



MAGNESIA

MINERAL COMPOUNDS



Mg



Whitepaper

Highly Active Soluble Magnesium Oxide for Liquid Food Supplements

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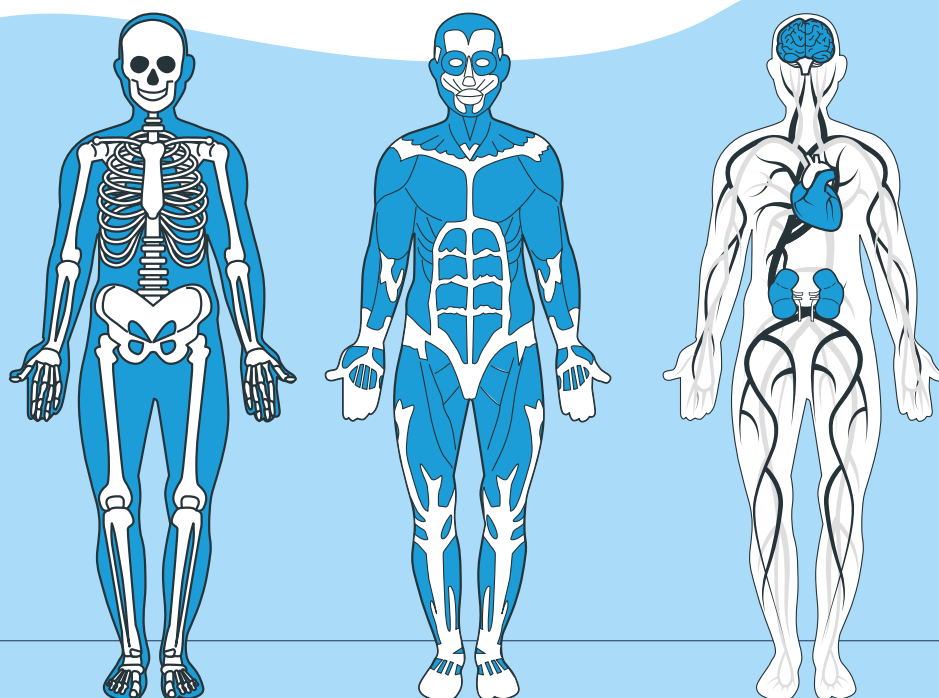
01

Magnesium

Magnesium has been recognized as an essential dietary element. It is involved in numerous metabolic processes and it is playing an important role in the physiological function of the brain, heart and skeletal muscle. Furthermore, Magnesium is a cofactor of hundreds of enzymes, regulating several biochemical processes,

including energy metabolism, protein synthesis, muscle and nerve function, blood glucose and blood pressure.

Magnesium is primarily stored in bones, teeth, muscle and soft tissue. The Magnesium homeostasis is regulated by the secretion and reabsorption in the kidneys.



02

Need for Magnesium Supplementation?

Several dietary surveys and epidemiologic studies performed in the USA and EU revealed that on average people have an intake of dietary magnesium lower than the Recommended Daily Allowance (RDA) of 320 to 420 mg Magnesium per day. The RDA is defined as the average daily level of intake sufficient to meet the nutrient requirements of nearly all (97%–98%) healthy individuals.

Based on these findings, it can be assumed that more than 50% of the normal population may have a marginal magnesium deficiency. The intake of dietary magnesium greatly differs among different countries,



