1 IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND COMPANY

1.1 Identification of the substance or preparation:
Commercial product name: Zirconium dioxide
Manufacture/distributor: UCM Zirconia Inc.
Identification number: 95ZC

1.2 Use of substance / preparation
Identified uses: Refractories, Abrasives and Ceramics

1.3 Company/manufacturer: UCM Zirconia Inc.
Manufacturer/distributor: UCM Zirconia Inc.
PB No./street: 109 Coile Street PO Box 1240
State postal code/city: Greeneville Tennessee 37744
Country: USA
Telephone: 001 423 787 0333
Telefax: 001 423 787 0775
Email: rick.hawk@ucm-zirconia.com

1.4 Emergency Information:
Department responsible for information: Technical/Quality

2 HAZARDS IDENTIFICATION

Critical hazards to man and environment
Classification EC 1272/2008(CLP) Not classified as hazardous goods
EC 67/548/EEC or 1999/45/EC: No Hazards characteristics,
No R- or H-Phrases

3 COMPOSITION / INFORMATION ON INGREDIENTS

Chemical characterization (substance): ZrO₂ 92-96 %, *CaO 3-6 %,* HfO₂ 1-2 %,
*others < 1%
*in combined state with Zirconium dioxide

Definition acc. to EC directive (EINECS No): Zirconium dioxide 215-227-2,
Calcium oxide 215-171-9
Hafnium dioxide 235-013-2

CAS No.: ZrO₂ 1314-23-4,
CaO 1305-78-8
HfO₂ 12055-23-1

REACH Reg. No.: 01-2119486976-14-0003
4 FIRST AID MEASURES

4.1 Inhalation: -------------------------------------------- Move to fresh air, Consult a physician if necessary
4.2 Skin contact: ------------------------------------------ Mechanical (dry) removal. Subsequent rinsing with water.
4.3 Eye contact: ------------------------------------------- Flush with plenty of water. Seek medical advice if irritation persists
4.4 Ingestion: --------------------------------------------- Rinse out mouth and give water to drink. Seek medical advice.

5 FIRE FIGHTING MEASURES

5.1 Suitable extinguishing media:--------------------------- Not flammable. Use extinguishing measures appropriate to the source of the fire
5.2 Extinguishing media which must not be used for safety reasons: None known
5.3 Special exposure hazards arising from the substance itself, combustion products, resulting gases: Product is not an explosion hazard. May be capable of spark generation during attrition or impact (not applicable in fine powder form).
5.4 Special protective equipment:--------------------------- Not applicable

6 ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions:------------------------------------ Avoid dust formation. In case of exposure to high levels of airborne dust, wear personal protective equipment (see also item 8)
6.2 Environmental precautions:------------------------------- No special measures required
6.3 Methods for cleaning up:------------------------------- Pick up mechanically and dispose of in accordance to regulations
7 HANDLING AND STORAGE

7.1 Handling:
- Precautions for safe handling: Avoid dust formation
- Precautions against fire and explosion: No danger of fire and dust explosion

7.2 Storage:
- Conditions of storage rooms and vessels: No special precautionary measures
- Advice of storage of incompatible materials: None

8 EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Exposure limit values: Not applicable

8.1.1 Components with specific control parameters as limit values:
- Observe the local bye laws in terms of fine dust (e.g.: ACGIH-TWA value 10 mg/m$^3$)

8.2 Exposure controls

8.2.1 Occupational exposure controls:
- Respiratory protection: Avoid inhaling the dust
- Hand protection: Protective gloves are recommended
- Eye protection: Safety glasses are recommended
- General protection and hygiene measures: Observe standard industrial hygiene practice

8.2.2 Environmental exposure controls
No special exposure controls required
9 PHYSICAL AND CHEMICAL PROPERTIES

9.1 Appearance:
Form: ................................................................. Grains, powder
Colour: ............................................................... White/Yellow/Orange/Grey
Odour: ............................................................... Odourless

9.2 Safety relevant basic parameters:
Change in physical state: ........................................ melting point approx. 2500°C
........................................................................ boiling approx. 3800°C
Flash point: ......................................................... Not applicable
Flammability: ...................................................... Not flammable
Ignition temperature: .......................................... Not applicable
Auto flammability: .............................................. Not auto flammable
Oxidizing properties: .......................................... Not applicable
Explosive properties: .......................................... Not applicable
Explosive limits: ................................................ Not applicable
Vapour pressure: ................................................ Not applicable
Specific gravity: ................................................ (5-6) g/cm³
Bulk density: ...................................................... (500-4000) kg/m³
Solubility in water: ............................................. Practically insoluble,
pH value: .......................................................... Not applicable
Partition coefficient n-octanol/water: ................. Not applicable

