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## PRODUCT STEWARDSHIP SUMMARY

### MARTINAL®, MARTIFIN®, MARTIGLOSS®

Aluminum hydroxide (ATH)

CAS No. 21645-51-2

EINECS No. 244-492-7

Formula: Al(OH)<sub>3</sub>

### MAGNIFIN®

Magnesium hydroxide (MDH)

CAS No. 1309-42-8

EINECS No. 215-170-3

Formula: Mg(OH)<sub>2</sub>

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#### Introduction

Albemarle Corporation markets aluminum hydroxide and magnesium hydroxide for use as mineral flame retardants and specialty chemicals in manufacturing paper. Aluminum hydroxide is sold under the brand names MARTINAL, MARTIFIN and MARTIGLOSS. The Albemarle trade name for magnesium hydroxide is MAGNIFIN.

In addition to use as flame retardants, coating pigments and fillers, aluminum hydroxide and magnesium hydroxide have many common uses such as ingredients in antacids, industrial water treatment, heavy-metals removal, and gas purification.

These products are unique in flame retardant applications. When exposed to fire, both materials absorb heat and energy as they decompose.

In this process they also release water. Another beneficial property is that they reduce smoke formation and the creation of toxic gases. They have been used as non-toxic, environmentally friendly fire-retardants for over thirty years.

#### Description and Properties

Magnesium hydroxide is a white powder and is insoluble in water. When exposed to the atmosphere, it absorbs a certain amount of moisture, depending on the environmental conditions, such as temperature and humidity. The moisture





level also depends on the specific surface of the filler. Aluminum hydroxide is also a white powder and insoluble in water. Similar to magnesium hydroxide, it can absorb a certain amount of water.

## Uses

MARTINAL (aluminum hydroxide) and MAGNIFIN (magnesium hydroxide) are specially manufactured for use as flame retardants in plastics and rubber used in wire and cable, electronic and electrical components, transportation, textiles and building and construction materials, wall cladding, furniture, roofing, agricultural films, and thermoset applications such as glass fibre reinforced plastics. The use of MARTINAL and MAGNIFIN in these applications ensures strict test requirements and government fire standards are met.

The flame retardant effects of these two materials are based on their ability to absorb heat when decomposing from exposure to fire. Additionally, only water is released during the decomposition reaction. Considerable quantities of heat are consumed and therefore energy is removed

from the combustion. The polymer is protected from a rapid thermal decomposition and the formation of flammable and combustible by-products is delayed. The water vapor displaces the oxygen and other flammable gases and functions as a protective gas.

A heat-resistant layer develops on the surface of the plastic, inhibiting further combustion and reducing the smoke density by collecting combustion products. Another reason the MARTINAL and MAGNIFIN flame retardants work so well is that, as fillers, they are a significant percent of the polymer.

This dilutes the polymer and reduces the fire load.

MARTINAL and MAGNIFIN are formulated into plastic dispersions and lattices. Examples of these applications include carpet backing, insulation wall coverings, polyurethane foam coverings and dispersions such as paints and adhesives, plasters and wall fillers.

Another significant use for the products is in the manufacture of polyvinyl chloride (PVC) plastic compounds. PVC products go into wire and cable, flooring material, conveyor

belts, and PVC-coated fabrics, such as truck covers, awnings, and sheets for roofs and tunnels.

MAGNIFIN is also used as flame retardants in polypropylene products. MARTINAL can also be used in this application if the processing temperature is maintained at a certain level. Examples of retardant-

treated polypropylene products are automotive cables, corrugated tubing, cable conduits, roof lining material, roofing panels, flooring, injection-molded components for household appliances and wall panels. The use of polypropylene injection molded or extruded parts in applications such as the production of cables, cable conduits, films or tubes, is increasingly being seen as an environmentally and physiologically friendly replacement for PVC.

An additional group of plastics called polyamides utilize MAGNIFIN as a flame retardant, in particular PA6. Polyamides are used predominantly in the electrical sector, where their ease of processing, favorable physical and electrical properties, high heat stability, and good chemical resistance, as well as their high surface quality are key benefits. Typical applications of polyamides include



medium-voltage components, insulation components, switch components and casings, electromagnetic switches, terminal blocks, plug connectors and multiple plug sockets. In addition, PA6 has other uses in the garment industry, as toothbrush bristles and to manufacture musical instrument strings. It has been used to replace metal

automobile parts, such as airbag housing, accelerator pedal, and oil pan.

A growing application for MARTINAL is in cast acrylics such as artificial marble. Cast acrylics are used as kitchen counters, bathroom panels as well as in laminates for tanks, pipes and boat building markets.

