MATERIAL SAFETY DATA SHEET

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND OF THE COMPANY / UNDERTAKING

Product Name: Zircon powder, flour, sand, FasShell™ zircon CS & ES

Manufacturer: Ransom & Randolph
Address: 3535 Briarfield Boulevard
Maumee, Ohio 43537, United States of America

Information Telephone Number: (419) 865-9497
Emergency Telephone Number: (419) 865-9497

Product Use: Investment casting

Date of Last Revision: July 24, 2009

MSDS Number: 391

SECTION 2 COMPOSITION INFORMATION ON INGREDIENTS

Ingredient	CAS No./EINECS No.	Percent (by wt)	EC Substance Classification (67/548/EEC)
Zirconium silicate	14940-68-2 / 239-019-6	96-97 %	Not Applicable
Aluminum silicate	1302-76-7 / 215-106-4	Less than 2.0 %	Not Applicable
Crystalline Silica Quartz	14808-60-7 / 238-878-4	Less than 0.2 %	Xn R48/20

See Section 16 for further information on EU Classification.

SECTION 3 HAZARDS IDENTIFICATION

Emergency Overview: May cause eye irritation. Inhalation of dust may cause mucous membrane and respiratory irritation. Prolonged overexposure to respirable crystalline silica may cause lung disease (silicosis) and increase the risk of lung cancer. Risk of cancer depends on duration and level of exposure. This material contains trace amounts of naturally occurring uranium, thorium, and radium.

EU Preparation Classification (1999/45/EC): Not classified as dangerous.

SECTION 4 FIRST AID MEASURES

Eye Contact: Flush eyes with large quantities of water for 15 minutes, holding the eyelids apart. Get medical attention if irritation develops and persists.
Skin Contact: No first aid is generally required. Wash skin with soap and water after use.
Ingestion: Get immediate medical attention. May cause gastrointestinal discomfort and intestinal blockage. If swallowed, drink 1 or 2 glasses of water to dilute. Never give anything by mouth to an unconscious or convulsing person.
Inhalation: Remove victim to fresh air. If irritation or other symptoms persist, get medical attention.

SECTION 5 FIRE FIGHTING PROCEDURES

Extinguishing Media: Use media appropriate to the surrounding fire.
Firefighting Procedures: Firefighters should wear full emergency equipment and NIOSH approved positive pressure self-contained breathing apparatus in fires involving chemicals.
Unusual Fire/Explosion Hazards: None known.
Known or Anticipated Hazardous Products of Combustion: Thermal decomposition may generate oxides of phosphorus and carbon along with metallic oxides.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Accidental Release Measures: Wear appropriate protective clothing as described in Section 8. Collect using dustless method (HEPA vacuum or wet method) and place in appropriate container for use. Do not use compressed air. Report releases as required by local, state and federal authorities.

Personal Precautions: Avoid contact with eyes and skin. Do not breathe dust.

Environmental Precautions: None known.

SECTION 7 HANDLING AND STORAGE

Handling: Avoid contact with the eyes and skin. Do not breathe dust. Wear protective clothing and equipment as described in Section 8. Use with adequate ventilation and proper dust collection methods to keep exposure level below occupational exposure limits. Wash thoroughly with soap and water after handling. Keep containers closed when not in use.

Storage: Store in a cool, dry, well ventilated area away from incompatible materials. Protect from physical damage.

SECTION 8 EXPOSURE CONTROL / PERSONAL PROTECTION

Occupational Exposure Limits:

Crystalline Silica, Quartz	10 mg/m^3 TWA PEL (respirable fraction) % Silica + 2 0.025 mg/m3 TWA TLV (respirable fraction) 0.3 mg/m3 TWA UK WEL
Zirconium silicate	10 mg/m^3 STEL ACGIH (respirable fraction) 5 mg/m^3 TWA OSHA PEL (respirable fraction)
Aluminum Silicate	5 mg/m^3 TWA OSHA PEL (respirable fraction) 15 mg/m^3 TWA OSHA PEL (total dust) 1 mg/m3 TWA ACGIH (respirable) (as Al) 1.5 mg/m3 TWA DFG MAK (respirable fraction) 4 mg/m3 TWA DFG MAK (total dust)

Engineering Controls: Use with adequate local exhaust ventilation to maintain exposures below the occupational exposure limits.
Personal Protective Equipment:
Eye Protection: Safety glasses or goggles if needed to avoid eye contact
Skin Protection: Wear rubber or other impervious gloves to avoid prolonged or repeated contact.
Respiratory Protection: If the exposure limits are exceeded, an approved particulate respirator appropriate for the form and concentration of the contaminants should be used. Selection and use of respiratory equipment must be in accordance with applicable regulations and good industrial hygiene practice.
Other Protective Clothing or Equipment: Impervious clothing as needed to avoid contamination of personal clothing.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance and Odor: White or tan free flowing powder with little to no odor.

