Safety Data Sheet

——Titanium Dioxide (Rutile)

[Prepared according to Globally Harmonized System of Classification and Labelling of Chemicals (GHS, Rev.4).]

1 Identification

1.1 GHS product identifier

GHS product identifier: Titanium Dioxide (Rutile)

1.2 Other means of identification

Synonyms: Rutile (TiO_2); CI 77891; Pigment white 6; Tipaque; Titania; Titanic anhydride; Titanium oxide; Titanium (IV) oxide; Titanium white; Zopaque

CAS#: 13463-67-7 / 1317-80-2

Molecular formula: TiO_2

Product grades: R210, R216, R218, R226, R299, R909, R1930, R1931

1.3 Recommended use of the chemical and restrictions on use

Recommended uses: Used as additives in paints, plastics, PVC, masterbatch coatings, papers, fiber, rubber, inks, etc.

Restrictions on use: These products are industrial-grade and unsuitable for use in food, medicine or daily chemical industry.

1.4 Supplier's details

Manufacturer: Shanghai Yuejiang Titanium Chemical Manufacturer Co., Ltd.

Address: 7F, No.355 Changyang Rd., Shanghai 200082, China

Website: www.yuejiangchem.com

Contact person: Chen Min

Tel: +86-21-55968738

Fax: +86-21-55968738

1.5 Emergency phone number

+86-13901777685

2 Hazards Identification

2.1 Classification of the substance or mixture

GHS: Serious eye damage/eye irritation - Category 2B

Specific target organ toxicity, single exposure; Respiratory tract irritation - Category 3

Specific target organ toxicity, repeated exposure - Category 1

Carcinogenicity - Category 1A

Hazardous to the aquatic environment, long-term hazard - Category 4

2.2 GHS label elements, including precautionary statements

Pictograms:

Signal word:

Danger

(Contd. on page 2)

Hazard statements:

H320 Causes eye irritation

H335 May cause respiratory irritation

H372 Causes damage to organs (lung, respiratory organs, kidneys) through prolonged or repeated exposure

H350 May cause cancer

H413 May cause long lasting harmful effects to aquatic life

Prevention precautionary statements:

P201 Obtain special instructions before use.

P202 Do not handle until all safety precautions have been read and understood.

P260 Do not breathe dust/fume.

P264 Wash hands and faces thoroughly after handling.

P270 Do no eat, drink or smoke when using this product.

P271 Use only outdoors or in a well-ventilated area.

P273 Avoid release to the environment.

P280 Wear protective gloves/protective clothing/eye protection/face protection.

Response precautionary statements:

P304+P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.

P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P308+P313 IF exposed or concerned: Get medical advice/attention.

P312 Call a POISON CENTER/doctor if you feel unwell.

P314 Get medical advice/attention if you feel unwell.

P337+P313 If eye irritation persists: Get medical advice/attention.

Storge precautionary statements:

P403+P233 Store in a well-ventilated place. Keep container tightly closed.

P405 Store locked up.

Disposal precautionary statements:

P501 Dispose of contents/container in accordance with local regulation.

2.3 Other hazards which do not result in classification

May be harmful if inhaled or swallowed.

3 Composition/Information on Ingredients

3.1 Substances

Chemical name: Rutile titanium dioxide

Common name: Titanium dioxide

Synonyms: Rutile (TiO_2); CI 77891; Pigment white 6; Tipaque; Titania; Titanic anhydride; Titanium oxide; Titanium (IV) oxide; Titanium white; Zopaque

CAS#: 13463-67-7 / 1317-80-2

EC#: 236-675-5 / 215-282-2

Stabilizing additives which are themselves classified and which contribute to the classification of the substance: Crystalline silica (CAS# 14808-60-7), Alumina (CAS# 1344-28-1).

3.2 Mixtures

Not applicable

(Contd. on page 3)

4 First-aid Measures

4.1 Description of necessary first-aid measures

Eye contact

Rinse cautiously with running water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention if irritation occurs.

Skin contact

Remove contaminated clothing immediately. Flush thoroughly with soap and plenty of water. Seek medical attention if irritation develops or persists. Wash clothing before reuse.

