SAFETY DATA SHEET

ALxxxx-RAM

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SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAMES:
A2024-RAM2, A2024-RAM2C, A6061-RAM2, A6061-RAM2C, A7050-RAM2, A2024-RAM5, A5083-RAM2, A5083-RAM5

MANUFACTURER: Elementum 3D
ADDRESS: 400 Young Ct, Unit 1, Erie, Colorado 80516 USA

EMERGENCY PHONE: Company Main: +1-720-545-9016 x31
Alternative: +1-303-775-4301

PRODUCT USAGE: Raw material for laser powder bed fusion additive manufacturing. For use in argon atmosphere only.
RESTRICTIONS: Use only as directed in certified reactive metals additive manufacturing system under argon atmosphere.

SECTION 2: HAZARDS IDENTIFICATION

HAZARD STATEMENT CODES:
Combustable Dust, Dust Explosion Class -1
Harm.-Swall. 4 H302 Harmful if Swallowed

SIGNAL WORD: WARNING

HAZARD STATEMENT: May form combustable dust concentrations in air. Harmful if swallowed.

Aluminum Alloy poyders are subject to the requirements of NFPA 484 "Standard for Combustible Metals". Follow all outlined housekeeping and handling statdards therein when dealing with Aluminum Allow Powders

PICTOGRAMS:

PRECAUTIONARY STATEMENT: Keep away from heat/sparks/flames/hot surfaces. No smoking. Use grounding to prevent electro-static discharge. Keep dry; may release small amounts of hydrogen gas on contact with water.

DESCRIPTION OF HAZARDS NOT OTHERWISE CLASSIFIED:

POTENTIAL HEALTH EFFECTS:

EYES: Dust may cause mechanical irritation and damage to tissues.
SKIN: Dust may cause mechanical irritation and damage to tissues.
INGESTION: May cause irritation of the digestive tract.
INHALATION: May cause respiratory irritation or damage. Inhalation of fumes may cause metal fume fever, cough, weakness, chest or muscle pain and increased white blood cell count.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Name	CAS Number	EC Number	Classification	% Weight
Aluminum	7429-90-5	231-072-3	Flam. Sol. 1. H228; Water-reac. 2. H261	70-95
Silicon	7440-21-3	231-130-8	Flam. Sol. 2.	0-2
Titanium	7440-32-6	231-142-3	Flam. Sol. 1. H228	0-16
Copper	7440-50-8	231-159-6	Flam. Sol. 1. H228; Aquatic Acute 1. H400; Aq. Chronic 3. H412	0-6
Magnesium	7439-95-4	231-104-6	Flam. Sol. 1. H228; Water-reac. 2. H261	0-6
Boron	7440-42-8	231-151-2	Acute Tox. 4; H302	0-6
Carbon	7440-44-0	231-153-3	Not hazardous	0-4
Vanadium	7440-62-2	231-171-1	Not hazardous	0-1
Manganese	7439-96-5	231-105-1	Water-reac. 1. H261; Aquatic Acute 3. H400; Aq. Chronic 3. H412	0-1

Composition may be in the form of alloys or compounds that may be less hazardous than elemental forms. The exact percentages of composition are withheld as a trade secret.

SECTION 4: FIRST AID MEASURES

EYES: Flush thoroughly with water for at lease 15 minutes. Remove contact lenses if present and continue flushing. Seek medical attention.

SKIN: Remove contaminated clothing. Wash thoroughly with soap and water. Seek medical attension if irritation develops.

INGESTION: Rinse mouth with water. Seek immediate medical attention.

INHALATION: Move away from source. Supply fresh air. If not breathing, provide artificial respiration. If breathing becomes difficult oxygen should be administered by a medical professional. Seek immediate medical attention.

SYMPTOMS: Acute symptoms may include difficulty breathing, coughing, and irritation. Delayed symptoms unknown.

SECTION 5: FIRE-FIGHTING MEASURES

EXTINGUISHING EQUIPMENT: Use Class D Fire Extinguisher (for metal powder fires) or dry sand. Do not use halogenated extinguishing agents, water, carbon dioxide, ABC powder, or foam.

