



## W. R. Grace & Co.-Conn. Lanthanum Chloride Product Stewardship Summary

### I. Overview

Lanthanum chloride is used by Grace in the production of Fluid Catalytic Cracking (FCC) catalysts. Lanthanum is a rare earth element, one of a collection of 17 chemically similar elemental metals. Rare-earth minerals tend to be found mixed together in ore deposits that are mined then purified. Lanthanum is supplied to Grace in various forms including oxides, hydrates and carbonates. The value and use of the various rare-earth metals varies; lanthanum finds application in metal alloys, optical glass, batteries, electronics, and in FCC catalysts.

FCC catalysts are typically composed of zeolites, silica, alumina, clay and a binder. The lanthanum in FCC catalysts is contained in the zeolite component of the catalyst. Grace converts the supplied form of lanthanum into lanthanum chloride, and does not commercially supply lanthanum chloride.

### II. Chemical Identity - Physical and Chemical Properties

CAS number: 10099-58-8  
EC number: 233-237-5  
Molecular formula:  $\text{LaCl}_3$   
Molecular weight: 245.264

**Synonyms:** lanthanum trichloride, lanthanum chloride anhydrous, Lanthanum (III) chloride; Lanthanum chloride hexahydrate; Lanthanum chloride heptahydrate

**Alternate CAS RNs:** 17272-45-6 (hexahydrate); 20211-76-1 (heptahydrate)

#### Physical-chemical properties

- Lanthanum chloride is an odorless solid in the form of a white powder
- Density:  $3.84 \text{ g/cm}^3$  at  $25.0^\circ\text{C}$
- Melting Point:  $852^\circ\text{C}$
- Boiling Point:  $1750^\circ\text{C}$
- Solubility:  $861.06 \text{ g/L}$  at  $20.0^\circ\text{C}$  and  $\text{pH} \geq 2.51 \leq 2.88$

### **III. Applications**

Rare-earth materials such as lanthanum are an essential ingredient in the production of transportation fuels, plastics and other petroleum based products, accounting for 16 percent of the total US consumption of rare earths. Rare-earth metals are a critical component of fluid catalytic cracking catalyst (FCC), a key conversion process in petroleum refining.

Grace use of lanthanum chloride is limited to that of a raw material in the manufacture of FCC catalysts. Refiners use the FCC process to break down crude oil and convert it into transportation fuels. Lanthanum performs several critical roles in the FCC catalyst. It is used to prevent rapid deactivation of the catalyst and to isolate and remove heavy metals, and it assists in controlling activity, coke selectivity, and olefin selectivity of the zeolite portion of the catalyst.

### **IV. Manufacturing Processes**

Lanthanum oxide is purchased by W.R. Grace and converted to lanthanum chloride for ease of use in the manufacturing process. Lanthanum chloride in aqueous form is added to zeolite based cracking catalysts through a process known as ion exchange. During this process a portion of the acidic protons and sodium located within the zeolite crystal are exchanged with lanthanum ions. The lanthanum exchanged zeolite is then dispersed into an aluminous or siliceous inorganic oxide-type sol or gel, which after further processing yields the final FCC catalyst. The lanthanum in finished FCC catalyst is in the oxide form. The final FCC catalyst produced is a white to light brown solid that is insoluble in water and is stable material under normal handling and storage conditions.

### **V. Health Effects**

Lanthanum chloride is one of a group of inorganic compounds that are collectively referred to as rare earths. Despite their being referred to as “rare” earths, they are found widely in the earth’s crust in quantities analogous to more commonly known chemicals like iodine and bismuth. Rare earth elements are generally moderately toxic. Lanthanum is poorly absorbed from the digestive tract and dermal absorption is minimal. Lanthanum chloride should be handled with care, as it can cause serious damage to the eye. Although systemic toxicity concerns are minimal, long-term high dose exposures should be avoided if possible due to some concerns about long-term tissue deposition.

Lanthanum chloride has been noted to be a skin sensitizer in animal experiments but there are no repeated human cases of dermatitis as a result of lanthanum exposures in the workplace. Lanthanum chloride is neither mutagenic, nor carcinogenic, and the only apparent effect on reproduction is that in large enough quantities when fed to pregnant animals, they lose their appetite and fail to thrive apparently as a result of irritation of the gastrointestinal system.

### **VI. Environmental Effects**

Lanthanum chloride is an inorganic chloride salt. Lanthanum is not considered biodegradable and is not expected to be photo-degradable. If discharged as a wastewater the substance has no COD or BOD impact on effluents. If released, depending on the pH of the water or soil, it dissociates nearly completely or salt hydrolysis occurs in the water phase of the soil. For the terrestrial food chain the data available indicates a low accumulation potential in plants. However testing indicates that lanthanum has the potential for bioaccumulation in aquatic dwelling organisms and in sufficient quantity it can affect soil microorganisms and algae. Lanthanum chloride exhibits concerns for ecotoxicity based on soluble form of lanthanum metal. The acute toxicity classification is  $> 1 \text{ mg/L} \leq 10 \text{ mg/L}$  in species based on two trophic levels. The chronic classification is dependent on three valid NOECs available for three trophic levels; the lowest is  $< 1 \text{ mg/L}$  and the high potential for bioaccumulation. Lanthanum chloride therefore is classified as environmental hazard.

## VII. Conclusion

Lanthanum chloride is used by Grace as an intermediate in the manufacture of FCC catalysts. In the Grace FCC catalyst manufacturing process, lanthanum chloride is completely converted into lanthanum oxide and therefore lanthanum chloride is not present in finished Grace FCC catalyst and accordingly exposure to the public is considered negligible. Overall there is some potential for concern to human health however the use pattern suggests low potential for exposure and release. The potential for aquatic bioaccumulation and associated toxicity requires handling of the substance under controlled conditions with a focus on the prevention of release to water.

## VIII. W. R. Grace Contacts

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

Brett Jurd  
Juergen Nolde

[Brett.Jurd@grace.com](mailto:Brett.Jurd@grace.com)  
[Juergen.Nolde@grace.com](mailto:Juergen.Nolde@grace.com)

### DISCLAIMER:

The statements contained herein are made in good faith and believed to be correct when made. References to data and to information derived from experience are offered for the user's consideration, investigation and verification. Information provided herein is general and does not relate to any specific product. Information may not be updated as rapidly as new information becomes available or corrected as soon as errors are found. W. R. Grace & Co.-Conn., or its affiliates, makes no representations or warranties, express or implied, that the manufacture, use, sale or other disposal of product made using the information supplied herein, or materials containing or derived from said product, does not infringe any patent or other rights. This information is furnished only on the condition that the reader assumes full responsibility for any use that he or she may make of it.