Safety Data Sheet

Silver Nitrate

1st Version : May. 21. 2007
Revised : Feb. 28. 2024

1. Product and company information

Product Name :	Silver Nitrate
Company Name :	Toyo Chemical Industrial Co., Ltd.
Address :	2-26-13, Naka-Izumi, Komae-City, Tokyo
Tel :	+81-3-3489-5152
Fax :	+81-3-3488-1706
Emergency Contact :	As above
Recommended use of the product and restrictions on use :	Silver plating, silver powder, antibacterial agents, mirrors, analytical reagents, catalysts

2. Hazard identification

GHS classification of the substance

Physicochemical hazards :	Oxidizing solids	Category 2
Health hazards :	Acute toxicity, oral	Category 4
	Skin corrosion/irritation	Category 1
	Serious eye damage/eye irritation	Category 1
	Specific target organ toxicity, single exposure	Category 3 (Respiratory tract irritation)
	Specific target organ toxicity, repeated exposure	Category 1 (Respiratory system)
Environmental hazards :	Hazardous to the aquatic environment, acute hazard	Category 1
	Hazardous to the aquatic environment, chronic hazard	Category 1

GHS Label elements

Pictograms :

Signal word : Danger

Hazard statements :

H272 : May intensity fire; oxidizer
H302 : Harmful if swallowed
H314 : Causes severe skin burns and eye damage
H318 : Causes serious eye damage
H335 : May cause respiratory irritation
H372 : Cause damage to organs through prolonged or repeated exposure
H400 : Very toxic to aquatic life
H410 : Very toxic to aquatic life with long-lasting effects

Precautionary statement

Safety measures :

P210 : Keep away from heat, hot surface, sparks, open flames and other ignition sources.
- No smoking.
P220 : Keep away from clothing and other combustible materials.
P260 : Do not breathe dust/fume/gas/mist/vapors/spray.
P261 : Avoid breathing dust/fume/gas/mist/vapors/spray.
P264 : Wash hands thoroughly after handling.
P270 : Do not 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.

Emergency measures :
P310 : Immediately call doctor/physician.
P312 : Call a doctor/if you feel unwell.
P314 : Get medical advice/attention if you feel unwell.
P321 : Specific treatment (see"First Aid" on this label).
P330 : Rinse mouth.
P301 + P312 : If swallowed : Call a doctor/... IF you feel unwell.
P304 + P340 : If inhaled : Remove person to fresh air and keep comfortable for breathing.
P301 + P330 + P331 : If swallowed : Rinse mouth. Do not induce vomiting.
P303 + P361 + P353 : If on skin (or hair) : Take off Immediately all contaminated clothing. Rinse skin with water [or shower].
P305 + P351 + P338 : If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P362 + P364 : Take off contaminated clothing and wash it before reuse.
P363 : Wash contaminated clothing before reuse.
P370 + P378 : In case of fire: Use water spray, foam retardants, powder retardants (excluding hydrogen carbonate), dry sand to extinguish.
P391 : Collect spillage.

Storage :
P403 + P233 : Store in a well-ventilated place. Keep container tightly closed.
P405 : Store locked up.

Disposal :
P501 : Dispose of contents/container entrust to a specialized waste disposal company.

3. Composition/information on ingredients

Substance or Mixture : Substance

Chemical name	Molecular formula (molecular weight)	CAS No.	Reference numbers in gazetted list in Japan (CSCL)	Reference numbers in gazetted list in Japan (ISHL)	Concentration or concentration range
Silver(I) Nitrate	$AgNO_3$ (169.87)	7761-88-8	1-8	1-8	100%

4. First-aid measures

Inhalation :
Remove victim to fresh air and keep at rest in a position comfortable for breathing.
Get medical advice/attention if you feel unwell.

Skin contact :
Take off or remove immediately all contaminated clothing.
Wash with plenty of water/soap.
Immediately call a doctor.

Eye contact :
Rinse cautiously with water for several minutes.
Remove contact lenses if present and easy to do.
Continue rinsing.
Immediately call a doctor.

Ingestion :
Rinse mouth.
Get medical advice/attention if you feel unwell.

Protection of people implementing emergency measures :
Wear protective equipment.
(See section 8. Exposure controls / personal protection)

5. Fire-fighting measures

Suitable extinguishing media :
Water spray, foam retardants, powder retardants (excluding hydrogen carbonate), dry sand, etc.

Do not use extinguishing media :
Carbon dioxide gas, and hydrogen carbonate powder fire extinguisher.

Specific hazards :
This substance can produce irritating, corrosive or toxic gases in a fire.
The fire extinguishing water might cause pollution.

