SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Starblast™ XL
Product Use : Abrasive blasting, Sand blasting, For industrial use only.

Restrictions on use : Do not use product for anything outside of the above specified uses
Manufacturer/Supplier : The Chemours Company TT, LLC.
1007 Market Street
Wilmington, DE 19899
United States of America

Product Information : 1-844-773-CHEM (outside the U.S. 1-302-773-1000)
Transport Emergency : CHEMTREC: +1-800-424-9300 (outside the U.S. +1-703-527-3887)

Other information : professional use

SECTION 2. HAZARDS IDENTIFICATION

Not classified as a hazardous substance or mixture according to the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard 2012.

Other hazards
The product, as shipped, poses a minimal inhalation health hazard because the bulk of the particles are in the non-inhalable size range. However, if during handling or use the particles are broken down to a size that can be inhaled, the dusts may be harmful to the respiratory system.. Use appropriate Personal Protective Equipment (PPE) such as an air supplied respirator approved for sandblasting., Product dust may be irritating to eyes, skin and respiratory system., Wash hands before breaks and at the end of workday.
SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staurolite</td>
<td>12182-56-8</td>
<td>88 - 92 %</td>
</tr>
<tr>
<td>Ilmenite (FeTiO3)</td>
<td>12168-52-4</td>
<td>4 - 6 %</td>
</tr>
<tr>
<td>Zircon</td>
<td>14940-68-2</td>
<td>1 - 3 %</td>
</tr>
<tr>
<td>Rutile</td>
<td>1317-80-2</td>
<td>0.5 - 1.5 %</td>
</tr>
<tr>
<td>Quartz (non-inhalable)</td>
<td>14808-60-7</td>
<td>0.1 - 1 %</td>
</tr>
<tr>
<td>Quartz</td>
<td>14808-60-7</td>
<td>0.01 - 0.05 %</td>
</tr>
</tbody>
</table>

SECTION 4. FIRST AID MEASURES

General advice : Call a physician if symptoms occur.
Inhalation : Remove person to fresh air. If signs/symptoms continue, get medical attention.
Skin contact : Wash off with soap and water.
Eye contact : Rinse with plenty of water.
Ingestion: No specific intervention is indicated. Consult a physician if necessary.

Most important symptoms/effects, acute and delayed: irritant effects

Protection of first-aiders: No special precautions are necessary for first aid responders.

Notes to physician: No special protective equipment required.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media: Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media: None known.

Specific hazards: Not a fire or explosion hazard.

Special protective equipment for firefighters: No special protective equipment required.

Further information: The product itself does not burn.

SECTION 6. ACCIDENTAL RELEASE MEASURES

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Safeguards (Personnel): Avoid breathing dust.

Environmental precautions: Do not flush into surface water or sanitary sewer system.

Spill Cleanup: Pick up and arrange disposal without creating dust. After cleaning, flush away...
Accidental Release Measures: For disposal considerations see section 13.

SECTION 7. HANDLING AND STORAGE

Handling (Personnel): Avoid formation of additional inhalable particles. If handling inhalable particulates, use of gloves and washing before eating, drinking, applying cosmetics or smoking is advisable to minimize dust inhalation or ingestion of residue from hands. Avoid breathing dust. Wash hands before breaks and at the end of workday.

Handling (Physical Aspects): This is a fully oxidized mineral product. As such it cannot support combustion or participate in a dust explosion.

Dust explosion class: Not applicable

Storage: No special storage conditions required.

Storage period: No applicable data available.

Storage temperature: No applicable data available.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering controls: Use sufficient ventilation to keep employee exposure below recommended limits. If using this product as an abrasive blast agent in confined areas, airborne dust levels should be controlled by physical enclosure of the abrasive blasting operation. The enclosure should be exhaust ventilated in accordance with 29 CFR 1910.94 Ventilation (a) Abrasive blasting.

Personal protective equipment
Respiratory protection: For abrasive blasting use a type CE abrasive-blast supplied-air respirator covering head, neck, and shoulders to provide protection from rebound abrasive per 29 CFR 1910.94 (a)(5).

A certified air-purifying respirator with a type 100 (high efficiency) particulate
cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Use a certified positive pressure air-supplied respirator in circumstances where air-purifying respirators may not provide adequate protection. Provide adequate ventilation. Evaluations as to which personnel may require respiratory protection should include consideration of potential exposure to bystanders near dust generating activities such as, for example, abrasive blasting.

Eye protection: Wear safety glasses with side shields.

Skin and body protection: Where there is potential for skin contact have available and wear as appropriate impervious gloves, apron, pants, and jacket.

