SAFETY DATA SHEET

Zinc Oxide Pieces

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Zinc Oxide Pieces
GENERAL USE: Physical vapor deposition of thin films

MANUFACTURER
Kurt J Lesker Company
United States
1925 Route 51
Jefferson Hills, PA 15025
E-Mail: msds@lesker.com
Service Number: 412-387-9200
Kurt J Lesker Company LTD
United Kingdom
15-16 Burgess Road
Hastings, East Sussex, TN35 4NR
England
Service Number: +44 (0) 1424 458100

24 HR. EMERGENCY TELEPHONE NUMBERS
24-Hour Emergency Response provided by
3E Global Incident Response Hotline
When calling, refer to Kurt J Lesker Company
Global Response Access Code: 333594
North America [USA, Canada, Mexico]: 1-866-519-4752
Mainland China: (+86) 4001 2001 74
Europe: {int'l call prefix}-1-760-476-3961
Asia Pacific: {int'l call prefix}-1-760-476-3960
Middle East & Africa: {int'l call prefix}-1-760-476-3959

2. HAZARDS IDENTIFICATION

GHS CLASSIFICATIONS

Environmental:
Acute Hazards to the Aquatic Environment, Category 1
Chronic Hazards to the Aquatic Environment, Category 1

GHS LABEL

HAZARD STATEMENTS

H410: Very toxic to aquatic life with long lasting effects.

PRECAUTIONARY STATEMENT(S)

Prevention:
P273: Avoid release to the environment.

Response:
P391: Collect spillage.

EMERGENCY OVERVIEW

PHYSICAL APPEARANCE: White solid
IMMEDIATE CONCERNS: This product is not hazardous under conditions of normal use.
POTENTIAL HEALTH EFFECTS

EYES: Contact may cause eye irritation.

SKIN: May cause skin irritation.

INGESTION: May be harmful if swallowed.

INHALATION: May be harmful if inhaled. May cause respiratory irritation.

REPRODUCTIVE TOXICITY

REPRODUCTIVE EFFECTS: Not Available

TERATOGENIC EFFECTS: Not Available

CARCINOGENICITY: Not listed as a human carcinogen

MUTAGENICITY: Not Available

ROUTES OF ENTRY: Inhalation, ingestion, eye contact, or skin contact.

IRRITANCY: May cause irritation of skin, eyes, and respiratory tract.

PHYSICAL HAZARDS: This substance is not considered hazardous in the form supplied.

3. COMPOSITION / INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Wt.%</th>
<th>CAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc Oxide</td>
<td>100</td>
<td>1314-13-2</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

EYES: Immediately flush eyes with plenty of water. Get medical attention, if irritation persists.

SKIN: Wash with soap and water. Get medical attention if irritation develops or persists.

INGESTION: Rinse mouth. Get medical advice/attention.

INHALATION: Remove to fresh air. If not breathing, give artificial respiration or give oxygen by trained personnel. Seek immediate medical attention.

SIGNS AND SYMPTOMS OF OVEREXPOSURE

INHALATION: Inhaling fumes of heated material may cause metal fume fever.

CHRONIC EFFECTS: Not Available

5. FIRE FIGHTING MEASURES

FLAMMABLE CLASS: Not flammable.

EXTINGUISHING MEDIA: Use alcohol foam, carbon dioxide, or water spray when fighting fires involving this material.

EXPLOSION HAZARDS: Dusts at sufficient concentrations can form explosive mixtures with air.

FIRE FIGHTING PROCEDURES: As in any fire, wear self-contained breathing apparatus pressure-demand, (MSHA/NIOSH approved or equivalent) and full protective gear.

HAZARDOUS DECOMPOSITION PRODUCTS: Toxic metal fumes

6. ACCIDENTAL RELEASE MEASURES
**SMALL SPILL:** Clean up spills immediately, observing precautions in Protective Equipment section.

**LARGE SPILL:** Collect spilled material in appropriate container. Spill may be reportable. Consult section 15 for Reportable Quantities.

**ENVIRONMENTAL PRECAUTIONS**

**WATER SPILL:** This material is a water pollutant and should be prevented from contaminating soil or from entering sewage and drainage systems and bodies of water.