MARTIFIN finely precipitated aluminum hydroxide is used as coating pigment and filler in high quality specialty paper where high whiteness, gloss, smoothness, and printability are required. MARTIFIN pigments and fillers provide increased retention properties and efficacy of optical brighteners used in paper manufacturing. Also, when used as extender for titanium dioxide, MARTIFIN helps to lower material costs while maintaining paper quality. It is also used in ceramic coating.

## Health Information

Based on the information available to date, both magnesium hydroxide and aluminum hydroxide are considered to be non-toxic materials under normal conditions of use. Because they are powdered or granular material, they may cause eye irritation or respiratory irritation from physical contact with the dust.

Magnesium hydroxide powder is classified by OSHA as a nuisance dust. ACGIH categorizes the powder form as particulates not otherwise classified. Exposure limits are as follows: ACGIH 10 mg/m<sup>3</sup> (5 mg/m<sup>3</sup> for respirable fraction), OSHA 15 mg/m<sup>3</sup> (5 mg/m<sup>3</sup> for respirable fraction). The TRGS 900 limit (Germany) for magnesium

hydroxide is 10 mg/m<sup>3</sup> (3 mg/m<sup>3</sup> for respirable fraction).

ACGIH set threshold limit values on aluminum hydroxide as well due to exposure to dust: 10 mg/m<sup>3</sup> TLV-TWA and 20 mg/m<sup>3</sup> TLV-STEL. In the EU the Finnish 8-hour limit is 2 mg/m<sup>3</sup>; the German BAT is 0.2 mg/m<sup>3</sup>; the Swedish NGV is 1 mg/m<sup>3</sup>; and the Swiss TWA is 6 mg/m<sup>3</sup>. In Asia Pacific, the Vietnam TWA is 2 mg/m<sup>3</sup> and the Vietnam STEL is 4 mg/m<sup>3</sup>.

Please consult the product Material Safety Data Sheet for recommended personal protective equipment and further information.

## Exposure Potential

Avoid dusting conditions. Respiratory protection is recommended if adequate ventilation is not provided. Chemical

goggles or safety glasses are also recommended person protective equipment.



Please consult the product Material Safety Data Sheet for recommended personal protective equipment and further information.

## Environmental Information

Neither aluminum hydroxide nor magnesium hydroxide is regulated as hazardous wastes or materials. If spilled, sweep or shovel spills into appropriate container for disposal. Waste containing these materials should be disposed of according to good waste-management practices and in compliance with applicable local, state, and federal regulations.

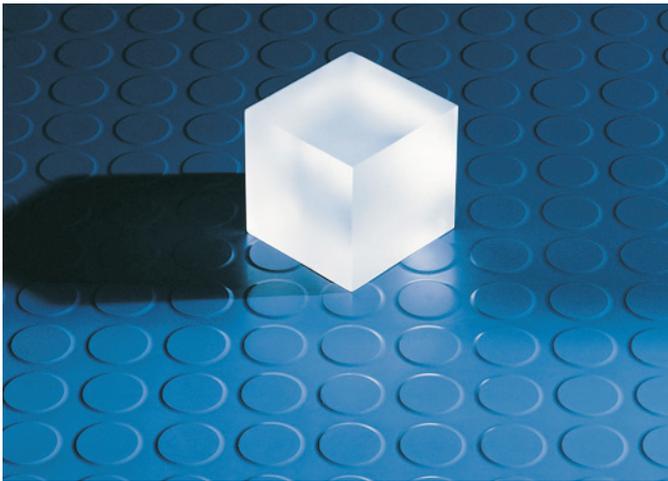
## Physical Hazards

Aluminum hydroxide and magnesium hydroxide are chemically stable solids. They should be stored in a dry, well-ventilated area and exposure to acids and strong bases should be avoided.

## Derivation/manufacturing

Albemarle Corporation manufactures aluminum hydroxide and the trade names MARTINAL and MARTIFIN in our German subsidiary, MARTINSWERK GmbH facility in Bergheim, Germany. Magnesium hydroxide and MAGNIFIN are produced at our joint venture in St. Jakob-Breitenau, Austria.





## Regulatory Information

Neither aluminum hydroxide nor magnesium hydroxide is regulated for transportation.

Both materials are in compliance with the Toxic Substances Control Act (15 USC 2601 – 2629).

The Emergency Planning and Community Right-to-Know Act (also known as SARA Title III or EPCRA) classifies both aluminum hydroxide and magnesium hydroxide as immediate (acute) health hazards.

