MATERIAL SAFETY DATA SHEET

DRAFT - 2/6/84 For internal review only

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Union Carbide Corporation requests that users of Synthetic Olivine study this data sheet to become aware of the product's hazards, and promote safe handling of the product by making this information available to its employees, agents and contractors. If the material is resold, Union Carbide requests that the purchaser be furnished a copy of this data sheet and advised to provide the information herein to its employees, agents and contractors.

SECTION I - IDENTIFICATION

PRODUCT NAME: Forsterite Synthetic Olivine
CHEMICAL NAME: Anhydrous Magnesium Silicate
COMPOSITION: Mixture of Fosterite, Enstatite, & Magnetite

CAS NO.: 1317-17-1
FORMULAS: Fosterite $2MgO\text{-}SiO_2$
Enstatite $MgO\text{-}SiO_2$
Magnetite Fe_3O_4
SYNONYMS: Olivine Sand

SECTION II - PHYSICAL DATA

APPEARANCE: Tan-brown Granules
ODOR: None
SPECIFIC GRAVITY: 3.2 Approximately
SOLUBILITY: Insoluble
VOLATILE CONTENT: Absorbed $H_2O < 2\%$
DRY BULK DENSITY: 75-95 lb/cu ft

SECTION III - PERMISSIBLE EXPOSURE LIMITS

No specific PEL exists for Forsterite Olivine. Use PEL's for nuisance particulate <1% quartz.

	TWA mg/cu M	
	Respirable Fraction	Total Dust
OSHA:	5	15
MSHA:	-	10
ACGIH:	5	10

PLAINTIFF'S EXHIBIT UC-791

SECTION IV - FIRE AND EXPLOSIVE HAZARD

COMBUSTIBILITY: Non-combustible. No fire hazard.
EXPLOSION HAZARD: Non-explosive.

SECTION V - HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE:

ACUTE

SWALLOWING: None known.
INHALATION: Breathing of dust may cause irritation of nose, throat, and bronchial membranes.
EYES: May cause irritation.
SKIN: May cause irritation by abrasive action.

CHRONIC

SWALLOWING: No effects expected.
INHALATION: Expected to cause foreign body-like reaction in the lungs that is reversible with removal from exposure.
EYES: No chronic effects expected.
SKIN: No chronic effects expected.

EMERGENCY HELP TELEPHONE: 304-744-3487

EMERGENCY AND FIRST AID PROCEDURES

INHALATION: Remove to fresh air, oxygen may be administered. If breathing stops start artificial respiration. Call a physician.

EYES: Flush with water for at least fifteen minutes. Call a physician.

SKIN: Wash with soap and water.

NOTES TO PHYSICIAN: This material closely resembles naturally occurring olivine and is expected to act in a like manner. There is no record that olivine has caused pneumoconiosis in man. In the lung, olivine has caused a foreign body reaction but no fibrosis in lab animals.

SECTION VI - REACTIVITY DATA

STABILITY:	Inert material.
CONDITIONS TO AVOID:	None.
HAZARDOUS DECOMPOSITION PRODUCTS:	None.
MATERIALS TO AVOID:	None.

SECTION VII - SPILL, LEAK, AND DISPOSAL INFORMATION

PROCEDURE FOR SPILLS: Fine material should be swept or vacuumed. Avoid maneuvering with compressed air or any other method that generates dust.

WASTE DISPOSAL: No special precautions are required. Synthetic olivine may be disposed of in sanitary landfills in accordance with federal, state, and local regulations.

SECTION VIII - EMPLOYEE PROTECTION INFORMATION

RESPIRATORY PROTECTION: No standard exists for olivine. Where overexposure is anticipated wear a NIOSH/MSHA approved respirator. For particulate concentrations of 50 mg/M^3 or less in the total dust or 25 mg/M^3 or less in the respirable dust use an approved particulate-filter respirator with quarter-mask or half-mask face-piece. For particulate concentrations greater than noted above, consult "American National Standards, Practices for Respiratory Protection (ANSI Z88.2-1980).

EYE PROTECTION: Goggles are recommended. Follow safety rules.

OTHER PROTECTION: Gloves are recommended. Avoid contamination of clothing with dust.

VENTILATION: Local exhaust ventilation for dusty operations per local, state and federal regulations.

SECTION IX - ADDITIONAL INFORMATION

LABELING:	No DOT precautionary labeling required.
USE:	For industrial use only.
HANDLING AND STORAGE:	Material should be stored in closed containers and kept dry.

Effective Date: March 1, 1984

Union Carbide Corporation believes that the data herein are current as of the effective date of this data sheet, and that the opinions herein are those of qualified experts. Since the product and the information herein will be used outside the control of Union Carbide Corporation, it is the user's responsibility to establish conditions for safe use of the product.

2/21/84 Draft - For internal review only.