Protective measures: The stated hazards of this material are based on non-inhalable particles that are the bulk fraction of the delivered product. However, if during handling or use the particles are broken down to the inhalable or respirable size range, the dusts may be harmful to the respiratory system. Inhalable quartz is an IARC Category 1 carcinogen and applicable exposure limits should be referenced.

Exposure Guidelines
Exposure Limit Values

Zircon
Permissible exposure limit:
OSHA TLV 5 mg/m3 8 hr. TWA as Zr
ACGIH TLV 5 mg/m3 TWA as Zr
ACGIH STEL 10 mg/m3 STEL as Zr

Rutile (TiO2)
Permissible exposure limit:
OSHA TLV 15 mg/m3 AEL * Total dust.
ACGIH TLV 10 mg/m3 AEL * Total dust.

Quartz
### Permissible exposure limit:

<table>
<thead>
<tr>
<th>Permissible exposure limit: (OSHA)</th>
<th>2.4 millions of particles per cubic foot of air</th>
<th>TWA Respirable.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks</td>
<td>The exposure limit is calculated from the equation, (250/(%\text{SiO}_2+5)), using a value of 100% SiO2. Lower percentages of SiO2 will yield higher exposure limits.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Permissible exposure limit: (OSHA)</th>
<th>0.1 mg/m³</th>
<th>TWA Respirable.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks</td>
<td>The exposure limit is calculated from the equation, (10/(%\text{SiO}_2+2)), using a value of 100% SiO2. Lower percentages of SiO2 will yield higher exposure limits.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Permissible exposure limit: (OSHA)</th>
<th>0.3 mg/m³</th>
<th>TWA Total dust.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks</td>
<td>The exposure limit is calculated from the equation, (30/(%\text{SiO}_2+2)), using a value of 100% SiO2. Lower values of % SiO2 will give higher exposure limits.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TLV (ACGIH)</th>
<th>0.025 mg/m³</th>
<th>TWA Respirable fraction.</th>
</tr>
</thead>
</table>

### SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

**Appearance**

- Physical state: solid
- Form: Solid form, crystalline
- Color: red brown

**Odor**

- odourless

**Odor threshold**

- Not applicable

**pH**

- Not applicable

**Melting point/freezing point**

- Melting point/range: 1,370 °C (2,498 °F)
## Boiling point/boiling range
- Not applicable

## Flash point
- does not flash

## Evaporation rate
- Not applicable

## Flammability (solid, gas)
- The product is not flammable.

## Upper explosion limit
- Not applicable

## Lower explosion limit
- Not applicable

## Vapor pressure
- Not applicable

## Vapor density
- Not applicable

## Specific gravity (Relative density)
- 3.7

## Water solubility
- insoluble

## Solubility(ies)
- Not applicable

## Partition coefficient: n-octanol/water
- Not applicable

## Auto-ignition temperature
- Not applicable

## Decomposition temperature
- Not applicable

## Viscosity, kinematic
- Not applicable

## Viscosity, dynamic
- Not applicable

### SECTION 10. STABILITY AND REACTIVITY

**Reactivity**: None reasonably foreseeable.

**Chemical stability**: Stable
Possibility of hazardous reactions: None known.
Conditions to avoid: Not applicable
Incompatible materials: None known.
Hazardous decomposition products: Not applicable

SECTION 11. TOXICOLOGICAL INFORMATION

Starblast™ XL
Inhalation: The objective of the study was to compare the lung toxicity of a set of abrasive substitutes for silica dust (garnet, staurolite, coal slag, specular hematite, and treated sand) to that of blasting sand. Rats were intratracheally instilled with 2.5 or 10 mg/kg of the various test substances and pulmonary toxicity endpoints were measured at 4 weeks postexposure. The biomarkers included lung inflammation and cytotoxicity endpoints. In addition, the investigators measured alveolar macrophage activation. The results indicated that blasting sand produced evidence of pulmonary toxicity/inflammation and lung fibrosis. Garnet, staurolite, and treated sand exposures induced pulmonary hazard effects and inflammation that were viewed as similar to blasting sand, while coal slag instillation produced greater pulmonary damage and inflammation than blasting sand. In contrast, specular hematite did not significantly increase levels of inflammation and cytotoxicity and did not stimulate macrophage activation. [Hubbs AF et al., Toxicological Sciences volume 61: 135-143, 2001]

The results of this study should be viewed as a preliminary, screening-type pulmonary toxicity study which utilized very high, overload doses. Subsequently, the NIOSH researchers followed up on the Hubbs et al., study with another lung toxicity screening study of blasting agents [“Comparative pulmonary toxicity of blasting sand and five substitute abrasive blasting agents” – DW Porter et al., J Toxicol Environ Health A 65:1121-40, 2002]. The additional test substances included steel grit, copper slag, nickel slag, crushed glass and olivine. The authors reported that steel grit produced less lung toxicity than blasting sand or any of the other abrasive blasting substitutes.
Ilmenite (FeTiO3)

