



DuPont™ Staurolite Products

Version 3.1

Revision Date 06/05/2015

Ref. 15000002242

This SDS adheres to the standards and regulatory requirements of the United States and may not meet the regulatory requirements in other countries.

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	DuPont™ Staurolite Products
Product Grade/Type	:	Biasill® Staurolite Sand Blasting Abrasive, Starblast® Blasting Abrasive
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	:	DuPont 1007 Market Street Wilmington, DE 19898 United States of America
Product Information	:	1-302-774-1000
Medical Emergency	:	1-800-441-3637 (outside the U.S. 1-302-774-1139)
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.

The following percentage of the mixture consists of ingredient(s) with unknown acute toxicity: 100 %


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SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
Staurolite	12182-56-8	85 - 90 %
Quartz (non-inhalable)	14808-60-7	0.1 - 3 %
Iron titanium trioxide	12022-71-8	<=10 %
Quartz	14808-60-7	0.01 - 0.09 %
Rutile (TiO ₂)	1317-80-2	<=5 %
Zircon	14940-68-2	<=3 %
Kyanite	1302-76-7	<=2 %

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.



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- Ingestion : No specific intervention is indicated. Consult a physician if necessary.
- Most important symptoms/effects, acute and delayed : irritant effects
- Protection of first-aiders :
Not applicable
- 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 traces with water.
- Accidental Release Measures : For disposal considerations see section 13.



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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.



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- 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

Rutile (TiO ₂)			
Permissible exposure limit:	(OSHA)	15 mg/m ³	AEL * Total dust.
TLV	(ACGIH)	10 mg/m ³	AEL * Total dust.
AEL *	(DUPONT)	10 mg/m ³	8 & 12 hr. TWA Total dust.
AEL *	(DUPONT)	5 mg/m ³	8 & 12 hr. TWA Respirable dust.

Zircon			
Permissible exposure limit:	(OSHA)	5 mg/m ³	8 hr. TWA as Zr
TLV	(ACGIH)	5 mg/m ³	TWA as Zr
TLV	(ACGIH)	10 mg/m ³	STEL as Zr

Kyanite			
TLV	(ACGIH)	1 mg/m ³	TWA Respirable fraction.

Quartz (non-inhalable)			
Permissible exposure limit:	(OSHA)	2.4 millions of particles per cubic foot of air	TWA
		Respirable.	
		Remarks	

The exposure limit is calculated from the equation, $250/(\%SiO_2+5)$, using a value of 100% SiO₂. Lower percentages of SiO₂ will yield higher exposure limits.



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Permissible exposure limit:	(OSHA)	0.1 mg/m3	TWA Respirable.
		Remarks	The exposure limit is calculated from the equation, $10/(\%SiO_2+2)$, using a value of 100% SiO ₂ . Lower percentages of SiO ₂ will yield higher exposure limits.
Permissible exposure limit:	(OSHA)	0.3 mg/m3	TWA Total dust.
		Remarks	The exposure limit is calculated from the equation, $30/(\%SiO_2+2)$, using a value of 100% SiO ₂ . Lower values of % SiO ₂ will give higher exposure limits.
TLV	(ACGIH)	0.025 mg/m3	TWA Respirable fraction.
AEL *	(DUPONT)	0.01 mg/m3	12 hr. TWA Respirable dust.
AEL *	(DUPONT)	0.02 mg/m3	8 hr. TWA Respirable dust.
Quartz			
Permissible exposure limit:	(OSHA)	2.4 millions of particles per cubic foot of air	TWA
		Respirable.	
		Remarks	The exposure limit is calculated from the equation, $250/(\%SiO_2+5)$, using a value of 100% SiO ₂ . Lower percentages of SiO ₂ will yield higher exposure limits.
Permissible exposure limit:	(OSHA)	0.1 mg/m3	TWA Respirable.
		Remarks	The exposure limit is calculated from the equation, $10/(\%SiO_2+2)$, using a value of 100% SiO ₂ . Lower percentages of SiO ₂ will yield higher exposure limits.
Permissible exposure limit:	(OSHA)	0.3 mg/m3	TWA Total dust.
		Remarks	The exposure limit is calculated from the equation, $30/(\%SiO_2+2)$, using a value of 100% SiO ₂ . Lower values of % SiO ₂ will give higher exposure limits.
TLV	(ACGIH)	0.025 mg/m3	TWA Respirable fraction.
AEL *	(DUPONT)	0.01 mg/m3	12 hr. TWA Respirable dust.
AEL *	(DUPONT)	0.02 mg/m3	8 hr. TWA Respirable dust.

* AEL is DuPont's Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

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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 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



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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

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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 increased 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-


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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

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.

Iron titanium trioxide

- 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)

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


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- 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.
- Rutile (TiO₂)
- 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
Did not cause sensitisation on laboratory animals., Guinea pig
- 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



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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, DuPont 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.

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).

Material	IARC	NTP	OSHA
Rutile (TiO ₂)	2B		
Rutile (TiO ₂)	2B		

SECTION 12. ECOLOGICAL INFORMATION

Aquatic Toxicity



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Rutile (TiO₂)

- 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

- 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
- 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



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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 (TiO ₂), Quartz (non-inhalable) |
| 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 (TiO ₂), 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 (TiO ₂), Radionuclides |

SECTION 16. OTHER INFORMATION

- Restrictions for use : Do not use DuPont materials in medical applications involving implantation in the human body or contact with internal body fluids or tissues unless the material has been provided from DuPont under a written contract that is consistent with DuPont policy regarding medical applications and expressly acknowledges the contemplated use. For further information, please contact your DuPont representative. You may also request a copy of the DuPont POLICY Regarding Medical Applications and DuPont CAUTION Regarding Medical Applications.

These products may not be directly added to food or pharmaceuticals and are not recommended for use in medical devices or cosmetics.

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Staurolite Products contain trace quantities of naturally occurring radioactive uranium and thorium (less than or equal to 25 ppm uranium plus 175 ppm thorium = 200 ppm total U + Th or 0.02 % w/w, equivalent to 28 pCi/g or less), and radium (less than or equal to 28 pCi/g). Naturally Occurring Radioactive Material, namely uranium, thorium, and their decay products, including radium, is commonly referred to as "NORM".

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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 μm , the calculated reference dust level is 6.9 mg/m^3 . For a total dust with aerodynamic diameter of 5 μm , the calculated reference dust level is 10.8 mg/m^3 . For a total dust with aerodynamic diameter of 10 μm , the calculated reference dust level is 15.9 mg/m^3 .

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 www2.dupont.com/Titanium_Technologies/en_US/ for the latest version of this MSDS.

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Contact person : MSDS Coordinator DuPont Titanium Technologies; Wilmington, DE 19898;
Telephone (800) 441-9485

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.