

MATERIAL SAFETY DATA SHEET

Complies with Approved Code of Practice: Chemical (Hazard Information and Packaging for Supply) Regulations 2002 (UK) and European 91/155/EEC, 67/548/EEC, 1999/45/EC format, and 2001/58/E, ANSI Standard Z400.1 and U.S. Federal OSHA Hazard Communication

Section 1. Identification of Chemical Substance and Company

- 1.1. **PRODUCTS IDENTIFICATION:** zp™130 powder
- 1.2. **USE OF SUBSTANCE:** Plaster powder for making rapid-prototyping 3D models.
- 1.3. **COMPANY:** Z Corporation
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Burlington, MA 01803
Contact Person: Manager of Technical Services
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119 Arthur Road, Windsor, Berkshire SL4 1Ru
Date of Preparation: 8/04 Revised: 10/04, 4/05
- 1.4. **EMERGENCY TELEPHONE:** 781-852-5005

Section 2. Composition/Information of Ingredients

Substance is a mixture with following general composition:

Component Classified As Dangerous (CHIP3)	Approximate % by weight	C.A.S. No. & EINECS No.	UK/EU Classification
1. Plaster which contains Crystalline Silica ¹ at <1%	50-95%	Trade Secret	None
2. Vinyl Polymer	2-20%	Trade Secret	Irritant Xi R 36/37/38
3. Sulfate Salt	0-5%	Trade Secret	S22 S24/25

Section 3. Hazard Identification

Potential Human Health Effects:

May cause irritation of the eyes, mucous membranes, and respiratory tract. May be harmful by inhalation or ingestion. Eye contact may cause mechanical abrasion with burning, tearing and redness. Ingestion may cause gastrointestinal disturbances such as upset stomach and intestinal irritation.

Target Organs or Systems:

Caution: May cause irritation to the eyes, skin, mucous membranes, upper respiratory tract. If ingested, toxic reactions due to bioaccumulation may occur.

¹ There is <0.1% respirable crystalline silica, no anticipated OSHA/TLV overexposure expected.

Route of Exposure:

Skin Contact: Repeated contact may dry the skin, causing cracking and dermatitis (rash). Sensitive individuals may develop an allergic dermatitis. When mixed with water, this material hardens and then slowly becomes hot. DO NOT attempt to make a cast enclosing any part of the body using this material. This can result in severe burns.

Eye Contact: May cause eye irritation.

Inhalation: May be harmful if inhaled. Material may be irritating to the mucous membranes and upper respiratory tract.

Ingestion: Toxic reactions due to bioaccumulation may occur. Inflammation of mouth, throat, esophagus and/or stomach.

Signs and Symptoms of Exposure:

Prolonged exposure can cause: Nausea, headache, and vomiting.

Acute:

May cause irritation of the eyes, skin, mucous membranes, and respiratory tract. May be harmful by inhalation, ingestion, or skin absorption.

CHRONIC:

Inhalation: Pre-existing upper respiratory and lung disease may be aggravated by exposure. Prolonged inhalation of dust may cause baritosis. Prolonged and repeated exposure to respirable crystalline silica can result in lung disease (i.e. silicosis) and/or lung cancer. The product does not contain detectable levels of respirable silica based on the plaster manufacturer's test data and the overall total weight of crystalline silica is less than 1% in the product. If the final models are sanded, ground or pulverized low levels of respirable dust may be generated that contain respirable fractions of silica. Thus the actual workplace exposure must be determined by workplace exposure testing.

Skin: Repeated contact may dry the skin, causing cracking and dermatitis (rash). Sensitive individuals may develop an allergic dermatitis. When mixed with water, this material hardens and then slowly becomes hot. DO NOT attempt to make a cast enclosing any part of the body using this material. This can result in severe burns.

Carcinogens Under OSHA, ACGIH, NTP, IARC, OTHER:

This product contains less than 1% by weight of crystalline silica and there is less than 0.1% respirable crystalline silica. Only the respirable fraction of crystalline silica is specifically regulated by OSHA. Respirable silica is listed as cancer agent by ACGIH, IARC as Group 1 and NTP as human carcinogen. All other ingredients in this product contain no carcinogens in concentrations of 0.1 percent or greater based on U.S. and European chemical data base information.

Potential Environmental Effects:

No significant environmental hazard are expected if material is released to the environment.

Section 4. Emergency First Aid**Inhalation:**

Remove from area to fresh air. Seek medical attention if respiratory irritation develops or if breathing becomes difficult.

Eye Contact:

Immediately flush eyes with copious amounts of water for at least 15 minutes. Call physician if irritation continues.

