citrate	◆ Magnesium Salt of citric acid	Nutritional supplements
	◆ Suitable for almost all dosage forms due to various pH values and solubility in this product group	
	◆ Organic Magnesium Salt as an active pharmaceutical ingredient (CEP) for the treatment of a Magnesium deficiency	Pharmaceutical products
Magnesium Hydroxide	◆ Active pharmaceutical ingredient (CEP) for antacids and laxatives	Pharmaceutical products
	◆ Excipients for tablets and capsules (DC granules)	
Magnesium Lactate	◆ Moisturizer and humectant for deodorants and hair care products	Cosmetic products
Magnesium Oxide	◆ Active pharmaceutical ingredient (DMF) for antacids and laxatives	Pharmaceutical products
	◆ Excipients for tablets and capsules	
Magnesium Peroxide	◆ Whitening agent for dental and hair care products	Cosmetic products
Magnesium Phosphate	◆ Acidity regulator and anti-caking agent	Food applications
	◆ Magnesium source for the fortification of foods	
	◆ Neutral taste	Food applications/ pharmaceutical products/ nutritional supplements
	◆ Insoluble product	
	◆ Available in different particle sizes	
	◆ Source of Magnesium and phosphate	
Magnesium Sulfate 7-hydrate	◆ Pain desensitization in dental care products	Cosmetic products
	◆ Hair conditioner for greasy hair and added volume	
	◆ Soluble Magnesium Salt	Food application/nutritional supplements/pharmaceutical products
	◆ Active pharmaceutical ingredient (DMF) for laxatives	Pharmaceutical applications

References

1 Prof. Dr. Hahn, A., & Dr. Schuchardt, J. (2011). Mineralstoffe - Stoffwechsel, Funktion und Bedarf. Hamburg: B. Behr`s Verlag GmbH.

2 De Baaij JHF, Hoenderop JGJ, Bindels RJM. Magnesium in Man: Implications for Health and Disease. Physiol Rev 95: 1–46, 2015. PubMed abstract

3 Swaminathan R. Magnesium metabolism and its disorders, Clin Biochem Rev,2003, vol. 24 (pg. 47-66). PubMed abstract

4 Walker AF, Marakis G, Christie S, Byng M. Mg citrate found more bioavailable than other Mg preparations in a randomised, double-blind study. Magnes Res. 2003 Sep;16(3):183-91. PubMed abstract

5 Firoz M, Graber M. Bioavailability of US commercial magnesium preparations. Magnes Res 2001;14:257-62. PubMed abstract

6 The Mineral Fortification of Foods, Editor Richard Hurrell, 1999, Leatherhead Food Research Association

7 Blaine, J., Chonchol, M., & Levi, M. (2015). Renal control of calcium, phosphate, and magnesium homeostasis. Clinical Journal of the American Society of Nephrology, 10(7), 1257-1272.

8 Commission Regulation (EU) No 432/2012 establishing a list of permitted health claims made on foods, other than those referring to the reduction of disease risk and to children's development and health

9 Regulation (EU) No 1169/2011 of the European Parliament and of the Council on the provision of food information to consumers

10 Hypomagnesemia ZS Agus - Journal of the American Society of Nephrology, 1999 - Am Soc Nephrol

11 Hypomagnesemia. A review of pathophysiological, clinical and therapeutical aspects. S Iannello, F Belfiore - Panminerva medica, 2001 - europepmc.org

12 Rude RK . Magnesium deficiency: a cause of heterogeneous disease in humans. Bone Miner Res 1998; 13: 749–758.

13 Nielsen FH, Milne DB, Klevay LM, Gallagher S, Johnson L. Dietary magnesium deficiency induces heart rhythm changes, impairs glucose tolerance, and decreases serum cholesterol in post menopausal women. J Am Coll Nutr 2007; 26: 121–132. PubMed abstract

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