Inhalation

Remove person to fresh air immediately and keep comfortable for breathing. If irritation persists or other symptoms are observed, seek medical attention. If breathing is difficult, give oxygen. If not breathing, give artificial respiration immediately.

Ingestion

Do NOT induce vomiting unless directed to do so by medical personnel. Rinse mouth and give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Seek medical attention immediately.

4.2 Most important symptoms/effects, acute and delayed

Acute: Dust or powder may be irritating to skin, eyes and respiratory tract. Ingestion may cause digestive tract irritation, vomiting and nausea.

Delayed: Long term exposure to dust or fume may cause lung fibrosis or pneumoconiosis. Prolonged exposure to respirable crystalline silica may lead to fibrotic lung disease, silicosis or cancer. Repeated or prolonged skin contact will defat the skin, causing drying and dermatitis.

4.3 Indication of immediate medical attention and special treatment needed, if necessary

Note to physician: Treat symptomatically and supportively.

5 Fire-fighting Measures

5.1 Suitable extinguishing media

CO_2, dry chemical, water or foam. Use any means suitable for extinguishing surrounding fire.

5.2 Special hazards arising from the chemical

Noncombustible solid. A violent or incandescent reaction with metals (aluminum, calcium, magnesium, potassium, sodium, zinc, and lithium) may occur at high temperatures.

5.3 Special protective actions for fire-fighters

Isolate fire and deny unnecessary entry. Firefighters should wear positive pressure self-contained breathing apparatus (SCBA) and full protective clothing. Cool fire exposed containers with water spray from a protected location. If safe to do so, remove containers from path of fire.

6 Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures

Ventilate area of leak or spill. Eliminate all ignition sources. Use personal protective equipment as indicated in Section 8. Avoid contact with eyes and skin. Avoid breathing dust. Avoid dust formation.

6.2 Environmental precautions

(Contd. on page 4)

Do not allow material to be released to the streams, ponds, lakes or sewers.

6.3 Methods and material for containment and cleaning up

Stop leak if without risk. Move containers from spill area. Collect spillage. Sweep up and shovel without creating dust. Vacuuming or wet sweeping may be used to avoid dust dispersal. Keep in suitable, closed containers for disposal. Then wash the spill site with water to remove trace residue.

7 Handling and Storage

7.1 Precautions for safe handling

- Use only outdoors or in a well-ventilated area.
- Avoid dust/fume generation and accumulation.
- Use personal protective equipment as required. Avoid eye and skin contact. Do not inhale or ingest.
- Handle in accordance with good industrial hygiene and safety practices.
- Maintain good housekeeping practices. Keep away from incompatibles.
- Do not eat, drink or smoke in working areas.
- Wash hands and faces thoroughly before breaks and after handling.
- Remove contaminated clothing and wash it before reuse.
- Obtain special instructions before use.
- If you feel unwell, seek medical attention and show the label when possible.

7.2 Conditions for safe storage, including any incompatibilities

- Store in a cool, dry and well-ventilated place. Store locked up.
- Keep container tightly closed when not in use. Protect against physical damage and moisture.
- Keep away from incompatibles.
- Keep out of reach of children.
- Suitable packaging containers: Plastic bags, kraft paper bags, plastic drums or iron drums.

8 Exposure Controls/Personal Protection

8.1 Control parameters

8.1.1 Occupational exposure limits

The following occupational exposure limits are provided for informational purposes. Exposure limits may differ from country to country. Refer to specific country regulations for additional exposure limit information.

Titanium dioxide

UK:	TWA 4mg/m^3(respirable dust)
Spain:	TWA 10mg/m^3
Sweden:	TWA 5mg/m^3(total dust)
Switzerland:	TWA 3mg/m^3(total dust)
Finland:	TWA 10mg/m^3
France:	TWA 10mg/m^3
USA-OSHA (PEL):	TWA 15mg/m^3(total dust)
USA-ACGIH (TLV):	TWA 10mg/m^3(total dust); TWA 3mg/m^3(respirable fraction)
China (PC):	TWA 8mg/m^3(total dust)

Crystalline silica

UK:	TWA 0.1mg/m^3(respirable)

(Contd. on page 5)

USA-ACGIH (TLV):	TWA 0.025mg/m^3(respirable fraction)
USA-NIOSH (REL):	TWA 0.05mg/m^3(respirable dust)
Alumina	
UK:	TWA 10mg/m^3(inhalable dust); TWA 4mg/m^3(respirable dust)
USA-OSHA (PEL):	TWA 15mg/m^3(total dust); TWA 5mg/m^3(respirable fraction)
China (PC):	TWA 4mg/m^3(total dust)

8.1.2 Biological exposure limits

No data available.