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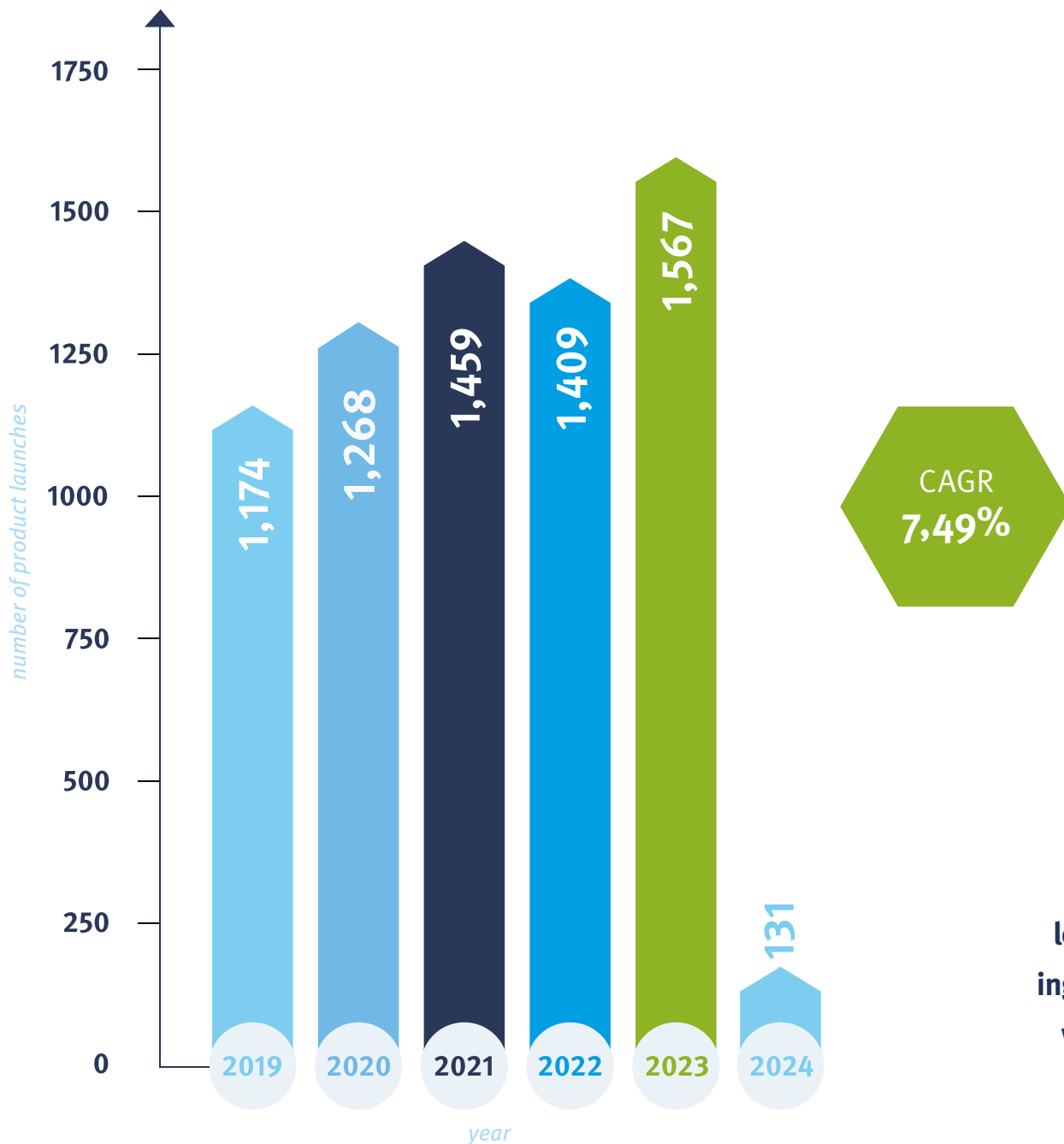
as well as between different subpopulations (young vs. old, sedentary vs. athletic).

A Magnesium deficiency can lead to different symptoms such as neuromuscular dysfunction, muscle weakness and muscle cramping. The maintenance of adequate body magnesium levels is, therefore, of special importance for optimal physical performance and post-exercise recovery.

03

Supplement market in Western Europe

Based on research in the Innova Market Insights New Product Database, the supplement market is still a growing market segment. Within the last 5 years (2019-2023) in Western Europe the CAGR (compound annually growth rate) is constantly increasing and amounts to 7,49%.