SPECIFIC HAZARDS: Do not allow a dust cloud to be formed and avoid heat, flames, electrical sparks, and prevent static electricity discharge. Material may react with acids, bases, or water to form flammable hydrogen gas. Dust clouds, confined burning material, or burning material with water may present an explosive hazard.

PROTECTIVE EQUIPMENT: Wear full protective fire fighting ear including self contained breathing apparatus (SCBA) for protection against possible exposure.

COMBUSTION PRODUCTS: Primary combustion product is aluminum oxide and may also form other oxides including titanium oxide and copper oxide.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Releases hydrogen when exposed to water.

HAZARDOUS DECOMPOSITION PRODUCTS: Hydrogen gas may form and present an explosive hazard if exposed to water while burning.

FIRE FIGHTING MEASURES: Use Class “D” extinguisher or dry sand. Cover burning powder with sand or Class “D” agent and allow to burn itself out. Do not disturb until fully cooled. Do not use Class A, B, or C extinguishers, halogenated agents, or water.

SECTION 6: ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS: Wear personal protective clothing and equipment, see SECTION 8.

EMERGENCY PROCEDURES: Eliminate all sources of ignition. If dust cloud is formed, evacuate the area until fully settled.

CONTAINMENT METHODS AND MATERIALS: Eliminate all sources of ignition including static discharge. Do not use water or strong oxidizing materials.

CLEANUP PROCEDURES: Use full personal protective gear. Use shovel or brush and dustpan to transfer spilled powder to suitable labeled disposal container. A wet separater vacuum with ESD grounding protection certified for flammable powder metals may also be utilized for small spills if available. DO NOT USE any vacuum that is not certified for use with flammable metal powders as this may result in fire or explosion.

SECTION 7: HANDLING AND STORAGE

PRECAUTIONS FOR HANDLING: Keep away from ignition sources including heat, flame, or sparks. Use electrical grounding for personell and equipment to eliminate static discharge. Wear flame resistant protective clothing, protective lab gloves, eye and face protection, and particulate filtration mask. Ensure adequate ventilation. Avoid actions that may result in the material becoming airborn and forming a dust cloud. Use explosion proof equipment and non-sparking tools. Additive manufacturing process should be carried out under argon atmosphere only.

CONDITIONS FOR STORAGE: Store in accordance with all current regulations and standards. Store in closed air and humidity-tight containers away from sources of ignition including heat flame, or sparks. Store away from water or moisture. Keep separated from oxidizers, acids, bases, nitrates, alcohols, halogens, and water.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

COMPONENT EXPOSURE LIMITS:

Aluminum (CAS: 7429-90-5) (EC: 231-072-3)

ACGIH: 1 mg/m3 TWA (respirable fraction)
OSHA: 15 mg/m3 TWA (total dust); 5 mg/m3 TWA (respirable fraction)
NIOSH: 10 mg/m3 TWA (total dust); 5 mg/m3 TWA (respirable dust)

Titanium (7429-90-5)(EC: 231-142-3)

ACGIH: 1 mg/m3 TWA
OSHA: 15 mg/m3 TWA (total dust); 5 mg/m3 TWA
NIOSH: 10 mg/m3 TWA (total dust); 5 mg/m3 TWA

Copper (CAS: 7440-50-8)(EC: 231-159-6)
ACGIH: 1 mg/m3 TWA
OSHA: 1 mg/m3 TWA (total dust); 5 mg/m3 TWA
NIOSH: 1 mg/m3 TWA (total dust); 5 mg/m3 TWA

Manganese (CAS: 7439-96-5)(EC:231-105-1)
ACGIH: 0.2 mg/m3 TWA
OSHA: 5 mg/m3 TWA (total dust); 5 mg/m3 C
NIOSH: 1 mg/m3 TWA (total dust); 5 mg/m3 TWA

PROTECTIVE EQUIPMENT

RESPIRATORY PROTECTION: Wear a particulate face mask in case of dust formation.

EYE PROTECTION: Wear safety goggles or face shield.

HAND PROTECTION: Wear suitable protective gloves.