**GENERAL PROCEDURES:** Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Eliminate all ignition sources if safe to do so. Avoid formation of dust. Provide appropriate exhaust ventilation where dust is formed. Avoid breathing (dust, vapor, mist, gas). Practice good chemical hygiene during and after use. Avoid release to the environment.

---

**7. HANDLING AND STORAGE**

**GENERAL PROCEDURES:** To avoid risks to human health and the environment, comply with the instructions for use.

**HANDLING:** Keep away from heat and flame. Keep container closed when not in use. Remove contaminated clothing and wash before reuse. Wash hands before eating and wash before reuse. Wash thoroughly after handling.

**STORAGE:** Keep container closed when not in use. Store in a cool dry place.

---

**8. EXPOSURE CONTROLS / PERSONAL PROTECTION**

**ENGINEERING CONTROLS:** Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

**PERSONAL PROTECTIVE EQUIPMENT**

**EYES AND FACE:** Wear safety glasses.

**SKIN:** Wear protective gloves.

**RESPIRATORY:** Not normally needed. If ventilation is inadequate and this material is handled at elevated temperatures or dusts/fumes/mists are generated a NIOSH/MSHA approved air purifying respirator with a manufacturers approved cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air purifying respirators is limited. Use a positive pressure air supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air purifying respirators may not provide adequate protection.

**WORK HYGIENIC PRACTICES:** Practice good chemical hygiene during and after use.

**COMMENTS:**

COMPONENT EXPOSURE LIMITS
### 9. PHYSICAL AND CHEMICAL PROPERTIES

**PHYSICAL STATE:** Solid

**ODOR:** None

**COLOR:** White

**pH:** NA = Not Applicable

**PERCENT VOLATILE:** NA = Not Applicable

**FLASH POINT AND METHOD:** NA = Not Applicable

**FLAMMABLE LIMITS:** NA = Not Applicable

<table>
<thead>
<tr>
<th>Component</th>
<th>Location, Type</th>
<th>Value (mg/m3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Zinc oxide (dust)</strong></td>
<td>ACGIH TLV TWA</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>OSHA OEL TWA</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>OSHA OEL STEL</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>NIOSH REL TWA</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>NIOSH REL STEL</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Canada - AB, BC, ON TWA</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Canada - AB, BC, ON STEL</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Canada - PQ TWA</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Europe TWA</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Germany TWA</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Germany STEL</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Sweden TWA</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Australia, NZ, Singapore TWA</td>
<td>10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>Location, Type</th>
<th>Value (mg/m3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Zinc oxide (fume)</strong></td>
<td>ACGIH TLV TWA</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>OSHA OEL TWA</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>NIOSH REL TWA</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Canada - PQ TWA</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Europe TWA</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Europe STEL</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Denmark TWA</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Denmark STEL</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Germany TWA/STEL</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Hungary STEL</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Spain TWA</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Switzerland TWA/STEL</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Australia, NZ, Singapore TWA</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Australia, New Zealand STEL</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>UK WEL TWA</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>UK WEL STEL</td>
<td>10</td>
</tr>
</tbody>
</table>
AUTOIGNITION TEMPERATURE: NA = Not Applicable
VAPOR PRESSURE: NA = Not Applicable
VAPOR DENSITY: NA = Not Applicable
BOILING POINT: 2360°C
MELTING POINT: 1975°C
SOLUBILITY IN WATER: .00016 g/100mL at 30°C
DENSITY: 5.606 at 25°C
MOLECULAR WEIGHT: 81.408

10. STABILITY AND REACTIVITY

STABLE: Yes
HAZARDOUS POLYMERIZATION: No
CONDITIONS TO AVOID: Avoid high temperatures.
HAZARDOUS DECOMPOSITION PRODUCTS: Toxic metal fumes
INCOMPATIBLE MATERIALS: Strong acids, Strong bases, Oxidizing materials, Magnesium powder.

