SAFETY DATA SHEET

Cobalt metal pieces

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Cobalt metal pieces
GENERAL USE: Physical vapor deposition of thin films

MANUFACTURER
Kurt J Lesker Company
United States
1925 Route 51
Jefferson Hills, PA 15025
Customer Service: 412-387-9200
E-Mail: msds@lesker.com

Kurt J Lesker Company LTD
United Kingdom
15-16 Burgess Road
Hastings, East Sussex, TN35 4NR
England
Customer Service: +44 (0) 1424 458100

2. HAZARDS IDENTIFICATION

GHS CLASSIFICATIONS

Health:
- Respiratory Sensitization, Category 1
- Skin Sensitization, Category 1

Environmental:
- Chronic Hazards to the Aquatic Environment, Category 4

GHS LABEL

Health hazard

HAZARD STATEMENTS

H334: May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H317: May cause an allergic skin reaction.
H413: May cause long lasting harmful effects to aquatic life.

PRECAUTIONARY STATEMENT(S)

Prevention:
- P261: Avoid breathing dust/fume/gas/mist/vapours/spray.
- P285: In case of inadequate ventilation wear respiratory protection.
- P273: Avoid release to the environment.
Response:

P304+P341: IF INHALED: If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing.
P342+P311: If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician.
P302+P352: IF ON SKIN: Wash with plenty of soap and water.

EMERGENCY OVERVIEW

PHYSICAL APPEARANCE: Grey metal

IMMEDIATE CONCERNS: Negligible fire or explosion hazard in bulk form. Powdered material may form explosive dust-air mixtures.

POTENTIAL HEALTH EFFECTS

EYES: Contact may cause eye irritation.

SKIN: May cause skin irritation. Allergic reactions are possible.

INGESTION: May be harmful if swallowed.

INHALATION: May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause respiratory irritation.

REPRODUCTIVE TOXICITY

REPRODUCTIVE EFFECTS: Not Available

TERATOGENIC EFFECTS: Not Available

CARCINOGENICITY: IARC Group 2B - Possibly carcinogenic to humans.

MUTAGENICITY: Not Available

MEDICAL CONDITIONS AGGRAVATED: None expected.

/routes of entry: Inhalation

TARGET ORGAN STATEMENT: Lungs, Respiratory tract

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

SENSITIZATION: May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause skin sensitization, an allergic reaction, which becomes evident on re exposure to this material.

PHYSICAL HAZARDS: This substance is not considered hazardous in the form supplied. Dusts at sufficient concentrations can form explosive mixtures with air.

3. COMPOSITION / INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Wt.%</th>
<th>CAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cobalt</td>
<td>0 - 100</td>
<td>7440-48-4</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

ACUTE TOXICITY: May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause skin irritation. Allergic reactions are possible.

CHRONIC EFFECTS: Not Available

5. FIRE FIGHTING MEASURES

FLAMMABLE CLASS: Noncombustible except as a powder.

EXTINGUISHING MEDIA: Use a Class D dry powder extinguisher, dolomite, dry sand, graphite, or soda ash.

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: Cobalt oxides

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 with side shields (or goggles) and a face shield.

SKIN: Wear protective gloves/protective clothing/eye protection/face protection. Wash contaminated clothing before reuse.

RESPIRATORY: 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:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Location, Type</th>
<th>Value (mg/m3)</th>
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<tbody>
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<td>Cobalt</td>
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<tr>
<td></td>
<td>OSHA OEL TWA</td>
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<tr>
<td></td>
<td>NIOSH REL TWA</td>
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<tr>
<td></td>
<td>UK WEL</td>
<td>0.1</td>
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</tbody>
</table>

### 9. PHYSICAL AND CHEMICAL PROPERTIES

**PHYSICAL STATE:** Solid

**ODOR:** None

**COLOR:** Light grey

**pH:** NA = Not Applicable

**PERCENT VOLATILE:** NA = Not Applicable

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

**FLAMMABLE LIMITS:** NA = Not Applicable

**AUTOIGNITION TEMPERATURE:** NA = Not Applicable

**VAPOR PRESSURE:** Not Available

**VAPOR DENSITY:** NA = Not Applicable

**BOILING POINT:** 2900°C

**MELTING POINT:** 1493°C

**SOLUBILITY IN WATER:** Insoluble

**DENSITY:** 8.9 at 25°C

**MOLECULAR WEIGHT:** 58.69
10. STABILITY AND REACTIVITY

STABLE: Yes

HAZARDOUS POLYMERIZATION: No

HAZARDOUS DECOMPOSITION PRODUCTS: Toxic metal fumes

INCOMPATIBLE MATERIALS: Strong acids, Oxidizing materials, Acetylene, Hydrazinium nitrate, Ammonium Nitrate.

11. TOXICOLOGICAL INFORMATION

ACUTE

EYES: May cause mild transient irritation but there is no evidence of long term harmful effects from available information.

DERMAL LD$_{50}$: Not Available

SKIN ABSORPTION: Not Available

ORAL LD$_{50}$: 6171 mg/kg

Notes: Rat

INHALATION LC$_{50}$: Not Available

SKIN EFFECTS: May cause an allergic skin reaction.

CARCINOGENICITY

IARC: Group 2B - Possibly carcinogenic to humans.

NTP: Not listed

OSHA: Not listed

SENSITIZATION: May cause skin sensitization. May cause allergic respiratory reaction.

REPRODUCTIVE EFFECTS: Not Available

TARGET ORGANS: Lungs, Respiratory tract

TERATOGENIC EFFECTS: Not Available

MUTAGENICITY: Not Available

12. ECOLOGICAL INFORMATION

BIOACCUMULATION/ACCUMULATION: 14 day Bioconcentration Factor (BCF) = 500 (Penaeus aztecus)

AQUATIC TOXICITY (ACUTE): Not Available

CHEMICAL FATE INFORMATION: Not Available

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)

   PRIMARY HAZARD CLASS/DIVISION: Not Regulated

ROAD AND RAIL (ADR/RID)

   PROPER SHIPPING NAME: Not Regulated

AIR (ICAO/IATA)

   PRIMARY HAZARD CLASS/DIVISION: Not Regulated

VESSEL (IMO/IMDG)

   PRIMARY HAZARD CLASS/DIVISION: Not Regulated

CANADA TRANSPORT OF DANGEROUS GOODS

   PRIMARY HAZARD CLASS/DIVISION: Not Regulated

15. REGULATORY INFORMATION

UNITED STATES

SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)

   311/312 HAZARD CATEGORIES: Acute health hazard. Chronic health hazard.

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>
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<th>CAS</th>
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<th>MN</th>
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   CALIFORNIA PROPOSITION 65: This material may contain the following components which are known to the State of California to cause cancer, birth defects or other reproductive harm and may be subject to the requirements of California Proposition 65 (CA Health and Safety Code section 25249.5):

CANADA

WHMIS HAZARD SYMBOL AND CLASSIFICATION

   Toxic

   D2A

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

16. OTHER INFORMATION
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.