SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier
· Trade name: Yttria Stabilized Zirconia

1.2 Relevant identified uses of the substance or mixture and uses advised against
No further relevant information available.

1.3 Details of the supplier of the substance or mixture
· Application of the substance/mixture Powder coating material
· Manufacturer/Supplier: Saint Gobain Coating Solutions
  One New Bond Street
  Worcester, MA 01615-0137
  (508) 795-5000
  CeramicMaterials@saint-gobain.com
· Emergency telephone number: CHEMTREC 1-800-424-9300 (US/Canada) +01 703-527-3887 (International)

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture
· Classification according to Regulation (EC) No 1272/2008
  The product is not classified as hazardous according to OSHA GHS regulations within the United States.
  The product is not classified as hazardous according to the CLP regulation.

  Additional information:
  Not hazardous as delivered. Long term inhalation of product dusts formed during use is harmful.
  There are no other hazards not otherwise classified that have been identified.
  0 % of the mixture consists of component(s) of unknown toxicity.

2.2 Label elements
· Labelling according to Regulation (EC) No 1272/2008
  This product does not have a classification according to the CLP regulation.
  The product is not classified as hazardous according to OSHA GHS regulations within the United States.
  Hazard pictograms Not Regulated
  Signal word Not Regulated
  Hazard-determining components of labelling: None.
  Hazard statements Not Regulated
  Precautionary statements Not Regulated
  Additional information:
  Safety data sheet available on request.

(Cont'd. on page 2)
SECTION 3: Composition/information on ingredients

3.2 Mixtures
Description: Mixture of substances listed below with nonhazardous additions.

<table>
<thead>
<tr>
<th>CAS</th>
<th>EINECS</th>
<th>Substance</th>
<th>Community workplace exposure limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1314-23-4</td>
<td>215-227-2</td>
<td>zirconium dioxide substance</td>
<td>43-92%</td>
</tr>
<tr>
<td>1314-36-9</td>
<td>215-233-5</td>
<td>yttrium oxide substance</td>
<td>6-55%</td>
</tr>
<tr>
<td>12055-23-1</td>
<td>235-013-2</td>
<td>hafnium dioxide substance</td>
<td>1-2%</td>
</tr>
</tbody>
</table>

Additional information:
For the listed ingredient(s), the identity and exact percentages are being withheld as a trade secret.

SECTION 4: First aid measures

4.1 Description of first aid measures
General information: No special measures required.
After inhalation: Supply fresh air; consult doctor in case of complaints.
After skin contact:
Brush off loose particles from skin.
Immediately rinse with water.
If skin irritation is experienced, consult a doctor.
After eye contact:
Remove contact lenses if worn, if possible.
Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.
After swallowing:
Rinse out mouth and then drink plenty of water.
Do not induce vomiting; call for medical help immediately.
4.2 Most important symptoms and effects, both acute and delayed
Slight irritant effect on skin and mucous membranes.
Slight irritant effect on eyes.
Nausea in case of ingestion.
May cause gastro-intestinal irritation if ingested.

Hazards
No further relevant information available.

4.3 Indication of any immediate medical attention and special treatment needed
No further relevant information available.

SECTION 5: Firefighting measures

5.1 Extinguishing media
Suitable extinguishing agents:
The product is not flammable.
Use fire extinguishing methods suitable to surrounding conditions.

For safety reasons unsuitable extinguishing agents: None.

5.2 Special hazards arising from the substance or mixture
Formation of toxic gases is possible during heating or in case of fire.

5.3 Advice for firefighters
Protective equipment:
Wear self-contained respiratory protective device.
Wear fully protective suit.

Additional information
No further relevant information available.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Ensure adequate ventilation
Avoid formation of dust.
Do not breathe dust.

6.2 Environmental precautions: Avoid release to the environment.

6.3 Methods and material for containment and cleaning up:
Pick up mechanically.
Dispose of the material collected according to regulations.
Send for recovery or disposal in suitable receptacles.

6.4 Reference to other sections
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
Use only in well ventilated areas.
Prevent formation of dust.
Any unavoidable deposit of dust must be regularly removed.

(Cont'd. on page 4)
SECTION 8: Exposure controls/personal protection

- Additional information about design of technical facilities: No further data; see section 7.

- 8.1 Control parameters

<table>
<thead>
<tr>
<th>Ingredients with limit values that require monitoring at the workplace:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1314-23-4 zirconium dioxide</td>
</tr>
<tr>
<td>PEL (USA)</td>
</tr>
<tr>
<td>Long-term value: 5 mg/m³ as Zr</td>
</tr>
<tr>
<td>REL (USA)</td>
</tr>
<tr>
<td>Short-term value: 10 mg/m³ as Zr</td>
</tr>
<tr>
<td>Long-term value: 5 mg/m³ as Zr</td>
</tr>
<tr>
<td>TLV (USA)</td>
</tr>
<tr>
<td>Short-term value: 10 mg/m³ as Zr</td>
</tr>
<tr>
<td>Long-term value: 5 mg/m³ as Zr</td>
</tr>
<tr>
<td>EL (Canada)</td>
</tr>
<tr>
<td>Short-term value: 10 mg/m³ as Zr</td>
</tr>
<tr>
<td>Long-term value: 5 mg/m³ as Zr</td>
</tr>
</tbody>
</table>

