

SAFETY DATA SHEET

SECTION I – CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Manufacturer's Name: TRS Technologies, Inc.
 2820 East College Avenue, Suite J
 State College, PA 16801
 Telephone: (814) 238-7485
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Chemical Names: Lead Magnesium Titanium Niobate Oxide Crystal 99.95% (PMN-x%PT)

Trade Names: TRS – X4A, X4B, X4C

SECTION II – COMPOSITION AND INFORMATION ON INGREDIENTS

<u>Material or Component</u>	<u>CAS Number</u>	<u>Approximate Weight %</u>	<u>TLV-TWA mg/m³</u>	<u>TLV-STEL mg/m³-8 hr</u>	<u>PEL mg/m³-8 hr</u>
Lead Monoxide (PbO)*	1317-36-8	65-75	0.15 as Pb	0.45 as Pb	0.05 as Pb
Titanium Dioxide (TiO ₂)	13463-67-7	6-10	10.00	20.00	5.00 respirable 15.00 total
Niobium Pentoxide (Nb ₂ O ₅)	1313-96-8	10-20	10.00	--	5.00 respirable 15.00 total
Magnesium Carbonate (MgCO ₃)	1309-48-4	1-3	10.00	--	15.00, fume
Indium Oxide (In ₂ O ₃)	1312-43-2	4-8	--	--	--

*** SARA Section 313 Supplier Notification** - These chemicals are subject to the reporting requirements of Section 313 of the EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT OF 1986 AND OF 40 CFR 372.

Material is a lead compound. Refer to Federal Register Vol. 43 #220, pgs. 53007-53014, November 14, 1978. Standard (OSHA) - Occupational Exposure to lead. Also, Code of Federal Regulation CFR Title 29 1910.1025.

SECTION III – HAZARD IDENTIFICATION

Routes of exposure when handling or processing (Health Hazard: NFPA EXIS Rating = 2)

MECHANICAL PROCESS ON THE CRYSTALS MAY RESULT IN INDUCING POWER OR DUST, TOXIC IN FINE POWDER/DUST FORM. Before processing this product, be familiar with information contained in: The Federal Standard for Occupational Exposure to Lead (29CFR1910.1025)

Mode of entry into body:

- By **Inhalation** of dust or powder, the respiratory system may be irritated and both acute and chronic effects, as described below can result.
- By **Ingestion** of dust/power swallowed or trapped in the upper respiratory tract or introduced into the mouth on food, tobacco, fingers or other objects, both acute and chronic effects can result.

3. By **Skin Contact** of dust/powder may cause irritation.
4. **Skin Absorption** does not apply, as dusts/powders are not absorbed.
5. **Eye Contact** of dusts or powder may cause irritation.

SECTION IV – FIRST AID MEASURES

Inhalation: Remove from exposure. Get medical attention if experiencing effects of acute overexposure.
Ingestion: Induce vomiting in a conscious individual. Get immediate medical attention. Call a physician.
Skin: Wash thoroughly with soap and water.
Eyes: Flush with copious quantities of water. Get immediate medical attention.

NOTES TO PHYSICIAN: Lead and its inorganic compounds are neurotoxic, which may produce peripheral neuropathy. For an overview of the effects of lead exposure, consult Occupational Safety and Health Administration A11.A of Occupational Exposure to Lead (29CFR1910.1025). “A Guide for Physicians, Health Maintenance of Workers Exposed to Inorganic Lead” is available from Lead Industries Association, Inc., 292 Madison Ave., New York, NY 10017.

SECTION V - FIRE AND EXPLOSION HAZARD DATA

Flammability: NFPA Flammability Rating = 0 Flash Point: NA Auto ignition Temperature: NA Flammable Limits: NA Extinguishing Media: Water Fog or Flood, CO₂ and Dry Chemical.

Special Fire Fighting Procedures: Wear full body protective clothing and full-face piece, self-contained breathing apparatus operated in positive-pressure mode.

Unusual Fire and Explosion Hazard: Fume, vapor and/or dust may occur and are considered toxic and respiratory irritants. The product or dust can react vigorously with strong oxidizing agents. Refer to FIRE PROTECTION GUIDE ON HAZARDOUS MATERIALS by N.F.P.A. for specific individual problem combinations.

SECTION VI – ACCIDENTAL RELEASE MEASURES

Waste Disposal Method: Disposal of waste and hazardous material used in the mechanical process of the crystals should be handled in a manner, which complies with local, state, and federal regulations. It is preferable to send waste material to an approved recycling facility. City, state, and federal regulations must be followed at all times.

Neutralizing Chemicals: N/A

SECTION VII – HANDLING AND STORAGE

Precautions: Wet mechanical process of crystals suggested; water cooling is fine; wear chemical resistant gloves, safety goggles, and other protective clothing when doing mechanical process of the crystals. There are two major methods of lead absorption; namely inhalation and ingestion. Most inhalation problems can be prevented with attention to ventilation and respirator use. Ingestion can be prevented with good hygiene practices.

- ◆ Do not inhale or swallow dust/powder.
- ◆ Wash thoroughly after handling.
- ◆ Use gloves and prevent secondary contamination by ingesting or inhalation.
- ◆ Wear suitable protective clothing
- ◆ Wear suitable protective equipment
- ◆ Do not smoke, eat, or apply cosmetics in work area or prior to washing hands.
- ◆ Wash thoroughly before entering into eating areas.
- ◆ Do not wear any part of work clothing home. This includes shoes.
- ◆ Keep lead materials away from food and food products.
- ◆ Keep away from children.

- ◆ Do not reuse containers.
- ◆ This product is intended for industrial use only.

Storage: Keep away from food and food products; keep away from children.

