1. IDENTIFICATION

Product Identifier
Product Name LSM-YSZ
Other means of identification SDS # NT-007
Synonyms LSMYSZ; Lanthanum Strontium Manganite-Yttria Stabilized Zirconia.
Recommended use of the chemical and restrictions on use
Recommended Use Laboratory chemicals and Manufacture of substances.

Details of the supplier of the safety data sheet
Supplier Address Nexceris, LLC
404 Enterprise Dr.
Lewis Center, OH 43035
www.nexceris.com
Emergency Telephone Number
Company Phone Number Non-emergency calls/questions: 1-614-842-6606
Fax: 1-614-842-6607
Emergency Telephone (24 hr) INFOTRAC 1-352-323-3500 (International)
1-800-535-5053 (North America)

2. HAZARDS IDENTIFICATION

Appearance Gray solid
Physical State Solid
Classification
Skin corrosion/irritation Category 2
Serious eye damage/eye irritation Category 2

Signal Word Warning
Hazard Statements
Causes skin irritation
Causes serious eye irritation

Precautionary Statements - Prevention
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Precautionary Statements - Response

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
IF ON SKIN: Wash with plenty of soap and water
If skin irritation occurs: Get medical advice/attention
Take off contaminated clothing and wash it before reuse

Unknown Acute Toxicity
71.5% of the mixture consists of ingredient(s) of unknown toxicity

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms
LSMYSZ; Lanthanum Strontium Manganite-Yttria Stabilized Zirconia.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No</th>
<th>Weight-%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zirconium Oxide</td>
<td>1314-23-4</td>
<td>34-52</td>
</tr>
<tr>
<td>Lanthanum Oxide</td>
<td>1312-81-8</td>
<td>23-34</td>
</tr>
<tr>
<td>Manganese Oxide</td>
<td>1317-35-7</td>
<td>13-20</td>
</tr>
<tr>
<td>Yttrium Oxide</td>
<td>1314-36-9</td>
<td>6-8</td>
</tr>
<tr>
<td>Strontium Oxide</td>
<td>1314-11-0</td>
<td>4-6</td>
</tr>
<tr>
<td>Hafnium Oxide</td>
<td>12055-23-1</td>
<td>1-2</td>
</tr>
</tbody>
</table>

"If Chemical Name/CAS No is "proprietary" and/or Weight-% is listed as a range, the specific chemical identity and/or percentage of composition has been withheld as a trade secret."

4. FIRST-AID MEASURES

First Aid Measures

General Advice
If exposed or concerned: Get medical advice/attention.

Eye Contact
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

Skin Contact
Wash with plenty of water. Remove and wash contaminated clothing before reuse. Seek medical advice / attention if symptoms develop.

Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Seek medical attention for further treatment.

Ingestion
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention if symptoms develop.

Most important symptoms and effects

Symptoms
Causes skin irritation. Causes serious eye irritation.

Indication of any immediate medical attention and special treatment needed

Notes to Physician
Treat symptomatically.
5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable Extinguishing Media  Not determined.

Specific Hazards Arising from the Chemical
Not determined.

Protective equipment and precautions for firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal Precautions  Use personal protective equipment as required. Avoid creating dust.

Environmental Precautions  Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information. See Section 13: DISPOSAL CONSIDERATIONS.

Methods and material for containment and cleaning up

Methods for Containment  Prevent further leakage or spillage if safe to do so.

Methods for Clean-Up  Avoid creating dust. Sweep up dry spills and place in a container for recovery or disposal.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on Safe Handling  Handle in accordance with good industrial hygiene and safety practice. Use personal protective equipment as required. Avoid contact with skin, eyes or clothing. Avoid generation of dust. Wash face, hands and any exposed skin thoroughly after handling. Wash contaminated clothing before reuse.

Conditions for safe storage, including any incompatibilities

Storage Conditions  Keep container tightly closed and store in a cool, dry and well-ventilated place.