8.2 Appropriate engineering controls

Use general and/or local exhaust ventilation to keep exposure levels below applicable exposure limits. Ensure that eyewash stations and safety showers are close to the workstation location.

8.3 Individual protection measures, such as personal protective equipment (PPE)

(a) Eye/face protection

Wear safety glasses with side shields (or goggles).

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU).

(b) Skin protection

Wear protective gloves and long sleeved clothing.

Gloves must be inspected before each use. Replace them if necessary (e.g. pinhole leaks). Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance(s) at the specific workplace.

(c) Respiratory protection

Use a NIOSH/MSHA or European Standard EN 149 approved respirator when ventilation is inadequate.

Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU)。

(d) Thermal hazards

Wear appropriate thermal protective clothing, when necessary. When handling wear appropriate gloves, such as Nomex, to prevent thermal burns.

9 Physical and Chemical Properties

(a) Appearance (physical state, colour etc):	White powder
(b) Odour:	Odorless
(c) Odour threshold:	Not applicable
(d) pH(aqueous suspension):	6.5-8.5
(e) Melting point/freezing point:	1830-1850℃(3326-3362℉)
(f) Initial boiling point and boiling range:	2500-3000℃(4532-5432℉)
(g) Flash point:	Not applicable
(h) Evaporation rate:	Not applicable
(i) Flammability (solid, gas):	Non-flammable solid
(j) Upper/lower flammability or explosive limits:	Not applicable

(Contd. on page 6)

(k) Vapour pressure:	Not applicable
(l) Vapour density:	Not applicable
(m) Relative density(water=1):	4.3
(n) Solubility(ies):	Insoluble in water, hydrochloric acid, nitric acid, dilute sulfuric acid, dilute alkalis and organic solvents. Dissolves slowly in hydrofluoric acid and hot concentrated sulfuric acid.
(o) Partition coefficient: n-octanol/water:	Not applicable
(p) Auto-ignition temperature:	Not applicable
(q) Decomposition temperature:	Not available
(r) Viscosity:	Not applicable
(s) Explosive properties:	Non-explosive
(t) Oxidising properties:	Non-oxidizing

10 Stability and Reactivity

10.1 Reactivity

Not reactive under normal conditions of use.

10.2 Chemical stability

Stable under normal storage and handling conditions.

10.3 Possibility of hazardous reactions

Hazardous polymerization will not occur. No hazardous reaction known under conditions of normal use.

The reaction of titanium dioxide and lithium occurs around 200℃(392℉) with a flash of light; the temperature can reach 900℃(1652℉). A violent or incandescent reaction with metals (aluminum, calcium, magnesium, potassium, sodium, zinc, and lithium) may occur at high temperatures.

10.4 Conditions to avoid

Dust, moisture, and incompatibles.

10.5 Incompatible materials

Strong reducing agents, strong acids.

10.6 Hazardous decomposition products

None known.

11 Toxicological Information

11.1 (a) Acute toxicity

Titanium dioxide is practically nontoxic via the oral and dermal routes. However, may be harmful if this product is inhaled or swallowed.