Skin Contact:

Immediately wash skin with soap and rinse with large amounts of water. Remove and wash contaminated clothing promptly. If skin has become cracked, take appropriate action to prevent infection and promote healing.

Ingestion:

Wash out mouth with water provided the person is conscious and seek medical attention. Plaster hardens when wetted and, if ingested, may result in obstruction.

Section 5. Fire and Explosion Hazard

Flash point (Method Used)	Flammable limits	LEL	UEL
	Not Applicable	Not Applicable	Not Applicable

Product is a combustible powder:

Minimum Ignition Energy (ASTM E 2019): 5kJ <MIE <10kJ

Dust Cloud Minimum Explosible Concentration (ASTM E 1515): N/A

Extinguishing Media:

Water spray do not use solid stream of water or Class AB fire extinguisher

If unconfined, ignition of the powder will give rise to a Class A fire. In case of fire use water streams.

Special Fire Fighting Procedures

As with all fires, fire fighters should wear full protective gear including supplied air respirators.

Unusual Fire & Explosion:

Emits toxic fumes under fire conditions. Fine dusts with oxygen or air can be explosive – keep away from open flame. Avoid conditions which produce dust.

Exposure Hazard(s): Material: Irritant

Section 6. Accidental Release Measures

Procedures of Personal Precautions:

Wear respirator, chemical safety goggles, and chemical gloves.

Environmental Precautions:

This material poses no significant environmental hazards; however, it is important to minimize contamination of sewage water, soil, groundwater, drainage systems, or bodies of water. Surfaces subject to spills or dusting with this product can become slippery when wet, use care to avoid falls.

Methods of Cleaning Up:

Sweep or vacuum material from spillage into a waste container for disposal. Avoid production of dust. Do not flush down drains. Place in closed containers. Ventilate area and wash spill site after material pickup is complete.

Waste Disposal Method:

Follow safe solid waste disposal guidelines in accordance with federal, state and local regulations. National or regional provisions may also be in force.

Section 7. Storage and Handling

Handling Precautions:

User Exposure: Avoid handling procedures which produce high levels of dust. Use mechanical ventilation to prevent dust generation. If dust collection systems are used they may need to be provided with explosion venting and automatic fire protection as recommended in NFPA 68-1994 Guide for Explosion Venting.

Storage Precautions:

Suitable: Store product in a cool, dry, ventilated area away from sources of heat, moisture, strong oxidizing materials and explosives. Keep containers tightly closed.

Special Requirements:

Under planned use this product should not result in excessive dust or hazards to the user following the recommended processes for creating prototype models.

Section 8. Exposure Controls & Personal Protection

Exposure Limit Values:

The European Member States have different standards for the components in this preparation. These powders are potentially irritant dusts with general exposure standard of 10 mg/m³. Particulates not otherwise classified (total dust) in Germany are 6 mg/ m³, and 10 mg/m³ in other European Countries. The respirable dust levels are 5 mg/ m³.

Component	IOELVs (UK)	EC OEL	ACGIH TLV	OSHA PEL
1. Plaster which contains Crystalline Silica ² at <1%	6 mg/m ³ R 0.3 mg/m ³ total 0.1 mg/m ³ R	10 mg/m ³	10 mg/m ³ Inhalable 3 mg/m ³ R Respirable Dust = 10 mg/m ³ / % Silica + 2	15 mg/m ³ Total 5 mg/m ³ Respirable Respirable Dust = 10 mg/m ³ / % Silica + 2
2. Vinyl Polymer	General Dust 4 mg/m ³ Inhalable 1.5 mg/ m ³ R	10 mg/m ³	10 mg/m ³ Inhalable 3 mg/m ³ R	15 mg/m ³ Total 5 mg/m ³ R
3. Sulfate Salt	General Dust 4 mg/m ³ Inhalable 1.5 mg/ m ³ R	10 mg/m ³	10 mg/m ³ Inhalable 3 mg/m ³ R	15 mg/m ³ Total 5 mg/m ³ R

Notations:

IOELVs = Indicative Occupational Exposure Limit Values

OEL = Occupational Exposure Limits

TLV = Threshold Limit Value

R = Respirable

TWA = time weighted average

PEL = Permissible Exposure Limit

STEL = short term exposure limit

Exposure Controls:**Ventilation Controls:**

Mechanical ventilation needs to be adequate to handle low levels of dust when adding product or there is a spill.

Respiratory Protection:

Respirators are generally not needed under normal conditions of use. If dust levels exceed the exposure limits use an approved dust respirator of at least an N95 (NIOSH) approval. The actual workplace exposure to dust and crystalline silica should be determined by workplace exposure testing if the final product is sanded, ground, or pulverized. If there are overexposures to respirable silica an N100 respirator filter should be used along with proper engineering controls. In Europe the respirator must be CE-marked and filter FFP3 is for high efficiency.