Specific fire extinguishing method :	Move the container from the region on fire if there is no danger. Thoroughly cool the containers using copious amounts of water even after the fire has been extinguished. If it cannot be moved, cool it by sprinkling water around the container and its surroundings.
Special protective actions fire-fighters :	Wear suitable air respirators and protective clothing (heat resistant). (See section 8. Exposure controls / personal protection)

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures :	Workers must wear appropriate protective equipment (see section 8. Exposure controls / personal protection) and avoid contact with eyes and skin and inhalation. Do not touch the leakage and do not walk on it. Immediately isolate appropriate distances in all directions as leak areas. Prohibit the entrance except the person concerned. Eliminate all ignition sources.
Environmental precautions:	Avoid discharging into the environment.
Methods and materials for containment and cleaning up :	No information
Collection and neutralization :	No information
Preventing secondary accidents :	No information

7. Handling and storage

Handling	
Technical measures :	Take the equipment measures described in "8. Exposure controls/personal protection" and wear protective equipment. Described in "8. Exposure controls/personal protection" perform local exhaust and general ventilation.
Precautions for safe handling :	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling. Avoid swallowing. Do not put it in eyes. Avoid discharging into the environment.
Contact evasion :	See “10. Stability and reactivity” section.
Storage	
Safe storage conditions :	Store locked up. Store in a closed container, dry and cool place. Store in a dark place away from direct sunlight.
Container and packing materials :	Airtight containers (glass, polyethylene, stainless steel, etc.)

8. Exposure controls/personal protection

Control concentration :	Not set
Tolerable concentration :	
Japan Society for Occupational Health (2021)	0.01mg/m^3 as Ag
ACGIH (2014)	TLV-TWA 0.01mg/m^3 as Ag Soluble compounds
Equipment measures :	Workplaces storing or handling this material should be equipped with an eyewash facilities and safety shower. Enclose the equipment or install a local exhaust ventilation to prevent exposure.
Protective Equipment	
Respiratory protection :	Wear suitable respiratory protection (gas mask (in case of fire: air respirator), dust mask). (Refer to JIS T8151 Particulate respirators, JIS T8152 Gas respirators, JIS T8155 Compressed air open-circuit self-contained breathing apparatus)

Hand protection :	Wear suitable protective gloves. (rubber gloves, etc.) (Refer to JIS T8116 Chemical protective gloves)
Eye protection :	Wear suitable eye protection (regular glasses, plain glasses with side plates, goggles). (Refer to JIS T8147 Protective Glasses)
Skin and body protection :	Wear suitable protective clothing, and protective boots, etc. (Refer to JIS T8115 Chemical Protective Clothing, JIS T8117 Chemical Protective Boots)

9. Physical and chemical properties

Physical state :	Solid : ICSC(2004)
Color :	Colorless to white : ICSC(2004)
Odor :	No information
Melting point/freezing point :	212℃ (melting point) : GESTIS(2014)
Boiling point, initial boiling point, and boiling range :	440℃(disassembly) : HSDB(2014)
Dlammability :	Incombustibility : ICSC (1998)
Lower and upper explosion limit / flammability limit :	Solids are not applicable
Flash point :	Solids are not applicable
Aut-ignition temperature :	Incombustibility : ICSC (1998)
Decomposition temperature :	440℃ : HSDB(2014)
pH :	Aqueous solution is litmus two allegiances (pH about 6) : HSDB(2006)
Kinematic viscosity :	Solids are not applicable
Solubility :	Water : 245g/100g : HSDB(2014)
Partition coefficient: n-octanol / water (log value) :	Water : 2,160g/L(20℃) : GESTIS(2015) No information
Vapor pressure :	No information
Density and/or relative density	d^{19} 4.35
Relative vapour density :	Solids are not applicable
Particle characteristics	No information

10. Stability and reactivity

Reactivity :	No information
Chemical stability :	Storage and handling in accordance with laws and regulations is considered stable.
Possibility of hazardous reactions :	Chemical dangers : This substance is decompose when heated to produce nitrogen oxide and or toxic fumes. The substance is a strong oxidant and reacts violently with combustible or reducing substances. This substance is reacts with acetylene, alkalis, halides and many incompatible compounds causing fire and explosion hazard. The danger of a fire and the explosion is posed. Erodes some plastics, rubbers and coatings.
Conditions to avoided :	Keep away from combustible and reducing substances.
Incompatible materisls :	Combustible substances, reducing substances
Hazardous decomposition products :	Silver, nitrogen oxides

11. Toxicological information

Acute toxicity	
Oral :	Based on the report that the rat LD50 value was 1,170 mg / kg (IUCLID (2000)), it was classified into Category 4.
Dermal :	Classification is not possible due to lack of data.
Inhalation : Gases	The definition of GHS is a solid.
Inhalation : Vapours	The definition of GHS is a solid.
Inhalation : Dusts and mists	Classification is not possible due to lack of data.

