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

I. Overview

Lanthanum Oxide is a component of Fluid Catalytic Cracking (FCC) catalysts manufactured by W. R. Grace & Co.-Conn. Lanthanum Oxide is derived from rare earth, a collection of 17 chemically similar elemental metals. Rare-earth minerals tend to be found mixed together in ore deposits that are mined and then purified. 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 does not commercially supply Lanthanum Oxide.

II. Chemical Identity - Physical and Chemical Properties

Chemical Identity:

CAS number (EC inventory):	1312-81-8
CAS name:	Lanthanum oxide (La2O3)
EC number:	215-200-5
EC name:	lanthanum oxide
RTECS number	OE5330000
Molecular formula:	La2O3
Molecular weight range:	325.817

Synonyms: Lanthanum sesquioxide, lanthanum trioxide, lanthana

Purity/Impurities/Additives:

Lanthanum oxide purity varies and may contain some level of cerium oxide (CAS#1306-38-3), neodymium oxide (CAS# 1313-97-9), praseodymium oxide (CAS# 12037-29-5), samarium oxide (CAS# 12060-58-1), gadolinium oxide (CAS# 12064-62-9), yttrium oxide (CAS# 1314-36-9) and other rare earth oxides.

Physical & chemical properties:

Lanthanum oxide is a stable, largely non-reactive inorganic solid with a very high melting point and low water solubility (e.g., 69.6 µg/L at 20°C).

III. Applications

Lanthanum possesses properties that give it broad commercial, industrial, and military applications. Lanthanum oxide like other rare-earth materials is found in a wide range of consumer electronics such as cell phones, computer hard drives, computer monitors and televisions. They are used in medical imaging, lasers, optical glasses and fiber optics, to name just a few industrial uses. Because of their successful use in batteries, motors and generators, rare-earth materials, and particularly rare-earth permanent magnets, are a critical component of many clean technologies such as wind turbines, electric cars, low-energy light bulbs and advance water filtration systems.

Rare-earth materials such as lanthanum oxide are also 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 in fluid cracking catalyst (FCC), a key conversion process in a petroleum refinery.

Refiners use the FCC process to break down crude oil and convert it into transportation fuels. The use of lanthanum oxide in FCC catalysts can increase the yield of gasoline by as much as 10 percent. Lanthanum oxide 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 the activity, coke selectivity, and olefin selectivity of the zeolite portion of the catalyst.

IV. Manufacturing Processes

Lanthanum 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 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

There are no known chronic effects from lanthanum oxide. The material is not classified as carcinogenic, mutagenic or toxic for reproduction nor is there any evidence of other chronic toxicity. It may be irritating to the skin upon prolonged contact and to the

respiratory system if dust is inhaled, and is mildly irritating to the eyes. However, it should be noted that FCC catalysts in which the lanthanum oxide is contained could contain other components that may have governmental established exposures limits.

VI. Environmental Effects

Lanthanum oxide 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. It can be concluded that lanthanum does not biomagnify in the aquatic food chain and does not lead to a concern with regard to secondary poisoning. Lanthanum oxide, because of its low water solubility in particular is assumed to have a low bioavailability, and bioaccumulation is not to be expected. For the terrestrial food chain the data available indicates a low accumulation potential of lanthanum in plants. It can be assumed that there is no risk for accumulation in the food chain. Acute toxicity testing in fish, invertebrates and algae indicates a low order of toxicity.

VII. Conclusion

Lanthanum oxide is a critical component of FCC catalyst. The FCC process itself is an of valuable fuels and petrochemical feedstocks from lesser quality feedstock. FCC catalyst converts heavy feedstocks, containing contaminant metals, into clean gasoline, diesel fuel oils and light olefins, such as propylene. Based on its chemical and physical properties, combined with its toxicological and ecotoxicological profile, lanthanum oxide is not expected to pose a risk to the environment or to consumers.

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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C. K. Gupta and Nagaiyar Krishnamurthy. *Extractive Metallurgy of Rare Earths.* CRC Press, 2004. Pages 43-44, 53.

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European Chemicals Agency registered substances webpage:
http://echa.europa.eu/web/guest/information-on-chemicals/registered-substances

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