Protective Gloves:

Avoid skin contact by use of neoprene, butyl, PVC-coated or like type chemical resistant gloves for dust exposure.

Eye Protection:

Safety goggles for dust are recommended during powder additions and cleaning.

Skin Protection:

Special skin protection is not routinely needed when using the product. If clothing becomes contaminated wash contaminated clothing before reuse.

Other Controls:

Safety shower and eyewash. Wash contaminated clothing before reuse. Always use good personal hygiene and housekeeping practices to minimize dust exposures. Wash thoroughly after handling.

Environmental Exposure Controls:

² There is <0.1% respirable crystalline silica, no anticipated OSHA/TLV overexposure expected.

This product is not known to chemical components requiring specific environmental exposure controls. Specific environmental requirements, however do vary and each user needs to follow local Community environmental protection requirements.

Section 9. Physical & Chemical Properties

Appearance: Powder	VOC by Weight = 0% (EPA Method 24)
Boiling Point (F°): Not applicable (NA)	Spec Gravity (H ₂ O = 1): 1.3 - 3.0
Vapor Pressure (MM Hg): NA	Color: White/Off-White Powder
Vapor Density (air = 1): NA	Odour: Slight odour
pH: 4 - 8 (aqueous solution)	Clarity: NA
Melting Point: Minimum 1450 ⁰ C	Solubility: 0.67 to 0.88 g/100 g solution
Flash Point: NA	Solubility Fat: NA
Flammability (soild, gas): Combustible Dust	Evaporation Rate: NA
Explosive Properties: NA	Partition coefficient: n octanol/water: NA
Oxidizing Properties: NA	Density: Not known
Bulk Density: NA	Viscosity: Not Determined
Water/Oil Distribution: NA	

Section 10. Stability and Reactivity

Stability:

Stable: Stable in dry environments. Dew point conditions or other conditions causing presence of liquid will harden the material.

Conditions to Avoid: Store in cool place

Materials to Avoid: Incompatible: Acids, strong oxidizing agents, phosphorous, water, high humidity.

Hazardous Decomposition Products: Aldehydes, carbon monoxide, carbon dioxide, sulfur oxides, and aluminum oxide. Temperatures above 1450⁰C calcium oxide and sulfur dioxide. Irritating and toxic fumes at elevated temperatures.

Hazardous Polymerization: Will not occur

Section 11. Toxicological Information

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated for the mixture. The following is for the product components.

1. Plaster:

The sulfate ion has caused gastro-intestinal disturbance in humans following large oral doses.

Limited studies involving the repeated inhalation of an (unspecified) calcium sulfate failed to identify any particular target organs in monkeys, rats and hamsters

No evidence of mutagenicity was found in Ames bacterial tests.

Oral LD50 rate > 5000 mg/kg

Dermal LD50 – nNone Determined

Skin Irritation LD50 – None Determined

Eye Irritation LD50 – None Determined

Plaster has <1% Crystalline Silica as total weight and exposures to any hazardous levels of respirable silica are not anticipated. The following information is based on silica toxicology information not the hazard of this product. **Crystalline silica:** Prolonged and repeated exposure to airborne free respirable crystalline silica can result in lung disease (i.e., silicosis) and/or lung cancer. The development of silicosis may increase the risks of additional health effects. The risk of developing silicosis is dependent upon the exposure intensity and duration. In June, 1997, IARC classified crystalline silica (quartz and cristobalite) as a human carcinogen. In making the overall evaluation, the IARC Working Group noted that

carcinogenicity in humans was not detected in all industrial circumstances studied. Carcinogenicity may be dependent on inherent characteristics of the crystalline silica or on external factors affecting its biological activity or distribution of its polymorphs. IARC states that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1).

2. Vinyl Polymer:

Acute Toxicity Effects Data: Oral LD50 (rat) 23,854 mg/kg

Dermal LD50 (rabbit): >7,490 mg/kg,

Inhalation LC50 (rat): 64,000 ppm/4 hr.

Oral-Mouse LD50: 14,270 mg/kg

Oral-Guinea Pig, adult LD50: 18,750 mg/kg

IARC Cancer Review: Group 3 IMEMDT 7,56,87; Animal Limited Evidence IMEMDT 19,341,79; Human Inadequate Evidence IMEMDT 19,341,79.

3. Sulfate Salt:

Oral-Woman LDLo: 750 mg/kg

Remarks: Behavioral: Convulsions or effect on seizure threshold. Lungs, Thorax, or Respiration: other changes. Gastrointestinal: Hypermotility, diarrhea.