Skin corrosios/irritation :	This substance is stated to cause corrosiveness to the skin (CICAD 44 (2003)). And a chemical burn by the contact with skin is reported in occupation exposure. (ATSDR (1990)) Based on the above results, it was set as Category 1. The substance is classified into "C; R34" in the EU DSD classification and "Skin Corr. 1B H314" in the EU CLP classification.
Serious eye damage/irritation :	This substance causes severe causticity in eyes mention.(CICAD 44(2003)) And a chemical burn by the contact with eyes is reported in occupation exposure. (ATSDR (1990)) The substance is further classified as Category 1 for skin corrosion / irritation. Based on the above results, it was set as Category 1. The substance is classified into "C; R34" in the EU DSD classification and "Skin Corr. 1B H314" in the EU CLP classification.
Respiratory sensitization :	Classification is not possible due to lack of data.
Skin sensitization :	Classification is not possible due to lack of data.
Germ-cell mutagenicity :	Classification is not possible due to lack of data.
Carcinogenicity :	Classification is not possible due to lack of data.
Reproductive toxicity :	Classification is not possible due to lack of data. Intrauterine administration to pregnant monkeys showed vaginal bleeding and miscarriage. But it has been reported that subsequent recrossing gave birth to a normal baby. (PATTY (6th, 2012),ACGIH (7th, 2001),ATSDR (1990)). Since this was not a normal human exposure route, it was not used for classification. Based on the above, classification was not possible due to lack of data. In the old classification, direct injection into the testis may have an effect on the testis (such as tubule necrosis) since it was observed it was classified in Category 2. However, this study is not reliable because it is not a standard protocol or route of administration and its effects are not well documented (IUCLID (2000) is described in. In addition, since it had only effects on the testes and had no known effects on reproduction, changed to "cannot be classified for category 2".
Specific target organ toxicity (single exposure) :	This material is corrosive, and there is respiratory tract acridity (ATSDR (1990)、PATTY (6th, 2012)). In humans, inhalation of dust causes irritation of the respiratory tract mucous membranes, acute oral toxic symptoms such as burning and pain in the mouth, salivation, vomiting, abdominal pain, diarrhea, severe gastroenteritis, decreased blood pressure, decreased respiratory rate, and dizziness, convulsions, diaphragmatic paralysis, coma, central nervous system disorders, and death have been reported. (HSDB (Access on September 2014)). There are no data of the laboratory animal. From the above, there is a statement showing the effect on the central nervous system, but only the information source List 2, HSDB, could not confirm the original, so the central nervous system was not adopted. In the old classification, the effects of methemoglobinemia and cyanosis on the blood system in laboratory animals (Category 1 (blood system)) were adopted using the information source of List 3 in humans and experimental animals. No blood system was adopted because there was no description indicating the effect on blood system in List1 and List 2 and the original author could not be confirmed from the information source of List 3 indicated by the old classification. Therefore, the substance was considered to have respiratory tract irritation and was classified into Category 3 (respiratory irritants).
Specific target organ toxicity (repeated exposure) :	Twenty-five out of thirty workers exposed to silver dust for less than one year to more than ten years at a silver nitrate and silver oxide manufacturing plant suffered upper airway irritation (sneezing, runny nose, stuffy nose, and sore throat), according to the report, 10 people complained of abdominal pain (reduced by antacids due to severe pain) (ATSDR (1990), ACGIH (7th, 2001)). Of these, abdominal pain may be due to mucous membrane irritation caused by ingestion of part of the dust, and in a small number of cases (1/3 of the total), diarrhea, vomiting, etc.

It was thought that the target organ should not be targeted.
In experimental animals, rats received 222mg Ag/kg/day (equivalent to 349.6 mg/kg day) of this substance, 37-week study of drinking water showed an increase in mortality after week23, but no description of organ toxicity other than ocular silverosis (ACGIH(7th,2001)).
Also, 89 mg Ag / kg / day for rats (Equivalent to 140 mg / kg / day) was administered as water for 9 months, and there was hypertrophy of the left ventricle (ATSDR (1990), ACGIH (7th,2001)).
However, no cardiovascular effects have been reported in human and other animal studies, and the results are considered unreliable (ATSDR (1990)).
In addition, there are not the data available for a classification in laboratory animals.
Based on the above, it was classified into Category 1 (respiratory).
In the old classification, “kidney” and “cardiovascular system” were targeted organs based on data from the information source of List 3,
but the reason why “cardiovascular system” was deleted is as described above.
Regarding the kidney, there is a possibility that silver deposition on the kidney may adversely affect renal function, but there is no evidence in animal studies.
Occupational exposure has no data linking silver exposure to renal dysfunction in humans, and there is insufficient evidence to target kidney (ATSDR (1990)), kidney was removed from the target organs.