Skin irritation : No skin irritation, animals (unspecified species)
Eye irritation : No eye irritation, animals (unspecified species)
Skin sensitization : Does not cause skin sensitisation., animals (unspecified species)

Rutile

Oral LD50 : > 5,000 mg/kg, Rat
Skin irritation : No skin irritation, Rabbit
Eye irritation : No eye irritation, Rabbit
Skin sensitization : Did not cause sensitisation on laboratory animals., Mouse

Repeated dose toxicity : Oral
  Rat
  - No toxicologically significant effects were found.
Inhalation
  Rat
  - No toxicologically significant effects were found.

Carcinogenicity : Not classifiable as a human carcinogen.
In lifetime inhalation studies rats were exposed for 2 years to respectively 10, 50 and 250 mg/m³ of respirable TiO2. Slight lung fibrosis was observed at 50 and 250 mg/m³ levels. Microscopic lung tumours were also observed in 13 percent of the rats exposed to 250 mg/m³, an exposure level that caused lung overloading and impairment of rat lungs clearance mechanisms. In further studies, these tumours were found to occur only under particle overload conditions in a uniquely sensitive species, the rat, and have little or no relevance for humans. The pulmonary inflammatory response to TiO2 particles exposure was also found to
be much more severe in rats than in other rodent species. The conclusions of several epidemiology studies on more than 20000 TiO2 industry workers in Europe and the USA did not suggest a carcinogenic effect of TiO2 dust on the human lung. Mortality from other chronic diseases, including other respiratory diseases, was also not associated with exposure to TiO2 dust. Based upon all available study results, Chemours scientists conclude that titanium dioxide will not cause lung cancer or chronic respiratory diseases in humans at concentrations experienced in the workplace.

**Mutagenicity**
- Tests on bacterial or mammalian cell cultures did not show mutagenic effects.
- Animal testing did not show any mutagenic effects.

**Reproductive toxicity**
- Animal testing showed no reproductive toxicity.

**Teratogenicity**
- Animal testing showed no developmental toxicity.

**Further information**
- The toxicological data has been taken from products of similar composition.

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**Quartz (non-inhalable)**

**Dermal**
- No adverse effects expected.

**Oral ALD - Approximate Lethal Dose**
- > 11,000 mg/kg, Rat

**Skin irritation**
- No skin irritation, animals (unspecified species)

**Eye irritation**
- Slight irritation, animals (unspecified species)

**Skin sensitization**
- Did not cause sensitisation on laboratory animals., animals (unspecified species)

**Mutagenicity**
- Animal testing did not show any mutagenic effects.
- Genetic damage in cultured mammalian cells was observed in some laboratory tests but not in others.
- Did not cause genetic damage in cultured bacterial cells.

**Quartz**

**Oral LD50**
- > 11,000 mg/kg, Rat
Bloody nasal discharge
Weight loss

Skin irritation : No skin irritation, Rabbit

Eye irritation : No eye irritation, Rabbit

Skin sensitization : Does not cause skin sensitisation., Guinea pig

Repeated dose toxicity : Inhalation
- Rat
  - Target Organs: Lungs
  The substance or mixture is classified as specific target organ toxicant, repeated exposure, Category 2.
  Fluid retention in lungs (pulmonary oedema), lung effects, Inflammation, Chronic lung disease, Fibrosis

Carcinogenicity : Human carcinogen.
An increased incidence of tumours was observed in laboratory animals.
An increased risk of cancer in humans has been shown in workplace-based studies.

Carcinogenicity
The carcinogenicity classifications for this product and/or its ingredients have been determined according to HazCom 2012, Appendix A.6. The classifications may differ from those listed in the National Toxicology Program (NTP) Report on Carcinogens (latest edition) or those found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest edition).

<table>
<thead>
<tr>
<th>Material</th>
<th>IARC</th>
<th>NTP</th>
<th>OSHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rutile (TiO2)</td>
<td>2B</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SECTION 12. ECOLOGICAL INFORMATION

Aquatic Toxicity

Rutile

96 h LC50 : Pimephales promelas (fathead minnow) > 1,000 mg/l
72 h EC50 : Pseudokirchneriella subcapitata (green algae) > 100 mg/l
48 h EC50 : Daphnia magna (Water flea) > 1,000 mg/l

Additional ecological information : Not applicable

SECTION 13. DISPOSAL CONSIDERATIONS

Waste disposal methods - Product : Dispose of in accordance with local regulations.
Contaminated packaging : Dispose of in accordance with local regulations.

