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

I. Overview

Cobalt aluminate is a component in Grace hydroprocessing catalysts used globally by the petroleum industry for the refining of crude oil fractions like naphtha, kerosene and diesel under elevated pressure and temperature. These catalysts are usually composed of oxides of Mo (Molybdenum), Co (Cobalt), Ni (Nickel), and W (Tungsten) on a matrix or carrier of alumina, silica or silica and alumina. Grace does not manufacture or supply pure cobalt aluminate.

II. Chemical Identity - Physical and Chemical Properties

Chemical Identity:

In pure form cobalt aluminate is odorless dark blue powder that is moisture sensitive but largely insoluble in water. It is a stable substance that is not volatile, flammable or explosive.

Chemical Name	Cobalt Aluminate
Chemical Category (if applicable)	Inorganic metal compound
Synonyms	Aluminum cobalt oxide (Al2CoO4), dialuminium cobalt tetraoxide, cobaltous aluminate, dialuminum dicobaltous oxygen(2-)
CAS Number	1333-88-6
CAS Name	Cobalt aluminate
EC Number	215-610-4
Melting point	1935 F
Density	5.7-6.7

III. Applications

The uses and applications of cobalt aluminate include utilization in heterogeneous catalysts, investment casting, pigments and as a material for electrical and magnetic instrumentation such as humidity sensors, as a as well as for thin film technology.

Grace uses of cobalt aluminate is limited to their presence in hydroprocessing catalysts, which are used in the refining industry within process reactors at industrial locations to upgrade heavy oils into lighter, more useful products by removing impurities such as nitrogen, sulfur and heavy metals, allowing less expensive feedstock to be used in the petroleum refining process. Hydroprocessing is an important process necessary to remove pollutants like sulfur, nitrogen and heavy metals from fuel oils.

The purpose of removing sulfur (hydrodesulfurization) is to reduce the sulfur dioxide (SO_2) emissions that result from using those fuels in vehicles, aircraft, ships, gas and oil burning power plants, furnaces and other forms of fuel combustion. The level of allowed sulfur content in fuels is regulated and can only be achieved by using such hydroprocessing catalysts. The desulfurization reaction takes place in a closed fixed-bed reactor at elevated pressure and temperature.

IV. Manufacturing Processes

Hydroprocessing catalysts are prepared at Grace by supporting necessary elements (e.g. Molybdenum, Tungsten, Cobalt, or Nickel) in their oxide stage on an alumina carrier material. The process of introducing the elements onto the alumina carrier occurs either by a pre- or post-impregnation. Cobalt is obtained by Grace from suppliers as either cobalt carbonate or cobalt acetate. During the impregnation step cobalt is converted into a soluble form. A second conversion takes place that occurs in the presence of oxygen. Hydroprocessing catalysts are typically supplied as extrudates or structured shapes such as asymmetric quadrilobes and spheres. The hydroprocessing catalysts supplied by Grace can be termed pre-catalysts because they must be sulfided to become active. As supplied, Grace hydroprocessing catalysts are not highly reactive, flammable or explosive.

V. Health Effects

Exposure to cobalt aluminate may occur through inhalation, ingestion, and dermal contact. Cobalt aluminate has many comparable physical-chemical properties compared to cobalt oxide and other tested cobalt compounds and therefore data obtained on these other cobalt substances can be used to help predict the effects of cobalt aluminate.

The health effects of cobalt aluminate are seen primarily where it comes in direct contact with living tissue such as in the lungs. Inhalation of cobalt aluminate dust can irritate the nose, throat, and lungs, and may cause difficulty breathing or an allergenic respiratory reaction. Exposure to the skin can result in sensitization, an allergic reaction, upon repeated or prolonged contact. Cobalt aluminate is considered possibly carcinogenic to humans, and studies have indicated it may cause genetic defects, impair fertility and do harm to unborn children.

Inhalation and skin contact during its production, processing and storage is the primary route of occupational cobalt exposure. Occupational exposure is limited by the use of engineering controls to include isolating the source of exposure, process design along with the use of general and local ventilation. Work practice controls such as housekeeping and establishment of restricted areas, and the use of personal protective equipment are also routinely employed to control worker exposures.

Public exposure to the cobalt aluminate manufactured by Grace is minimized by the use of engineering controls, process and equipment design, work practices and pollution control equipment.

VI. Environmental Effects

Cobalt and other inorganic cobalt compounds are non-volatile and are released into the atmosphere in particulate form. Cobalt that is released into the atmosphere is deposited on soil, and cobalt released into water may either adsorb to particles and settle into sediment or adsorb directly to sediment.

Cobalt aluminate is both acutely and chronically toxic to aquatic life based on toxicity data associated with cobalt and other cobalt compounds. Data regarding the toxicity of cobalt to terrestrial systems is limited and there is little evidence of cobalt toxicity to plants as a result of elevated cobalt concentrations in the soil. In addition, studies show that plants can only accumulate very small amounts of cobalt from the soil therefore, consumed plants and animals will generally not contain high amounts of cobalt.

VII. Conclusion

The hydroprocessing catalysts in which the cobalt aluminate supplied by Grace is found are important to refining industry because they are used to remove pollutants like sulfur, nitrogen and heavy metals from fuel oils. The primary risk of worker exposure to cobalt aluminate is by dust inhalation and by dermal contact. This exposure potential is

controlled by the use of process enclosures, ventilation work practices and personal protective equipment. Because Grace hydroprocessing catalysts containing cobalt aluminate are manufactured and used in industrial settings, the risk of exposure to the general public or to the environment is largely limited to that which may occur in accidental situations.

VIII. 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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IX. References, Literature and Other Sources of Information

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