Incompatible Materials  None known based on information supplied.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guidelines

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zirconium Oxide 1314-23-4</td>
<td>STEL: 10 mg/m³ Zr  TWA: 5 mg/m³ Zr</td>
<td>(vacated) TWA: 5 mg/m³ Zr (vacated) STEL: 10 mg/m³ Zr</td>
<td>IDLH: 25 mg/m³ Zr TWA: 5 mg/m³ except Zirconium tetrachloride Zr STEL: 10 mg/m³ Zr</td>
</tr>
<tr>
<td>Manganese Oxide 1317-35-7</td>
<td>TWA: 0.02 mg/m³ Mn  TWA: 0.1 mg/m³ Mn</td>
<td>(vacated) TWA: 1 mg/m³ Mn (vacated) Ceiling: 5 mg/m³ Mn Ceiling: 5 mg/m³ Mn</td>
<td>IDLH: 500 mg/m³ Mn TWA: 1 mg/m³ Mn STEL: 3 mg/m³ Mn</td>
</tr>
<tr>
<td>Yttrium Oxide 1314-36-9</td>
<td>TWA: 1 mg/m³ Y</td>
<td>-</td>
<td>IDLH: 500 mg/m³ Y TWA: 1 mg/m³ Y</td>
</tr>
<tr>
<td>Hafnium Oxide 12055-23-1</td>
<td>TWA: 0.5 mg/m³ Hf</td>
<td>-</td>
<td>IDLH: 50 mg/m³ Hf TWA: 0.5 mg/m³ Hf</td>
</tr>
</tbody>
</table>
Appropriate engineering controls

Engineering Controls  Apply technical measures to comply with the occupational exposure limits. Eyewash stations. Showers.

Individual protection measures, such as personal protective equipment

Eye/Face Protection  Refer to 29 CFR 1910.133 for eye and face protection regulations.

Skin and Body Protection  Refer to 29 CFR 1910.138 for appropriate skin and body protection.

Respiratory Protection  Ensure adequate ventilation, especially in confined areas. In case of inadequate ventilation wear respiratory protection.

General Hygiene Considerations  Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Physical State</th>
<th>Solid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
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<td>Color</td>
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<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
<th>Remarks • Method</th>
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<tbody>
<tr>
<td>pH</td>
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<tr>
<td>Melting Point/Freezing Point</td>
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<tr>
<td>Boiling Point/Boiling Range</td>
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<tr>
<td>Flash Point</td>
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<tr>
<td>Evaporation Rate</td>
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<tr>
<td>Flammability (Solid, Gas)</td>
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<tr>
<td>Upper Flammability Limits</td>
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<td>Lower Flammability Limit</td>
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<td>Vapor Pressure</td>
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<td>Vapor Density</td>
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<tr>
<td>Solubility in other solvents</td>
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<tr>
<td>Partition Coefficient</td>
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<tr>
<td>Auto-ignition Temperature</td>
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<tr>
<td>Decomposition Temperature</td>
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<td>Kinematic Viscosity</td>
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<td>Dynamic Viscosity</td>
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<tr>
<td>Explosive Properties</td>
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<tr>
<td>Oxidizing Properties</td>
<td>Not determined</td>
<td></td>
</tr>
</tbody>
</table>

10. STABILITY AND REACTIVITY

Reactivity
Not reactive under normal conditions.

Chemical Stability
Stable under recommended storage conditions.

Possibility of Hazardous Reactions
None under normal processing.

Conditions to Avoid
Keep out of reach of children. Avoid generation of dust. See Sec. 7 Handling & Storage.
Incompatible Materials
None known based on information supplied.

Hazardous Decomposition Products
None known based on information supplied.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Product Information

Eye Contact  Causes serious eye irritation.
Skin Contact  Causes skin irritation.
Inhalation  Avoid inhalation of dust.
Ingestion  Do not ingest.

Component Information

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Oral LD50</th>
<th>Dermal LD50</th>
<th>Inhalation LC50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lanthanum Oxide 1312-81-8</td>
<td>&gt; 8500 mg/kg (Rat)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Information on physical, chemical and toxicological effects

Symptoms  Please see section 4 of this SDS for symptoms.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Carcinogenicity  Based on the information provided, this product does not contain any carcinogens or potential carcinogens as listed by OSHA, IARC or NTP.