ESD PROTECTION: Wear electrically conducting or electrostatic dissipative (ESD) shoes with ESD floor mat or other suitable ESD grounding device. DO NOT USE electrical hazard (EH) (non conducting) footwear.

OTHER PROTECTIVE CLOTHING: Wear flame resistant workwear or lab coat.

WORK HYGIENIC PRACTICES: Wash hands and face after exposure. Do not smoke, drink or eat near the substance.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Metallic powder. Gray color.

ODOR: Odorless

PHYSICAL STATE: Solid.

MELTING POINT: Approximately 660 °C.

BOILING RANGE: 1091-3287 °C. Majority boils at approximately 2,470 °C.

AUTOIGNITION TEMPERATURE: Approximately 480 °C.

EXPLOSIVE PROPERTIES: May be explosive if dispersed into a dust cloud in air in the presense of an ignition source.

BULK DENSITY (UNCONSOLIDATED): Approximately 1.2 g/cm^3.

SOLUBILITY IN WATER: Insoulable but may slowly react to releasing flammable hydrogen gas.

MOLECULAR WEIGHT: N/A

SECTION 10: STABILITY AND REACTIVITY

REACTIVITY: May release flammable hydrogen gas when exposed to water. May react violently with strong oxidizers. Dust may burn in air if ignited.

CHEMICAL STABILITY: Stable product under recommended storage and handling conditions. Store in suitable sealed container away from ignition sources, water, and incompatable materials.

CONDITIONS TO AVOID (STABILITY): Avoid ignition sources, water and humidity, and incompatable materials.

INCOMPATIBILITY (MATERIAL TO AVOID): Water, acids, carbonates cyanides, chlorates, hydrocarbon, fulfate, oxidizers. React with acids to form hydrogen gas.

HAZARDOUS DECOMPOSITION OR BY-PRODUCTS: Hydrogen.

SECTION 11: TOXICOLOGICAL INFORMATION

TOXICOLOGICAL INFORMATION: No toxicological data available for this product.

SECTION 12: ECOLOGICAL INFORMATION

ECOLOGICAL INFORMATION: Do not empty into drains.

SECTION 13: DISPOSAL CONSIDERATIONS

WASTE DISPOSAL INFORMATION: Reuse or recycle product whenever possible. Material unfit for reuse may be sent to a metals recovery facility that is properly equipped to handle fnely divided materials. Material that cannot be reclaimed or recycled should be disposed of in accordance with applicable Federal, State, and local Regulations

SECTION 14: TRANSPORT INFORMATION

Hazard Class: N/A
UN Number: N/A
Packing Group: N/A

Note: Elementum 3D RAM-2 materials have been tested in accordance with the UN Model Regulations on the Transport of Dangerous Goods, Manual of Tests and Criteria and have been found to **NOT** meet the requirements for classification in Hazard Class 4, or any other Hazard Class, and will not be marked or described as Hazardous Materials.

SECTION 15: REGULATORY INFORMATION

National regulations:

US Federal Regulations:

SARA Section 302 Extremely Hazardous Substances Tier II Threshold Planning Quantities
The Following Ingredients are Listed: None Listed.

CERCLA/Superfund, Hazardous Substances/Reportable Quantities (EPA)
Contains Copper less than 100 um diameter.

SARA Extremely Hazardous Substances EPCRA Reportable Quantities
The Following Ingredients are Listed: None Listed.

SARA 313 Emission Reporting
The Following Ingredients are Listed: Aluminium, vanadium, copper, manganese

CAA Accidental Release Prevention
The Following Ingredients are Listed: None Listed.

OSHA Highly Hazardous Chemicals
The Following Ingredients are Listed: None Listed.

European Union Regulations:

REACH:
The following ingredients are listed as Substances of Very High Concern (SVHC): None listed.

SECTION 16: OTHER INFORMATION

OTHER INFORMATION: N/A

DISCLAIMER: ***The information contained in this document is accurate to the best of the manufacturer's knowledge. However, since circumstance such as application conditions, mishandling, misuse, or government regultions may change, the manufacturer makes no warranty, either expressed or implied, with respect to the expected performaces of this material. User should independently verify the accurancy of the information provided in this document.***