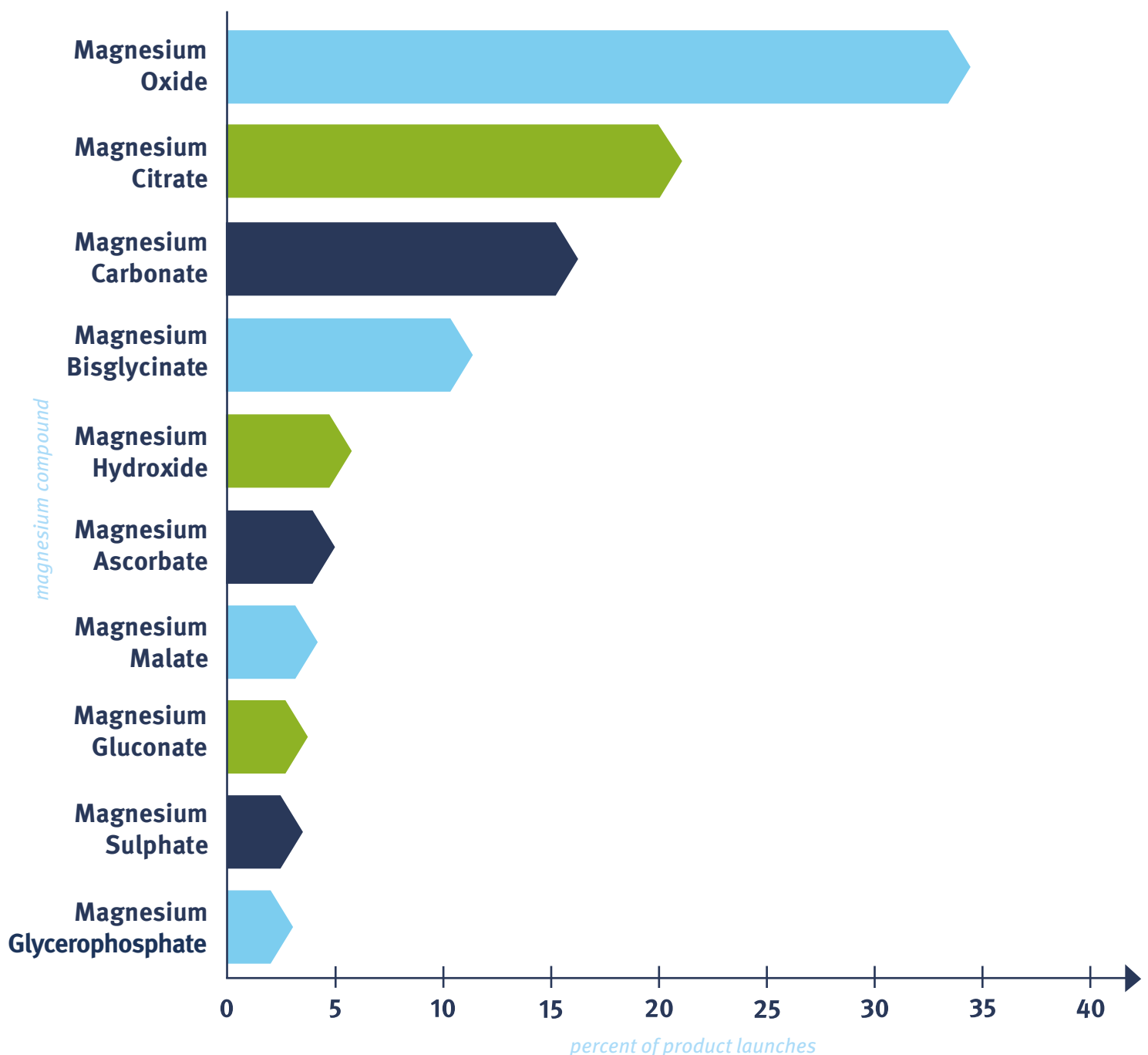


A closer
look into the
ingredients is
worthwhile.