FORSTERITE

CAUTION

OVEREXPOSURE TO DUST MAY CAUSE IRRITATION TO EYES, NOSE AND THROAT

Avoid Breathing Dust
Avoid Unnecessary Contact With Skin or Clothing
Wash Hands Thoroughly After Handling
Wear An Approved Respirator In Dusty Areas

FOR ADDITIONAL SAFETY INFORMATION SEE CURRENT UNION CARBIDE MATERIAL SAFETY DATA SHEET.

EMERGENCY HELP TELEPHONE
304-744-3487

FOR INDUSTRIAL USE ONLY

DO NOT REUSE THIS CONTAINER UNLESS THOROUGHLY CLEANED

UNION CARBIDE

UNION CARBIDE CORPORATION
METALS DIVISION
OLD RIDGEBURY ROAD
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INTERNAL
CORRESPONDENCE

UNION CARBIDE CORPORATION P.O. BOX 1029, GRAND JUNCTION, COLORADO 81502
METALS DIVISION (303) 245-3700

To (Name)	Mr. W. C. Thurber	Date	February 22, 1984
Division	Metals - J1398		
Location	Danbury, CT	Originating Dept.	E/R-Occupational Health
Area			Product Safety
		Area	
Copy to	Messrs. B. L. Ingall D. F. Kapral W. C. Kuryla W. F. McClure	Subject	MSDS and Product Label Asbestos Alteration Product (Synthetic Olivine) (3.3.3.2)

cc RJK JLM 315

This confirms our telephone conversation of February 21, 1984. It is intended to provide a review of the current situation and outline a background for management decisions as the project moves forward.

Based on discussions with Messrs. Ingalls and Kapral, the high temperature calcined material appears to be essentially a synthetic olivine. The only notable difference is the iron is present as magnetite, Fe_3O_4, rather than as enstatite, $MgO\text{-}SiO_2$. Olivine has been used for many years with minimal health hazard reported, i.e., it is basically a nusiance dust. The olivine analogy requires that two conditions be met:

1. The calcination has eliminated or reduced the amount of asbestos and/or fiber-like material to less than some defined small level.

2. The level of free crystalline silica (quartz) produced in the recrystallization is less than 1% by weight.

There is no question that any material derived from asbestos is inherently suspect as a health hazard regardless of its true risk. Even a totally harmless material of this origin represents a future product liability risk due to the costs of defense against spurious lawsuits. The testing and eventual marketing of the product obviously needs to include careful consideration of this potential problem area and the development of a reasonable approach to risk management.

At the present time, Dr. Chopra has studied the modified asbestos by electron microscopy. Preliminary results indicate that there does not appear to be anything left that looks like asbestos and particles that have an L/D ratio greater than three are extremely rare events. A written report documenting the work has not yet been received, however, and it is very important that one be obtained promptly.

The quartz analysis is not as crucial since it takes substantial exposures over an extended time for serious effects to develop. These may, however, be an analytical probelem since 1% is somewhat below the detection limit of the usual method. Initially, at least, a standard test with the detection limit defined is needed to verify and document that substantial amounts of free quartz are not present. More definitive analysis may require mineralogical work for which we no longer have capabilities within the Division. A phase diagram for the system may also provide useful insight.

In the area of health hazard evaluation, Dr. Kuryla has indicated a sequence of tests that should be considered as the project moves forward. These include:

1. A computer search of the literature. This is already under way and the completion time depends on the amount of material found.

2. A "Rabbit Alveola Macrophage" (RAM) test. This test is a specific indicator of fibrogenic lung activity such as would be caused by quartz. It's applicability to asbestos is being checked. Cost of the test is about $2,500 per substance tested. If we wish to push the olivine analogy and draw from existing olivine hazard studies, it would be necessary to run natural olivine as a control at a total of about $5,000.

3. A standard acute toxicity screening series. (This is the same sequence run recently on APT.) This series costs $6,000-$7,000.

4. A test for dust inhalation toxicity. This costs about $4,300 per substance. It might also be very desirable to run natural olivine as a control.

The amount of information that needs to be acquired at each stage of the product development, testing, and market development is a management-legal risk decision. Based on the assumption that the material could be treated as olivine, the draft material safety data sheet and comparison product label shown in Attachment 1 have been developed. The Corporate Toxicology Group has concurred on the MSDS but no legal review has been obtained on either it or the label.

The opinion is offered for your consideration that it would be prudent to have a favorable written report from Dr. Chopra, at least a rough silica analysis to verify that the free quartz content is quite low, and initial results from the computer data search completed before putting the material out for testing. At that time samples could be supplied to potential users marked "For Experimental Use Only" with the label in the Attachment on the package and accompanied by the MSDS.

Before the material is used in a large number of places or in large quantity testing, it is quite desirable to have completed at least the RAM testing and preferably also the dust inhalation toxicity tests. The standard acute toxicity series would complete the picture before routine commercial use. Implicit in the foregoing discussion is assumption that all of the testing continues to confirm the validity of the natural olivine analogy. Different results may dictate a different strategy.

I will be glad to discuss this further at your convenience. Both the label and MSDS can be produced very quickly once all of the necessary approvals have been received.

H. B. Rhodes

HBR/sw

Attachment