SECTION 14. TRANSPORT INFORMATION

Not classified as dangerous in the meaning of transport regulations.

SECTION 15. REGULATORY INFORMATION

EINECS (EU) Status : On the inventory, or in compliance with the inventory
AICS (AU) Status : On the inventory, or in compliance with the inventory
DSL (CA) Status : On the inventory, or in compliance with the inventory
ENCS (JP) Status : On the inventory, or in compliance with the inventory
KECI (KR) Status : On the inventory, or in compliance with the inventory
PICCS (PH) Status : On the inventory, or in compliance with the inventory
IECSC (CN) Status : On the inventory, or in compliance with the inventory
ISHL (JP) Status : On the inventory, or in compliance with the inventory
NZIOC Status : On the inventory, or in compliance with the inventory
HSNO (NZ) Status : Exempt
TSCA : On the inventory, or in compliance with the inventory

Other regulations : These products are exempt from Nuclear Regulatory Commission (NRC) regulations for source material per 10 CFR 40, since it falls under the definition of "unimportant quantity source material" containing less than 0.05% uranium or thorium. Some states may apply NRC type radiation protection standards for NORM above background levels, or may have NORM specific regulations that are determined based upon the radium content. It is recommended that you consult with current regulations.

SARA 313 Regulated Chemical(s) : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

PA Right to Know Regulated Chemical(s) : Substances on the Pennsylvania Hazardous Substances List present at a concentration of 1% or more (0.01% for Special Hazardous Substances): Rutile (TiO2)

NJ Right to Know Regulated Chemical(s) : Substances on the New Jersey Workplace Hazardous Substance List present at a concentration of 1% or more (0.1% for substances identified as carcinogens, mutagens or teratogens): Rutile (TiO2), Quartz (non-inhalable)

California Prop. 65 : WARNING! This product contains a chemical or chemicals known to the State of California to cause cancer. Quartz, Rutile (TiO2), Radionuclides

SECTION 16. OTHER INFORMATION
Restrictions for use : Do not use or resell Chemours™ materials in medical applications involving implantation in the human body or contact with internal body fluids or tissues unless agreed to by Seller in a written agreement covering such use. For further information, please contact your Chemours
These products may not be directly added to food or pharmaceuticals and are not recommended for use in medical devices or cosmetics.

Starblast™ is a trademark of The Chemours Company TT, LLC.

Starblast® XL contains trace quantities of naturally occurring radioactive uranium and thorium (less than or equal to 10 ppm uranium plus 70 ppm thorium = 80 ppm total U + Th or 0.008 % w/w, equivalent to 11 pCi/g or less), and radium (less than or equal to 11 pCi/g). Naturally Occurring Radioactive Material, namely uranium, thorium, and their decay products, including radium, is commonly referred to as "NORM".

The main radiological hazard from the product is internal exposure from small amounts of alpha particles given off by inhaled dust. Industrial hygiene practices aimed at control of airborne dust can lessen the potential for exposure. Overexposure by inhalation to inhaled dusts containing radioactive uranium, thorium, and radium may cause lung cancer. Low level gamma radiation in proximity to bulk or bagged stockpiles of these products may present a lesser, external exposure that can be managed by limiting close proximity for long time periods to large volumes of material.

With respect to dust exposure, evaluation and calculation based upon dosimetry (ICRP 68) yield the following guidance to ensure that inhalation intake is less than a 100 mrem/yr public dose reference point for radionuclides.

For a total dust with aerodynamic diameter of 1 um, the calculated reference dust level is 17.4 mg/m³. For a total dust with aerodynamic diameter of 5 um, the calculated reference dust level is 27.0 mg/m³. For a total dust with aerodynamic diameter of 10 um, the calculated reference dust level is 39.8 mg/m³.

The calculations noted above are based upon 8 hr/day TWAs. It should be noted that for these products, the actual particle physical diameter is approximately 1/2 the effective aerodynamic diameter. For these products, as shipped, with essentially no particles as small as calculated above, the highest total dust level can provide a conservative limit. However, if during handling or use the particles are broken down to finer particle sizes, lower levels of total dust would apply.

These reference calculations for radionuclides may or may not provide the most conservative recommendation vs. other trace contaminants as compared to specific country dust contaminant limit calculations. It is recommended that the user compare and calculate or measure for specific contaminants vs. reference limits, especially if particles are broken down, to determine the most appropriate standard for protection.

Please see www.Chemours.com/Titanium_Technologies/en_US/ for the latest version of this MSDS.
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Significant change from previous version is denoted with a double bar.