Component	Species	Route	Results
Titanium dioxide	Rat	Oral	LD_{50}>10,000 mg/kg
	Hamaster	Dermal	LD_{50}≥10,000 mg/kg
	Rat	Inhalation	LC>6.82 mg/L/4H
	Rat	Intratracheal	LD>100μg/kg
Crystalline silica	Rat	Intratracheal	LDLo=200mg/kg

(Contd. on page 7)

Crystalline silica	Rat	Intravenous	LDLo=90mg/kg
	Mouse	Intratracheal	LD>20mg/kg
	Human	Inhalation	TCLo=16mppcf/8H/17
	Human	Inhalation	LCLo= 300μg/m^3/10Y
Alumina	Rat	Oral	LD_{50}>5,000 mg/kg
	Rabbit	Inhalation	LC_{50}>1.9 mg/L/4H

(b) Skin corrosion/irritation

Not corrosive to skin. Dusts or powder may cause slight skin irritation. Prolonged and repeated exposure can cause defatting and drying of the skin resulting in skin irritation and dermatitis.

CAS# 13463-67-7:	Skin irritation- rabbit (LUCLID 2000)	Not irritating, slightly irritating
	Draize test, human, skin: 300μg/3d (intermittent)	Mild

(c) Serious eye damage/irritation

Dusts or powder can cause mild eye irritation.

CAS# 13463-67-7:	Eye irritation- rabbit (LUCLID 2000)	Mild
CAS# 14808-60-7:	Draize test, rabbit, eye: 25mg/24H	Mild

(d) Respiratory or skin sensitization

CAS# 13463-67-7:	Maurer optimization test, Guinea pig skin	Not sensitizing
	Patch test, Human skin	Not sensitizing

(e) Germ cell mutagenicity

Titanium dioxide (CAS# 13463-67-7):

In *vivo*, Drosophila SLRL test: Negative (Drosophila melanogaster)

In *vitro*, Ames: Negative (Salmonella typhimurium, Metabolic activation: with/without)

Crystalline silica (CAS# 14808-60-7):

Most cellular genotoxicity assays with crystalline silica have been performed with quartz samples. Some studies gave positive results, but most were negative.

Alumina (CAS# 1344-28-1):

According to reports concerning experimental genotoxicity studies, the results suggest that Al_2O_3 nanomaterials (NMs) are able to cause genotoxic effects in vivo. But there is no indication that the substance (bulk material) is mutagenic.

(f) Carcinogenicity

This product contains 2-3% crystalline silica and may cause cancer.

There is inadequate evidence in humans for the carcinogenicity of titanium dioxide, but there is sufficient evidence in experimental animals: Inhalation exposure in rats caused an increased incidence of lung cancer.

Ingredient	CAS#	IARC	ACGIH	NTP	OSHA	NIOSH	CA Prop 65
Titanium dioxide	13463-67-7	2B	A4		S	Listed	Listed
Crystalline silica	14808-60-7	1	A2	K	S	Listed	Listed

1 - Known human carcinogen
2B - Possibly carcinogenic to humans
A2 - Suspected human carcinogen
A4 - Not classifiable as a human carcinogen
K - Known to be a human carcinogen
S - Select carcinogen

(g) Reproductive toxicity

No reproductive studies were found.

(Contd. on page 8)

(h) STOT-single exposure

May cause respiratory irritation.

(i) STOT-repeated exposure

Causes damage to organs (lung, respiratory organs, kidneys) through prolonged or repeated exposure.

(j) Aspiration hazard

Not an aspiration hazard.

12 Ecological Information

12.1 Toxicity

May cause long lasting harmful effects to aquatic life. Since this product is a metallic compound, and behavior in water is unknown, though no acute toxicity is reported within the saturated aqueous solution.

Titanium dioxide (CAS# 13463-67-7):

Fish: Leuciscus idus, 48h, LC_0	≥1000 mg/L
Aquatic invertebrates: Daphnia magna, 30d, EC_0	≥3 mg/L
Bacteria: Pseudomonas fluorescens, 24h, EC_0	＞5000 mg/L

Alumina (CAS# 1344-28-1):

Fish: Salmo trutta, 96h, NOEC	＞100 mg/L
Aquatic invertebrates: Daphnia magna, 48h, NOEC	＞100 mg/L
Alage: Selenastrum capricornutum, 72h, NOEC	＞100 mg/L

12.2 Persistence and degradability

Studies on biodegradation are not applicable to inorganic substances.

12.3 Bioaccumulative potential

Bioaccumulation is unlikely to be significant.

12.4 Mobility in soil

This product is immobile in soil. It is insoluble in water and will adhere to sediments.