11. TOXICOLOGICAL INFORMATION

ACUTE
DERMAL LD$_{50}$: Not Available
SKIN ABSORPTION: Not Available
ORAL LD$_{50}$: > 5000 mg/kg
Notes: Rat
INHALATION LC$_{50}$: 5.7 mg/L
Notes: Mouse

CARCINOGENICITY
IARC: Not listed
NTP: Not listed
OSHA: Not listed

REPRODUCTIVE EFFECTS: Not Available
TERATOGENIC EFFECTS: Not Available
MUTAGENICITY: Not Available

12. ECOLOGICAL INFORMATION

BIOACCUMULATION/ACCUMULATION: Not Available

AQUATIC TOXICITY (ACUTE)
96-HOUR LC$_{50}$: 1.1 mg/L (Oncorhynchus mykiss)
48-HOUR EC$_{50}$: 1.0 mg/L (Daphnia magna)
13. DISPOSAL CONSIDERATIONS

**DISPOSAL METHOD:** Dispose of according to applicable federal, state, provincial, and local regulations.

**PRODUCT DISPOSAL:** Contact a licensed waste disposal company.

**EMPTY CONTAINER:** Follow all MSDS/label precautions even after container is emptied because it may retain product residues.

14. TRANSPORT INFORMATION

**DOT (DEPARTMENT OF TRANSPORTATION)**

**PROPER SHIPPING NAME:** Environmentally hazardous substances, solid, n.o.s.

**TECHNICAL NAME:** Zinc oxide

**PRIMARY HAZARD CLASS/DIVISION:** 9

**UN/NA NUMBER:** 3077

**PACKING GROUP:** III

**MARINE POLLUTANT #1:** Yes

**CANADA TRANSPORT OF DANGEROUS GOODS**

**SHIPPING NAME:** Environmentally hazardous substances, solid, n.o.s.

**TECHNICAL NAME:** Zinc oxide

**UN/NA NUMBER:** 3077

**PRIMARY HAZARD CLASS/DIVISION:** 9

**PACKING GROUP:** III

15. REGULATORY INFORMATION

**UNITED STATES**

**SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)**

**311/312 HAZARD CATEGORIES:** None

**313 REPORTABLE INGREDIENTS:** Yes

**TSCA (TOXIC SUBSTANCE CONTROL ACT)**

**TSCA STATUS:** All components of this product are included in inventory, exempt, or notified

**REGULATIONS**

**STATE REGULATIONS:**

The following components appear in one or more of the following state hazardous substances lists

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS</th>
<th>CA</th>
<th>MA</th>
<th>MN</th>
<th>NJ</th>
<th>PA</th>
<th>RI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc oxide</td>
<td>1314-13-2</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**CALIFORNIA PROPOSITION 65:** This product is not known to contain any components for which the State of
California has found to cause cancer, birth defects or other reproductive harm.

CANADA

WHMIS (WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM): Not Regulated

DOMESTIC SUBSTANCE LIST (INVENTORY): All components of this product are included in inventory, exempt, or notified

16. OTHER INFORMATION

APPROVED BY: EHS DEPT
PREPARED BY: E Bolton
INFORMATION CONTACT: msds@lesker.com

HMIS RATING

<table>
<thead>
<tr>
<th>Category</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>1</td>
</tr>
<tr>
<td>Flammability</td>
<td>0</td>
</tr>
<tr>
<td>Physical Hazard</td>
<td>0</td>
</tr>
<tr>
<td>Personal Protection</td>
<td>C</td>
</tr>
</tbody>
</table>

NFPA CODES

- Health: 2
- Flammability: 0
- Physical Hazard: 0
- Personal Protection: C

GENERAL STATEMENTS: The physical and toxicological properties of this material have not been thoroughly investigated.

MANUFACTURER DISCLAIMER:

Kurt J. Lesker Company ("KJLC") believes the information contained in this Material Safety Data Sheet is accurate as of the “Date of Last Revision” specified. The information relates only to typical properties of the product. Do not use the information for product performance or specification purposes. The information is for use by technically skilled persons at their own risk. KJLC MAKES NO EXPRESS OR IMPLIED WARRANTY OF ANY KIND, INCLUDING WITHOUT LIMITATION WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, WITH RESPECT TO THE PRODUCT OR THE INFORMATION. The information may not be valid for product use in combination with any other product or material or in any process. KJLC expressly disclaims any liability arising from any use of the product or any reliance on the information. Do not treat the information (a) as assurance that use of the product will not infringe patent or other rights or (b) as a license or grant of patent or other property rights. "KJLC" means KJLC and each of its subsidiaries.