Boiling Point: Not available
Freezing Point: Not available
Solubility in Water: insoluble
Vapor Pressure (mmHg): Not available
Evaporation Rate: None
% Volatile by Volume: Not available
Flammable Limits in Air:
LEL: Not applicable
UEL: Not applicable

Melting Point: Not available
Specific Gravity: 4.7
pH: Not applicable
Vapor Density: Not applicable
Viscosity: Not applicable
Flashpoint: Not flammable
Autoignition Temperature: Not applicable

SECTION 10 STABILITY AND REACTIVITY

Stability: Stable
Conditions to Avoid: Contact with water or high humidity.
Incompatibility with Other Materials: Avoid oxidizing agents and acids.
Hazardous Decomposition Products: Crystalline silica will dissolve in hydrofluoric acid and produce silicone tetrafluoride. Reaction with water or acids generates heat. Thermal decomposition (above 1450°C) may generate calcium oxide and sulfur dioxide. Zircon sand will disassociate to Zirconium Dioxide (ZRO_2) and Silicon dioxide (SiO_2) when heated above1540 degrees Celsius.
Hazardous Polymerization: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

Potential Health Effects:
Eyes: Contact may cause mechanical irritation and possible injury.
Skin: May cause rough and grainy inflammation of skin.
Ingestion: No adverse effects expected for normal, incidental ingestion. Large amounts may cause gastrointestinal irritation and blockage.
Inhalation: Inhalation of dust may cause irritation to the nose, throat and upper respiratory tract with coughing and shortness of breath.

Chronic Health Effects: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling and sometimes fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness and reduced pulmonary function. This product contains trace quantities of naturally occurring radioactive uranium, thorium and radium (106-120 Picocuries/gram). Overexposure to respirable dust containing radioactive materials may cause lung cancer. Zirconium silicate is exempt from NRC regulations for source material per 10 CFR 40, since it falls under the definition of material containing less than 0.05% uranium or thorium. However, calculations show that observance of 2-2.8 mg/m3 of respirable dust will, under voluntary guidelines, ensure that intake is less than 10% of the annual limits on intake (ALS) specified in 10 CFR 20.1502(B) and NRC Standards for the protection against radiation for uranium, thorium, radium and radioactive daughter decay products.).
Carcinogenicity: Crystalline silica quartz is listed as “Carcinogenic to Humans” (Group 1) by IARC and “Known to be a Human Carcinogen" by NTP.

Medical Conditions Aggravated by Exposure: Individuals with pre-existing skin and respiratory disorders may be at increased risk from exposure.

Acute Toxicity Data:

Crystalline Silica (as Quartz):	Oral Rat LD50 - >22,500 mg/kg.
Zirconium silicate:	No data available
Aluminum Silicate:	No data available

SECTION 12 ECOLOGICAL INFORMATION

Crystalline Silica (as Quartz):	72 hr LC50 carp: >10,000 mg/L
Zirconium silicate:	No data available
Mono-magnesium phosphate:	No data available
Aluminum Silicate:	No data available

SECTION 13 DISPOSAL CONSIDERATIONS

Dispose in accordance with federal, state, and local regulations.

SECTION 14 TRANSPORT INFORMATION

DOT Shipping Name: Not Regulated
DOT Hazard Class: N/A
UN Number: N/A
DOT Labels Required (49CFR172.101): N/A

IATA Shipping Name: Not Regulated
IATA Hazard Class: N/A
UN Number: N/A
IATA Hazard Labels Required: N/A

IMDG Shipping Name: Not Regulated
IMDG Class: N/A
UN Number: N/A
IMDG Label: N/A

SECTION 15 REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS:

CERCLA 103 Reportable Quantity: This product is not subject to CERCLA reporting requirements. Many states have more stringent release reporting requirements. Report spills required under federal, state and local regulations.

SARA TITLE III:
Hazard Category For Section 311/312: Chronic health, Acute health

Section 313 Toxic Chemicals: This product contains the following chemicals subject to Annual Release Reporting Requirements Under SARA Title III, Section 313 (40 CFR 372): None

Section 302 Extremely Hazardous Substances (TPQ): None

EPA Toxic Substances Control Act (TSCA) Status: All of the components of this product are listed on the TSCA inventory.

U.S. STATE REGULATIONS

California Proposition 65: This product contains the following substances known to the State of California to cause cancer: Crystalline Silica as Quartz (<0.02 %)

INTERNATIONAL REGULATIONS:

Canadian Environmental Protection Act: All of the components in this product are listed on the Domestic Substances List (DSL).

Canadian WHMIS Classification: Class D Division 2A (quartz) and Class D Division 2B

European Community Labeling:

Harmful

Contains Crystalline Silica (Quartz)
R48/20 Harmful: danger of serious damage to health by prolonged exposure through inhalation.
S22 Do not breathe dust.
S38 In case of insufficient ventilation, wear suitable respiratory equipment.

European Inventory of New and Existing Chemicals Substances (EINECS): All of the components in this product are listed on the EINECS inventory.

Australian Inventory of Chemical Substances: All of the components in this product are listed on the AICS for Australia.

China Inventory of Existing Chemicals and Chemical Substances: All of the components in this product are listed on the IECSC for China.

Japanese Existing and New Chemical Substances: All of the components in this product are listed on the Japanese ENCS list.

Korean Existing Chemicals List: All of the components in this product are listed on the KECL for Korea.

Philippine Inventory of Chemicals and Chemical Substances: All of the components in this product are listed on the PICCS.

SECTION 16 OTHER INFORMATION

HMIS Hazard Rating:
Health –1* Fire Hazard – 0 Reactivity – 0
*Chronic Health Hazard

EU Classes and Risk Phrases for Reference (See Sections 2 and 3):
Xn Harmful
R48/20 Harmful: danger of serious damage to health by prolonged exposure through inhalation.