Aspiration hazard : Classification is not possible due to lack of data.

12. Ecological information

Toxicity

Hazardous to the aquatic environment (acute) : 48-hour EC50 of crustacea (Daphnia magna) = 0.0006 mg / L (CERI Hazard Data Collection, 2002), (Silver nitrate (Ⅰ) concentration conversion value: 0.0013 mg / L), Based on the above, it was set as Category 1.

Hazardous to the aquatic environment (chronic) : Acute toxicity Category 1, metal compound behavior in water is unknown, and bioaccumulative (BCF = 600 (existing chemical substance safety inspection data)).
Based on the above, it was classified into Category 1.

Persistence and degradability : No information

Bioaccumulative potential : No information

Mobility in soil : No information

Hazardous to the ozone layer : The materials concerned are not listed by an affiliated book of Montreal Protocol.

13. Disposal consideations

Residual waste : Prior to disposal, treatments such as detoxification, stabilization and neutralization are carried out to the extent possible to reduce the hazard level.
Dispose of in accordance with relevant laws and local government standards.
Outsource to an industrial waste disposal contractor licensed by the prefectural governor, or if a local public entity does the disposal, outsource it there.
If outsourcing waste disposal, thoroughly notify the disposal companies of the dangers and harmfulness before outsourcing.
Avoid discharging wastewater and washing wastewater containing this substance directly into rivers, or landfill, or dumping.

Dirty containers and packaging : Containers should be cleaned and recycled or disposed properly in accordance with relevant laws and local government standards.
When disposing of empty containers, make sure to discard the contents completely.

14. Transport information

International regulations

UN No. : 1493

Proper shipping name : SILVER NITRATE

Class : 5.1

Packing group : II

Marine pollutant (sea) :	Applicable
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC code :	Not applicable

Japanese regulations

Land regulations information :	Obey poisonous and deleterious substances control act and fire services act regulations.
Maritime regulations information :	Obey ship safety law regulations.
Aviation regulations information :	Obey the civil aeronautics law.
Special safety measures :	Yellow card must be held required during transport. Do not transport together with food or livestock feed. Do not add heavy goods. When transporting, avoid direct sunlight, load containers without damage, corrosion, or leakage, and securely prevent collapse of cargo.
Urgent measures during a crisis policy number :	140

15. Regulatory information (Japanese law)

Fire service act :	Hazardous materials Category I Nitrates Class 3 oxidizing solid (Specified quantity : 1,000kg)
Poisonous and deleterious substances control act :	Deleterious substances(Cabinet order) Article 2-1-24 of cabinet order
Industrial safety and health act :	Hazardous material (oxidizing substance) Dangerous or Harmful Substances Subject to Be Indicated their Names (Article 57 of the act, Article 18 of the Cabinet Order, Appendix Table 9) Dangerous or Harmful Substances Whose Names, etc. Should Be Notified (Article 57-2 of the act, Article 18-2 of the Cabinet Order, Appendix Table 9) Dangerous or Harmful Substances for which a risk assessment should be conducted (Article 57-3 of the act) Ordinance on industrial safety and health Article 594-2
PRTR :	Class I designated chemical substance (Appended table 1 105 Silver and its water-soluble compounds.)
Air pollution control act :	Hazardous air pollutants (45 of Central environment council 9th report)
Water pollution control act :	Harmful substances (Law art.2, Enforcement order art.2, ordinace designatin wastewater standards art.1)
Ship safety act :	Oxidizing substance
Civil aeronautics act :	Oxidizing substance
Act on port regulations :	Oxidizing substance

＊Laws and regulations are examples and do not cover domestic laws and regulations.

16. Other information

References, etc. :	GHS classification results database: NITE website GHS model SDS information: JISHA website Ministry of health, labor and welfare website JIS Z7252：2019 JIS Z7253：2019 Selection Manual for Protective Equipment for Prevention of Skin Damage, etc. (Ministry of Health, Labour and Welfare Feb.2024)

*Caution:

Althoug hazard and harmfulness evaluations are based on the data and information available at the current time, they may not be sufficient.

Please handle with care.

Furthermore, the data and evaluations described herein are not in any way guaranteed. The descriptions refer to normal handling. Regarding special handling, please handle based on the safty measures which are suitable for the intended applications and methods of use.

This SDS is an English translation of a document prepared in Japanese in accordance with JIS Z7253:2019.