



W. R. Grace & Co.-Conn. Magnesium Aluminate Product Stewardship Summary

I. Overview

Magnesium Aluminate is one of several substances present together in a family of products sold by W. R. Grace & Co.-Conn. (Grace) that reduce the amount of sulfur oxide (SOx) air pollutants emitted from an oil refining facility's fluid catalytic cracking unit operation. This substance when present with other components in certain additive products provides both a chemically stable and physically attrition resistant catalytic support that enables basic functionality of these products to absorb and release sulfur compounds prior to sulfur exiting the fluid cracking catalyst unit (FCCU) exhaust gas stack to the atmosphere. These products in which Magnesium Aluminate is present are blended with Fluid Cracking Catalysts (FCC) in the range of 5-10 wt% of the total volume of the catalyst.

II. Chemical Identity - Physical and Chemical Properties

Chemical Identity:

Substance Name: Magnesium Aluminate

CAS RN: 12068-51-8

EINECS No: 235-100-5

MF: Al₂MgO₄

MW: 142.27

Alternate Names: dialuminium magnesium tetraoxide; Spinel

Alternate CAS RNs: N/A

Product Name(s): Magnesium Aluminate

Physical & chemical properties:

The pure substance is a white odorless solid; the mineral form may be as a crystal of blue to red color.

Melting Point: 2,135 °C

Boiling Point: N/A

Vapor Pressure: <10⁻⁸ mm Hg (est.)

Density: 3.64 g/ml at 25 °C

pH: 5 - 9

Physical State: Solid

Solubility: Insoluble

III. Applications

The products in which the substance will be present are non-incorporative catalysts used in fluid cracking catalyst units (FCCU). No other uses of the substance are known to Grace, and all uses of Grace products containing Magnesium Aluminate are limited to sulfur oxide reduction at oil refineries. Magnesium Aluminate as provided by Grace is used solely in petroleum refining.

IV. Health Effects

There are limited studies currently available on magnesium aluminate. Based on aluminum the acute oral, dermal and inhalation toxicity is expected to be low. The substance is likely to be a skin and eye irritant. High levels of aluminum exposure can cause altered blood chemistry and neurological problems, and inhalation exposure is especially likely to lead to pulmonary fibrosis. There is evidence that aluminum is neurotoxic in animals, but the relevance to humans is unclear.

No studies on carcinogenicity were located for magnesium aluminate; however aluminum is classified as IARC 4. Aluminum is not mutagenic in bacteria and does not induce mutation or transformation in mammalian cells *in vitro*. **There are also** no reproductive assays available; however, based on aluminum citrate, there may be some potential for reproductive toxicity at high doses. Occupational exposure to aluminum – especially aluminum fumes – has been associated with pulmonary fibrosis and neurological problems.

Exposure Limit Data:

Aluminum (Al):

OSHA Permissible Exposure Limit (PEL) - General Industry: 15 mg/m³ T

OSHA PEL - Shipyard Employment - 15 mg/m³ TWA

National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL)-

10 mg/m³ TWA

CAL/OSHA PEL:

10 mg/m³ TWA

V. Environmental Effects

No measured data was identified to magnesium aluminate itself and ecotoxicity is based on data for similar substances. It should also be noted that magnesium aluminate is considered insoluble in water, which may further reduce the potential for harmful effects. Based on poor water solubility at or around environmentally relevant pH, magnesium aluminate is not expected to show toxicity to the aquatic environment. Magnesium

Aluminate is an inorganic material (mineral) and will not further biodegrade. Bioconcentration or bioaccumulation is not expected. Magnesium is an essential nutrient, present in cells, and may be taken up by organisms. Aluminum compounds are also taken up by the body as part of normal eating and drinking. Magnesium Aluminate is a naturally occurring material as a part of the Spinel group. The substance is stable and not expected to further breakdown in the environment. Both magnesium and aluminum can be taken up in the diet; however, levels in tissues can be controlled metabolically.

Magnesium aluminate is a mineral found in nature and is not expected to further degrade in the environment. Both magnesium and aluminum can be ingested and taken up by the body; however, bioaccumulation is not expected to be a concern for this compound. Due to its low solubility in water magnesium aluminate will deposit in soil or sediment. A very minor fraction may dissolve into the aqueous phase. Biodegradation is not relevant since the substance is inorganic.

VI. Conclusion

Magnesium Aluminate is an inorganic material. It is a stable solid that is not expected to biodegrade or be a concern for bioaccumulation. Based on data for a similar material that also contains containing vanadium and cerium oxide this substance fulfills the criteria for low ecotoxicity concerns. A low overall human health hazard is expected; long-term high dose exposures to aluminum should be avoided, inhalation exposure should be minimized. Magnesium Aluminate manufactured by Grace is generated in situ and used in a closed industrial process, with minimal potential for exposure or release. The overall exposure potential for the substance as present in Grace products is low. Magnesium and Aluminum are naturally occurring elements. Both elements are part of the normal diet and are consumed daily. The data collected in this summary suggest low concerns for ecotoxicity. Human health concerns are generally low. Exposure controls are managed using standard practices.

Based on its chemical and physical properties, combined with its toxicological and ecotoxicological profile the magnesium aluminate in Grace products is not expected to pose a risk to the environment or to consumers.

VII. W. R. Grace Contacts

Please feel free to contact one of the following Grace representatives should you desire additional information or have questions.

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Section 5: Tier 1 Exposure Considerations

Manufacture and Use Volumes (for this scenario only): 2,000,000 lbs/year [910,000 kg/yr]

Use Description and Category: Catalyst for oil refinery operations, generated in situ and used in an industrial setting

Consumer Use: No

Potential for Exposure to Children: No

Production: Magnesium Aluminate is synthesized in situ during the manufacture of fluid cracking catalyst (FCC) additives.

Since the material is generated and used in situ, potential for exposure during production are minimized.

Use: Magnesium Aluminate as provided by Grace is used solely in fluid cracking operations in petroleum refining. The substance is one of several that reduce the amount of sulfur oxide (SO_x) air pollutants emitted from an oil refining facility's fluid catalytic cracking (FCC) unit operation. This substance, when present with other components in these products, provides both a chemically stable and physically attrition resistant catalytic support that enables these products to absorb and release sulfur compounds prior to sulfur exiting the fluid cracking catalyst unit (FCCU) exhaust gas stack to the atmosphere. These products are blended with Fluid Cracking Catalysts (FCC) in the range of 5-10 wt% of the total volume of the catalyst. The catalyst will be cycled through the process multiple times and may be used for other processes as starting material and blended/recycled to lower activities. Eventually the metals will be "poisoned" to the point of inactivity and will be disposed of as non-RCRA waste.

The process itself is an enclosed system. The potential for exposure during the use process is minimal. The potential for release to the environment is minimal.

Exposure Summary: Magnesium Aluminate is manufactured in situ and used in a closed process in an industrial setting. The substance is recycled multiple times until it is no longer active, then disposed of as non-RCRA waste. The overall exposure potential for the substance is low.