10 STABILITY AND REACTIVITY

10.1 Conditions to avoid: ........................................ None
10.2 Materials to avoid: .......................................... None
10.3 Hazardous decomposition products: ............ The material is stable, no hazardous
 reactions known
Calcia stabilised Zirconia (ZrO₂, CaO)

11 TOXICOLOGICAL INFORMATION

11.1 Toxic kinetics: ................................................. No bio accumulating potential

11.2 Acute effects/toxicity tests)
oral: ............................................................. Not applicable. Not a relevant exposure route
Dermal: .......................................................... Not applicable
Inhalation: ..................................................... Not applicable
Skin corrosion: ............................................. Not corrosive
Skin irritation: ............................................. Not irritating
Eye irritation: ............................................. Not irritating
Sensitisation: ............................................... Not sensitising
Repeated dose Toxicity: ................................ Not applicable. Not a relevant exposure route.
Oral: .............................................................
Inhalation: ..................................................... Not applicable. Not a relevant exposure route.
CMR effects: .................................................. There is no evidence of any CMR effects

12 ECOLOGICAL INFORMATION

12.1 Ecotoxicity: .................................................. No harmful effects on water organisms anticipated. The substance is highly insoluble in water.

12.2 Mobility - distribution to terrestrial compartments: Not applicable

12.3 Persistence and degradability: ............................. Chemically inert and insoluble in water. Separation by mechanical processes (sedimentation, filtration etc.)

12.4 Results of PBT assessment: ............................... Zirconium oxide is not a PBT substance.

12.5 Other adverse effects None

13 DISPOSAL CONSIDERATIONS

13.1 Appropriate disposal: ................................. Reuse or recycle when possible. Can be stored with domestic waste. Observe local bye-laws

13.2 Contaminated packaging: .............................. Packaging has to be emptied entirely. Recycling of used packaging is recommended. Local bye-laws must be observed
# TRANSPORT INFORMATION

### 14.1 Land transport:
- GGVS / ADR - classification: Not classified as hazardous material
- GGVE / RID: Not classified as hazardous material

### 14.2 Inland waterways:
- GGVBisch / ADNR - classification: Not classified as hazardous material

### 14.3 Maritime transport:
- GGVSee / IMDG - classification: Not classified as hazardous material

### 14.4 Air transport:
- ICAO-TI / IATA - classification: Not classified as hazardous material

# REGULATORY INFORMATION

### 15.1 Classification according to EC guidelines:
- Labelling EC No 1272/2008: The product is not classified. No hazard symbol is necessary.
- Labelling (67/548/EEC or 1999/45/EC) Hazard symbols: None

### 15.2 National regulations:
- e.g.: (Germany) Classification according VbF: Not subjected to VbF
- Water Pollution Category: Not water polluting (VwVwS (Germany) dated 27.07.2005, enclosure 1)
16 OTHER INFORMATION

16.1 Relevant R- and H-Phrases: None

Zirconium Dioxide is a non-toxic, inert material, but does exhibit a very low level of natural radioactivity. UCM Advanced Ceramics GmbH products are not notifiable under the Ionising Radiation Regulations 1985 (typically 36 Bq/g compared to registration level of 100 Bq/g) except for dusty operations where the appropriate regulatory authority recommendations must be observed. Zirconium Dioxide powders containing lower levels of natural radioactivity are available; these conform to the U.S. Food and Drug Administration limit of 100 ppm of U + Th (typical values in product 25 ppm).

This information covers the safety requirements of the product(s) exclusively and is based on current knowledge and experience. It does not represent a guarantee for properties of the described product(s) in terms of the legal warranty regulations.

The product specification is contained in a separate product data sheet.

16.2 Issuer of MSDS UCM Zirconia Inc. Tech. Center

16.3 Annex Exposure Scenarios

As a result of the hazard assessment and PBT/vPvB assessment it is found that the Substance Zirconium Dioxide (CAS# 1314-23-4) does not meet the criteria for classification as hazardous (according to the directives 67/548/EEC and 1272/2008/EC) nor it is considered to be a PBT/vPvB. An exposure assessment and the subsequent step of risk characterisation are not required.