It is therefore one of the most important Magnesium ingredients in this market segment. This overview is taking 26 different Magnesium compounds into account and represents the top 10 Magnesium ingredients.

More than 30% of the vitamin- and mineral supplements contain **Magnesium Oxide** as ingredient.



04

Magnesium Oxide

Magnesium Oxide is a chemical compound with the formula MgO , white crystals and usually insoluble in water. In medicine it is used as an antacid and a source of magnesium. In the food industry, it is registered as food additive E530, serving as a pH regulator and additionally permitted for the fortification of foods and food supplements with ma-

gnesium. It has a high Magnesium load of approx. 58-60% Mg^{2+} and can be used in food supplements with limited space like tablets or capsules. Furthermore, it is often used to push the magnesium content which cannot be reached by using organic Magnesium sources alone.



Want to know more about Magnesium Oxide?

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05

Bioavailability of Magnesium Salts

Approximately 30% of ingested Magnesium is absorbed by the intestine. The extent of absorption depends on the body magnesium status. A Magnesium deficiency leads to an increased absorption.

The solubility of Magnesium compounds in various solutions can be used to predict bioavailability of supplemental sources. Similar to Magnesium, a lot of other micronutrients currently on the market in the form of supplements may have suboptimal efficacy due to poor solubility and/or bioavailability.

In general, normal Magnesium Oxide or “dead burnt Magnesium Oxide” exhibits a very limited bioavailability because of its poor solubility. By increasing the solubility, the bioavailability is increased as well.

The bioavailability of Magnesium Oxide is influenced by the application form. A comparative study shows that the observed bioavailability of Magnesium from Magnesium Oxide in effervescent tablets is twice as high compared to Magnesium Oxide in capsules. This leads to the assumption that the dissolution in water (ionization of Mg^{2+}), is an important precondition for absorption. As a result, the bioavailability of solved/ ionized Magnesium from Magnesium Oxide is comparable to that of the organic Magnesium salts.

These findings apply to Magnesia’s Highly Active Magnesium Oxide. This product offers a good solubility in diluted organic acids like citric acid or malic acid, which are mainly used in food products and food supplements as acidifier.



06

Highly Active Magnesium Oxide in Effervescent Tablets

Ingredients

- Citrocoat EP (*Citric Acid, Sodium citrate, Sodium bicarbonate, Gum Arabic*)
- Citric Acid
- Sugar
- Flavour
- High Active Magnesium Oxide

Nutrition Declaration	Per portion (10.56 g)
Energy	113kJ/ 27 kcal
Fat	0 g
Carbohydrates	0 g
<i>of which sugar</i>	3 g
Fibre	0.16 g
Protein	0 g
Salt (<i>calculated from sodium content</i>)	1.35 g
Sodium	0.54 g
Organic Acid	4.66 g
Magnesium	0.3 g (80% NRV*)

*Percentage of the nutrient reference values (NRV) according to Regulation (EU) No. 1169/2011

Magnesia's Highly Active Magnesium Oxide is easily soluble in diluted organic acids like citric acid. It dissolves during the dissolution time of the effervescent powder and gives a solution without any sediment. During solution CO_2 production, acidic pH and excess Citric Acid achieve complete solubility of the Magnesium Oxide such that Mg^{2+} becomes readily ionized. Due to the high Magnesium content, only small amounts of Magnesium Oxide are needed to achieve the desired Magnesium content in the final application.

The increased solubility of Higly Active Magnesium Oxide in comparison to a standard MgO grade in Citric Acid (2%) is clearly recognisable without any further additives.



Figure 1 - left: standard MgO, right: Highly Active MgO in Citric Acid (2%)

07

Conclusion

Magnesium Oxide is a chemical compound that encompasses various forms and types, each with distinct properties. Choosing the right type of Magnesium Oxide for the final application is crucial for its effectiveness in the human body.

High Active Magnesium Oxide combines the advantages of the small total amount with a good bioavailability which is comparable to organic Magnesium Salts.



Literature

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