| 1314-36-9 yttrium oxide                                                |
| PEL (USA)                                                              |
| Long-term value: 1 mg/m³ as Y                                         |
| REL (USA)                                                              |
| Long-term value: 1 mg/m³ as Y                                         |
| TLV (USA)                                                              |
| Long-term value: 1 mg/m³ as Y                                         |
| EL (Canada)                                                            |
| Long-term value: 1 mg/m³ as Y                                         |

| 12055-23-1 hafnium dioxide                                            |
| PEL (USA)                                                              |
| Long-term value: 0,5 mg/m³ as Hf                                       |
| REL (USA)                                                              |
| Long-term value: 0,5 mg/m³ as Hf                                       |
8.2 Exposure controls
 Personal protective equipment:
 General protective and hygienic measures:
 The usual precautionary measures are to be adhered to when handling chemicals.
 Keep away from foodstuffs, beverages and feed.
 Do not breathe dust.
 Avoid contact with the eyes.
 Avoid close or long term contact with the skin.
 Respiratory protection:
 Suitable respiratory protective device recommended.
 Particulate mask should filter at least 99% of airborne particles.
 Protection of hands:
 Wear gloves for the protection against mechanical hazards according to NIOSH or EN 388.
 Eye protection:

- Body protection: Protective work clothing
- Limitation and supervision of exposure into the environment Avoid release to the environment.
- Risk management measures See Section 7 for additional information.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties
 General Information
 Appearance:
- Form: Powder
- Colour: Yellow
- Odour: Odourless
- Odour threshold: Not determined.
- pH-value: Not applicable.
- Change in condition
  Melting point/Melting range: Not Determined.
  Boiling point/Boiling range: Undetermined.
- Flash point: Not applicable.
- Flammability (solid, gaseous): Not determined.
Trade name: Yttria Stabilized Zirconia

- Auto/Self-ignition temperature: Not determined.
- Decomposition temperature: Not determined.
- Self-igniting: Product is not self-igniting.
- Danger of explosion: Product does not present an explosion hazard.
  - Explosion limits:
    - Lower: Not determined.
    - Upper: Not determined.
- Vapour pressure: Not determined.
- Density: Not determined.
- Relative density: Not determined.
- Vapour density: Not applicable.
- Evaporation rate: Not applicable.
- Solubility in / Miscibility with water: Insoluble.
- Partition coefficient (n-octanol/water): Not determined.
- Viscosity:
  - Dynamic: Not applicable.
  - Kinematic: Not applicable.
- 9.2 Other information: No further relevant information available.

SECTION 10: Stability and reactivity

- 10.1 Reactivity: No further relevant information available.
- 10.2 Chemical stability:
- Thermal decomposition / conditions to be avoided:
  No decomposition if used and stored according to specifications.
- 10.3 Possibility of hazardous reactions:
  Reacts with strong acids and alkali.
  As the product is supplied it is not capable of dust explosion; however enrichment with fine dust causes risk of dust explosion.
- 10.4 Conditions to avoid: Avoid acids.
- 10.5 Incompatible materials: Oxidizers, strong bases, strong acids
- 10.6 Hazardous decomposition products: Toxic metal compounds

SECTION 11: Toxicological information

- 11.1 Information on toxicological effects
- Acute toxicity
- LD/LC50 values relevant for classification: None.
- Primary irritant effect:
- Skin corrosion/irritation: Based on available data, the classification criteria are not met.
Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and OSHA
GHS

Printing date: 23.03.2018
Revision: 23.03.2018

Trade name: Yttria Stabilized Zirconia

- Serious eye damage/irritation
  Based on available data, the classification criteria are not met.
- Respiratory or skin sensitisation
  Based on available data, the classification criteria are not met.
- Repeated dose toxicity:
  Repeated or long-term inhalation of product dusts may cause pulmonary disease.
- CMR effects (carcinogenicity, mutagenicity and toxicity for reproduction):
  - Germ cell mutagenicity
    Based on available data, the classification criteria are not met.
  - Carcinogenicity
    Based on available data, the classification criteria are not met.
  - Reproductive toxicity
    Based on available data, the classification criteria are not met.
  - STOT-single exposure
    Based on available data, the classification criteria are not met.
  - STOT-repeated exposure
    Based on available data, the classification criteria are not met.
- Aspiration hazard
  Based on available data, the classification criteria are not met.

SECTION 12: Ecological information

- 12.1 Toxicity
  - Aquatic toxicity: No further relevant information available.
- 12.2 Persistence and degradability
  No further relevant information available.
- 12.3 Bioaccumulative potential
  No further relevant information available.
- 12.4 Mobility in soil
  No further relevant information available.
- Additional ecological information:
  - General notes: Generally not hazardous for water
  - 12.5 Results of PBT and vPvB assessment
  - PBT: Not applicable.
  - vPvB: Not applicable.
  - 12.6 Other adverse effects
  No further relevant information available.