Oral-Rat LD50: 6600 mg/kg

Section 12. Ecological Information

1. Plaster: No data

2. Vinyl Polymer:

LC50 Bluegill sunfish (*Lepomis macrochirus*): >10,000 mg/L 96 hour

LC50 Cerio Daphnia: 7.9 g/L 48 hour

LC50 Fathead Minnows: >40 g/L 96 hour

LC50 Daphnia magna: 8300 mg/L 96 hour

Mobility: Vinyl Polymer (2): Chemical oxygen demand (COD): 1800 mg/g

Persistence and degradability Vinyl Polymer (2):

Biochemical oxygen demand: BOD5 = 0-5%; BOD30 = 100%

Bioaccumulation potential: Vinyl Polymer (2) Biodegradability: >90% (Zahn-Wellens Test)

Other adverse effects: No other data available to address these issues.

3. Sulfate Salt:

Aquatic Toxicity

Alburnus alburnus (Fish, estuary): 96 hours LC50 = 1692444 ug/l

Alburnus alburnis (Fish, estuary): 96 hours LC50 = 2380000 ug/l

Lepomis macrochirus (Fish, fresh water): 96 hours LC50 = 653-796 mg/l

Lepomis macrochirus (Fish, fresh water): 96 hours Mortal = 869 ppm

Lepomis sp.: 96 hours TLm = 3550 ppm

Section 13. Disposal Considerations

Follow safe solid waste disposal guidelines in accordance with governmental regulations (community, national or regional). Contact a licensed professional waste disposal service to dispose of this mixture. As with all foreign substances do not allow to enter the storm drainage systems. Material may be dissolved or mixed with a combustible solvent and burned in a chemical incinerator equipped with an afterburner and scrubber if approved by the governmental authority.

Section 14. Transportation Information

This is not a regulated material for transportation

Section 15. Regulatory Information

The following provides a summary of the legal requirements.

Ingredient	EPA TSCA	CA Prop 65	European Economic Community (EEC)				Canada Regs	
			EINECS	European Community Standards	Listed as dangerous chemicals	EEC Symbol	DSL	NPRI
(1) Plaster	Yes	Yes	Yes	Nuisance dust 6 to 10 mg/m ³	No	Irritant (Xi)	Yes	1406
(2) Vinyl Polymer	Yes	No	Yes	Nuisance dust 6 to 10 mg/m ³	R 36/37/38 S2/7/24/25/26/36	Irritant (Xi)	Yes	No
(3) Sulfate Salt	Yes	No	Yes	Nuisance dust 6 to 10 mg/m ³	S22 S24/25	Irritant (Xi)	Yes	No

DSL = Canadian Domestic Substance List

NPRI = National Pollutant Release Inventory

Relevant European R and S phrases: **Irritant Mixture Xi**



Risk Phases:

R36/37/38: Irritating to the eyes, respiratory system, and skin.

Safety Phases:

S2: Keep out of reach of children

S7: Keep container tightly closed

S24/25: Avoid contact with skin and eyes.

S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S36: Wear suitable personal protective equipment.

Pursuant to Title III of the Superfund Amendments and Reauthorization Act of 1986, (SARA) and 40 CFR 372 Part 372, this product does contain any chemicals subject to the reporting requirements under Section 313.

This product does not contain chemicals subject to the reporting requirements under the Canadian National Pollutant Release Inventory (NPRI).

California Proposition 65: This product contains trace amounts of crystalline silica in raw product which are known to the state of California to cause cancer.

Section 16. Other Information

HMIS (Hazardous Materials Information System) for secondary labeling:

Health 1*

Fire Hazard 1

Reactivity 1

Personal Protective Equipment B

*additional chronic hazards present

Reason for Revision: 10/04 Revision: To conform with UK CHIP 3 and EPA Method 24

4/05 Revision: to update based on removal of two compounds: Cellulose and one of the Sulfate compounds from the mixture – no new chemicals compounds were added.

References

- 1) 2004 Threshold Limit Values and Biological Exposure Indices. American Conference of Governmental Industrial Hygienists.
- 2) Chemical (Hazard Information and Packaging for Supply) Regulation 2002 (UK).
- 3) MSDS + Cheminfo (2001-1) CD-ROM expires 6/05, Canadian Centre for Occupational Health and Safety.
- 4) SAX'S Dangerous Properties of Industrial Materials, Eleventh Edition.
- 5) TSCA & SARA Title III, CD-ROM, January 2005 Version 11.1 Produced by the U.S. Environmental Protection Agency and the National Technical Information Services.
- 7) Raw Material Manufacturers Material Safety Data Sheets.
- 8) US National Institute of Medicines Toxnet current 2005.

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