Before using this product, be familiar with information contained in: The Federal Standard for Occupational Exposure to Lead (29CFR1910.1025), first published in the Federal Register on Tuesday, November 14, 1978, by the Occupational Safety and Health administration, and as also later modified.

SECTION VIII – EXPOSURE CONTROLS/PERSONAL PROTECTION

Specific Personal Protective Equipment:

Respirator: As specified by 29CFR1910.1025(f) of the Federal Occupational Safety and Health Administration Standard for Occupational Exposure to Lead -- When handling, use a dust/fume respirator with NIOSH/WSHA approval. Respirator must be worn if TLV is exceeded.

Protective Gloves: Not required, but recommended.

Eye Protection: Not required, but recommended.

Other Clothing & Equipment: Personal clothing should be protected from contamination.

Engineering Controls: If user operations generate dust or powder, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Ventilation Requirements: Ventilation as described in the Industrial Ventilation Manual, by ACGIH shall be provided where exposures exceed PEL or TLV specified in and in accord with OSHA Standard 29CFR1910.94. Other local and state regulations may apply.

Exposure Limits: TWA: 0.05 (mg/m³) from ACGIH (TLV) [United States] TWA: 0.05 (mg/m³) from OSHA (PEL) [United States] TWA: 0.03 (mg/m³) from NIOSH [United States] TWA: 0.05 (mg/m³) [Canada] Consult local authorities for acceptable exposure limits.

SECTION IX – PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point @ 760mm Hg:	N/A	Specific gravity (H₂O=1):	8.0 - 8.2
Melting Point:	1300 to 1320°C	Solubility in H₂O (g/L):	N/A
Vapor Pressure (mmHg):	N/A	Evaporation Rate:	N/A
% Volatiles by Volume:	N/A	Molecular Weight:	310 to 330
Appearance:	Yellow/Green/Brown	Odor:	Odorless

SECTION X – STABILITY AND REACTIVITY DATA

Reactivity:	NFPA Exis Rating = 1
Stability:	Stable to 1100°C
Conditions to Avoid:	Do not apply dry mechanical processing
Hazardous Decomposition Products:	Extremely high temperatures or fire may produce lead oxide, vapor.
Hazardous Polymerization:	N/A

SECTION XI – TOXICOLOGICAL INFORMATION

Routes of Entry: Absorbed through eye contact. Inhalation. Ingestion of the dust or powder.

Effects from Acute Overexposure: Lead intoxication will occur with accompanying symptoms of constipation, sleep disturbance, fatigue, headache, loss of appetite. Where inhalation is severe from heavy dusting or a large quantity is ingested and left untreated, colic, anemia, vomiting and neuritis will follow as evidenced by intense periodic cramps, aching bones and muscles, uncoordinated body movements. Worst-case situations could result in convulsions, stupor, coma, and encephalopathy. Niobium Pentoxide may be irritants to the mucus membranes and the skin.

Effects from Chronic Overexposure: Normal ingestion of lead from the ambient air, foods, and beverages occurs and the normal adult metabolism can eliminate the majority of this, but when lead ingested exceeds the body's ability to eliminate it, accumulation can reach the point where symptoms and disability occur. In this context, lead has a cumulative toxic effect.

Early effects of chronic overexposure to lead are difficult to detect, but symptoms include persistent fatigue, sleep disturbance, headache, aching bones and muscles, constipation, abdominal pains and loss of appetite. Prolonged ingestion may be associated with intense periodic cramps and constipation, nausea and vomiting. Excessive exposure may affect blood, nervous and digestive systems. Synthesis of hemoglobin is inhibited and can result in anemia. If left untreated, neuromuscular dysfunction, possible paralysis, and encephalopathy can result. Unusual occurrence of symptoms should prompt immediate contact of a physician. For industrial exposure, a worker's lead accumulation can be detected by an increase in blood lead above the base level established upon the employee's entry to the workplace.

Magnesium compounds may cause metal fume fever.

SECTION XII- ECOLOGICAL INFORMATION

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation: Possibly hazardous short-term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

SECTION XIII – DISPOSAL CONSIDERATIONS

Waste Disposal: Disposal of waste and hazardous material should be handled in a manner, which complies with local, state, and federal regulations. It is preferable to send waste material to an approved recycling facility. City, state, and federal regulations must be followed at all times.

SECTION XIV – TRANSPORT INFORMATION

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

SECTION XV – OTHER REGULATORY INFORMATION

Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Lead oxide, yellow
California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (female) which would require a warning under the statute: Lead oxide, yellow
California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (male) which would require a warning under the statute: Lead oxide, yellow
California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Lead oxide, yellow
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Lead oxide, yellow
Pennsylvania RTK: Lead oxide, yellow
Massachusetts RTK: Lead oxide, yellow
TSCA 8(b) inventory: Lead oxide, yellow
SARA 313 toxic chemical notification and release reporting: Lead oxide, yellow
CERCLA: Hazardous substances.: Lead oxide, yellow

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC): R36- Irritating to eyes. R40- Possible risks of irreversible effects.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment: Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

SECTION XVI - OTHER INFORMATION

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References: Not Available.

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Vendee and third persons assume the risk of injury proximately caused by the material if reasonable safety procedures are not followed as provided for in the data sheet, and vendor shall not be liable for injury to vendee or third persons proximately caused by abnormal use of the material even if reasonable safety procedures are followed.

All persons using this product, all persons working in an area where this product is used, and all persons handling this product should be familiar with contents of this data sheet. This information should be effectively communicated to employees and others who might come in contact with the product.

While the information accumulated and set forth herein is believed to be accurate as of the date hereof, TRS Ceramics, Inc. makes no warrant with respect thereto and disclaims all liability from reliance thereon. Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable for their particular circumstances.