SECTION 13: Disposal considerations

- 13.1 Waste treatment methods
  - Recommendation
    Smaller quantities can be disposed of with household waste.
    Contact waste processors for recycling information.
    The user of this material has the responsibility to dispose of unused material, residues and containers in compliance with all relevant local, state and federal laws and regulations regarding treatment, storage and disposal for hazardous and nonhazardous wastes.
  - Uncleaned packaging:
    - Recommendation: Disposal must be made according to local official regulations.

SECTION 14: Transport information

- 14.1 UN-Number
  Not Regulated
- DOT, ADR, IMDG, IATA
- 14.2 UN proper shipping name
  Not Regulated
- DOT, ADR, IMDG, IATA
(Cont'd. on page 8)
Trade name: Yttria Stabilized Zirconia

14.3 Transport hazard class(es)
- DOT, ADR, ADN, IMDG, IATA
- Class: Not Regulated

14.4 Packing group
- DOT, ADR, IMDG, IATA: Not Regulated

14.5 Environmental hazards:
- Marine pollutant: No

14.6 Special precautions for user
- Not applicable.

14.7 Transport in bulk according to Annex II of Marpol and the IBC Code
- Not applicable.

UN "Model Regulation": Not Regulated

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
- United States (USA)
- SARA
  - Section 355 (extremely hazardous substances):
    None of the ingredients are listed.
  - Section 313 (Specific toxic chemical listings):
    None of the ingredients are listed.
  - TSCA (Toxic Substances Control Act):
    All ingredients are listed.
  - Proposition 65 (California):
    - Chemicals known to cause cancer:
      None of the ingredients is listed.
    - Chemicals known to cause reproductive toxicity for females:
      None of the ingredients are listed.
    - Chemicals known to cause reproductive toxicity for males:
      None of the ingredients are listed.
    - Chemicals known to cause developmental toxicity:
      None of the ingredients are listed.
  - Carcinogenic Categories
    - EPA (Environmental Protection Agency)
      None of the ingredients are listed.
    - IARC (International Agency for Research on Cancer)
      None of the ingredients are listed.
    - TLV (Threshold Limit Value established by ACGIH)
      1314-23-4 zirconium dioxide
Trade name: Yttria Stabilized Zirconia

- **NIOSH-Ca (National Institute for Occupational Safety and Health)**
  None of the ingredients are listed.

- **Canada**
  - **Canadian Domestic Substances List (DSL)**
    All ingredients are listed.
  - **Canadian Ingredient Disclosure list (limit 0.1%)**
    None of the ingredients are listed.
  - **Canadian Ingredient Disclosure list (limit 1%)**
    None of the ingredients are listed.

- **Directive 2012/18/EU**
  - **Named dangerous substances - ANNEX I**
    None of the ingredients are listed.

- **Other regulations, limitations and prohibitive regulations**
  This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations.

- **Substances of very high concern (SVHC) according to REACH, Article 57**
  None of the ingredients are listed.

- **15.2 Chemical safety assessment**: A Chemical Safety Assessment has not been carried out.

**SECTION 16: Other information**

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

- **Abbreviations and acronyms:**
  ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
  IMDG: International Maritime Code for Dangerous Goods
  DOT: US Department of Transportation
  IATA: International Air Transport Association
  GHS: Globally Harmonised System of Classification and Labelling of Chemicals
  ACGIH: American Conference of Governmental Industrial Hygienists
  EINECS: European Inventory of Existing Commercial Chemical Substances
  ELINCS: European List of Notified Chemical Substances
  CAS: Chemical Abstracts Service (division of the American Chemical Society)
  NFPA: National Fire Protection Association (USA)
  HMIS: Hazardous Materials Identification System (USA)
  DNEL: Derived No-Effect Level (REACH)
  PNEC: Predicted No-Effect Concentration (REACH)
  LC50: Lethal concentration, 50 percent
  LD50: Lethal dose, 50 percent
  PBT: Persistent, Bioaccumulative and Toxic
  SVHC: Substances of Very High Concern
  vPvB: very Persistent and very Bioaccumulative

- **Sources**
  Website, European Chemicals Agency (http://echa.europa.eu/)
  Website, US EPA Substance Registry Services (http://ofmpub.epa.gov/sor Internet/registry/substrg/home/overview/home.do)
Trade name: Yttria Stabilized Zirconia

(Cont'd. from page 9)

Website, Chemical Abstracts Registry, American Chemical Society (https://www.cas.org)
Safety Data Sheets, Individual Manufacturers
SDS Prepared by:
ChemTel Inc.
1305 North Florida Avenue
Tampa, Florida USA 33602-2902
Toll Free North America 1-888-255-3924 Intl. +01 813-248-0573
Website: www.chemtelinc.com