12.5 Other adverse effects

Avoid release to the environment.

13 Disposal Considerations

13.1 Disposal methods

Product: Recycle to process, if possible. Offer surplus and non-recyclable solutions to a licensed disposal company. Do not dispose product into drains, sewers, waterways or soil. Regulations may vary in different locations. Disposal must be in accordance with applicable federal, state/provicial, and local regulations.

Contaminated packaging: Empty containers should be taken to an approved waste handling site for recycling or disposal.

14 Transport Information

14.1 UN number: Not applicable

14.2 UN proper shipping name: Not applicable

14.3 Transport hazard class(es):

ADR/RID: Not regulated

(Contd. on page 9)

IMDG: Not regulated
ICAO/IATA: Not regulated

14.4 Packing group: Not applicable

14.5 Environmental hazards: Not classified as a marine pollutant

14.6 Special precautions for user: Not applicable

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not applicable

15 Regulatory Information

15.1 Safety, health and environmental regulations specific for the product in question

EU regulations

- **Regulation (EC) No 1907/2006 (REACH)**

  Annex XIV - List of substances subject to authorisation

  Not listed.

  Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles

  Not applicable.

- **Regulation (EC) No 689/2008**

  All components are not listed in the Annex I of Regulation (EC) No 689/2008 concerning the export and import of dangerous chemicals.

- **EINECS inventory status**

  All substances are listed on EINECS inventory.

- **Water hazard class (Germany)**

  Non-hazardous to water.

US federal regulations

- **TSCA inventory status**

  All substances are listed on the TSCA inventory.

- **CERCLA hazardous substances and corresponding RQs**

  None of the chemicals in this material have an RQ.

- **Clean Air Act**

  This material does not contain any hazardous air pollutants.
  This material does not contain any Class 1 Ozone depletors.
  This material does not contain any Class 2 Ozone depletors.

- **Clean Water Act (CWA)**

  None of the chemicals in this product are listed as Hazardous Substances under the CWA.
  None of the chemicals in this product are listed as Priority Pollutants under the CWA.
  None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

- **SARA Title III**

  - Section 302 Extremely hazardous substances: None.
  - Section 313 Toxic chemicals: None.
  - Section 311/312 Hazard classes

  Immediate (acute) health hazard: Yes
  Delayed (chronic) health hazard: Yes

(Contd. on page 10)

Fire hazard:	No
Sudden release of pressure hazard:	No
Reactive hazard:	No

- **California Proposition 65**

  This product contains chemicals known to the State of California to cause cancer: Titanium dioxide and Crystalline silica.

16 Other Information

(a) Creation/Issue date

January 1, 2013

(b) Abbreviations and acronyms

GHS	Globally Harmonized System of Classification and Labelling of Chemicals
ACGIH	American Conference of Governmental Industrial Hygienists
OSHA	Occupational Safety and Health Administration
NTP	National Toxicology Program
NIOSH	National Institute for Occupational Safety and Health
IARC	International Agency for Research on Cancer
ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
RID	Regulations concerning the International Transport of Dangerous Goods by Rail
IMDG	International Maritime Code for Dangerous Goods
ICAO	International Civil Aviation Organization
IATA	International Air Transport Association
MARPOL 73/78	International convention for the prevention of pollution from ships, 1973 as modified by the protocol of 1978
IBC Code	International code for the construction and equipment of ships carrying dangerous chemicals in bulk
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
EINECS	European Inventory of Existing Commercial Chemical Substances
TSCA	Toxic Substance Control Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
SARA	Superfund Amendments and Reauthorization Act

(c) Key literature references

• IARC Monograph Vol. 93, 2010
• IARC Monograph Vol. 68, 1997
• UBA (Federal Environment Agency of German), Administrative Regulation on the Classification of Substances hazardous to waters into Water Hazard Classes (VwVwS), Berlin, German, July 27, 2005

Disclaimer: *The contents of this SDS are based on material and information available as of today and may be revised due to knowledge newly obtained. The values of concentration, physical/chemical properties are not guaranteed. In addition, the precautions described herein apply only to normal uses, and thus safety cannot be guaranteed.*

**********End of Safety Data Sheet**********