The Canadian Workplace Hazardous Material Information System (WHMIS) requires that aluminum hydroxide be labeled as a Class D material in Division 2B.

Neither aluminum hydroxide nor magnesium hydroxide is regulated under the criteria of Directive 67/548/EC. Additionally, magnesium hydroxide is not regulated under the criteria of Directive 199/45/EC.

Aluminum hydroxide is not regulated under the criteria of the local Safety and Health Law and the Global Harmonization System (GHS) of classification and labeling. It does not contain any Toxic, Observational, Restricted, or Prohibited Chemicals under the Korean Toxic Chemical Control Law.

Aluminum hydroxide and magnesium

hydroxide have been pre-registered under the European Community Regulation “REACH” by Martinswerk GMBH, which is part of Albemarle Corporation. Martinswerk GMBH is a member of a consortium developing the

registration dossier for both materials. Martinswerk GMBH will act as the Lead registrant for magnesium hydroxide.

## Product Stewardship

Albemarle Corporation is committed to manage MAGNIFIN, MARTINAL, MARTIFIN, and MARTIGLOSS so they can be safely used by our customers. Our relationships with our customers encourage communication about safety and environmental stewardship, and we work with them to minimize the risks of personnel exposure and spills.

Albemarle is staffed and organized to investigate and provide advice regarding appropriate corrective actions if such incidents occur.

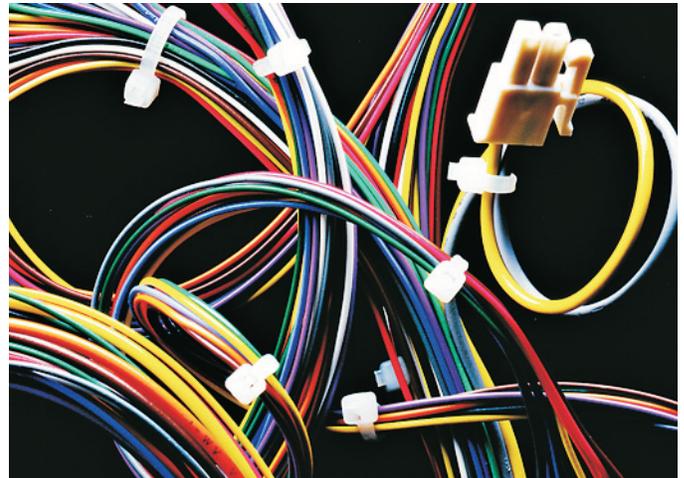
## Conclusion

MARTINAL and MAGNIFIN products are world-renowned and environmentally sound flame retardants. They are non-corrosive and do not affect pigmentation in plastics and rubber products. As flame

retardants, they protect the polymer against rapid decomposition, suppress formation of flammable by-products, and effectively reduce smoke density.

## Note

This document provides general information about magnesium hydroxide, aluminum hydroxide and their trade names MAGNIFIN, MARTINAL, MARTIFIN, MARTIGLOSS and does not supplant or replace required regulatory and/or legal communication documents, nor is it intended to provide an in-depth discussion of health and safety information. Always consult the product’s material safety data sheet, product label and technical data sheet before using the chemical.



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MARTINAL® OL-107 LEO

### MARTINSWERK GmbH European MSDS

Issue Date: 07/27/2007, Product Name: MARTINAL® (coated)

### Albemarle Corporation Americas MSDS

Issue Date: 08/04/2008, Product Name: MARTINAL OL-104 LEO;  
MARTINAL OL-107 LEO

### Albemarle Corporation Americas MSDS

Issue Date: 12/04/2008, Product Name: MAGNIFIN® H-5GV

### MARTINSWERK GmbH European MSDS

Issue Date: 07/27/2007, Product Name: MAGNIFIN® /  
MARTINIT® / Magnesium Hydroxide (coated)

### Albemarle Technical Leaflet - MARTINAL® Flame Retardants: Fire Retarding Thermosets

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Albemarle Technical Leaflet - MARTINAL® MAGNIFIN® SAYTEX®  
Flame Retardants for The Cable Industry  
October 2007

Albemarle Technical Leaflet - MARTINAL® and MAGNIFIN®:  
Mineral Flame Retardants for Use in Rubber  
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Mineral Flame Retardant for Polypropylene  
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Albemarle Corporation is a member of the American Chemistry Council and, through ACC's participation with the International Council of Chemical Associations (ICCA), has prepared this document to improve product stewardship within the chemical industry and with suppliers and customers.

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