Numerical measures of toxicity
Not determined

Unknown Acute Toxicity  71.5% of the mixture consists of ingredient(s) of unknown toxicity.

12. ECOLOGICAL INFORMATION

Ecotoxicity
The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Persistence/Degradability
Not determined.

Bioaccumulation
Not determined.

Mobility
Not determined

Other Adverse Effects
Not determined
13. DISPOSAL CONSIDERATIONS

Waste Treatment Methods

Disposal of Wastes
Disposal should be in accordance with applicable regional, national and local laws and regulations.

Contaminated Packaging
Disposal should be in accordance with applicable regional, national and local laws and regulations.

14. TRANSPORT INFORMATION

Note
Please see current shipping paper for most up to date shipping information, including exemptions and special circumstances.

DOT
Not regulated

IATA
Not regulated

IMDG
Not regulated

15. REGULATORY INFORMATION

International Inventories

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>TSCA</th>
<th>DSL</th>
<th>NDSL</th>
<th>EINECS</th>
<th>ELINCS</th>
<th>ENCS</th>
<th>IECSC</th>
<th>KECL</th>
<th>PICCS</th>
<th>AICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zirconium Oxide</td>
<td>Present</td>
<td>X</td>
<td></td>
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<td>X</td>
<td>Present</td>
<td>X</td>
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<tr>
<td>Lanthanum Oxide</td>
<td>Present</td>
<td>X</td>
<td></td>
<td>Present</td>
<td>Present</td>
<td>X</td>
<td>Present</td>
<td>X</td>
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<tr>
<td>Manganese Oxide</td>
<td>Present</td>
<td>X</td>
<td></td>
<td>Present</td>
<td>Present</td>
<td>X</td>
<td>Present</td>
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</tr>
<tr>
<td>Yttrium Oxide</td>
<td>Present</td>
<td>X</td>
<td></td>
<td>Present</td>
<td>Present</td>
<td>X</td>
<td>Present</td>
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</tr>
<tr>
<td>Strontium Oxide</td>
<td>Present</td>
<td>X</td>
<td></td>
<td>Present</td>
<td>Present</td>
<td>X</td>
<td>Present</td>
<td>X</td>
<td>X</td>
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</tr>
<tr>
<td>Hafnium Oxide</td>
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<td>Present</td>
<td>X</td>
<td>Present</td>
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<td>X</td>
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</tr>
</tbody>
</table>

Legend:
- TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
- DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
- EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
- ENCS - Japan Existing and New Chemical Substances
- IECSC - China Inventory of Existing Chemical Substances
- KECL - Korean Existing and Evaluated Chemical Substances
- PICCS - Philippines Inventory of Chemicals and Chemical Substances
- AICS - Australian Inventory of Chemical Substances

US Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No</th>
<th>Weight-%</th>
<th>SARA 313 - Threshold Values %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manganese Oxide - 1317-35-7</td>
<td>1317-35-7</td>
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</table>
US State Regulations

U.S. State Right-to-Know Regulations

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>New Jersey</th>
<th>Massachusetts</th>
<th>Pennsylvania</th>
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<tbody>
<tr>
<td>Zirconium Oxide</td>
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<td>X</td>
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</tr>
<tr>
<td>1314-23-4</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Manganese Oxide</td>
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<td>X</td>
<td>X</td>
</tr>
<tr>
<td>1317-35-7</td>
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<td></td>
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</table>

16. OTHER INFORMATION

<table>
<thead>
<tr>
<th></th>
<th>NFPA</th>
<th>HMIS</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Health Hazards</td>
<td>Flammability</td>
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<td>Health Hazards</td>
<td>Flammability</td>
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<tr>
<td></td>
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</tbody>
</table>

Issue Date: 23-Jul-2015
Revision Date: 01-Oct-2015
Revision Note: New format

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

End of Safety Data Sheet