Safety Data Sheet

Palladium(II) Sulfate Solution

1st Version : July. 29. 2010
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1. Product and company information

Product Name :	Palladium(II) Sulfate Solution
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 :	Palladium plating, catalysts

2. Hazard identification

GHS classification of the substance

Health hazards :	Acute toxicity, Inhalation : Dusts and mists	Category 2
	Skin corrosios/irritation	Category 1A-1C
	Serious eye damage/irritation	Category 1
	Specific target organ toxicity, single exposure	Category 1 (respiratory)
	Specific target organ toxicity, repeated exposure	Category 1 (respiratory)
Environmental hazards :	Hazardous to the aquatic environment, acute hazard	Category 3
	Hazardous to the aquatic environment, chronic hazard	Category 1

GHS Label elements

Pictograms :

Signal word : Danger

Hazard statements :

H314 : Causes severe skin burns and eye damage
H318 : Causes serious eye damage
H330 : Fatal if inhaled (Dusts and mists)
H370 : Causes damage to organs (respiratory)
H372 : Causes damage to organs through prolonged or repeated exposure (respiratory)
H402 : Harmful to aquatic life
H410 : Very toxic to aquatic life with long-lasting effects

Precautionary statement

Safety measures :

P260 : Do not breathe dust/fume/gas/mist/vapors/spray.
P264 : Wash hand 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.
P284 : [In case of inadequate ventilation] Wear respiratory protection.

Emergency measures :	P310 : Immediately call a doctor/physician.
	P314 : Get medical advice/attention if you feel unwell.
	P363 : Wash contaminated clothing before reuse.
	P391 : Collect spillage.
	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.
	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 + P311 : If exposed or concerned: Call a Poison Center/doctor/...
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
Palladium(II) Sulfate	$PdSO_4$ (202.48)	13566-03-5	—	1-(3)-375	7.6 %
Sulfuric acid	H_2SO_4 (98.08)	7664-93-9	1-430	—	33.0 %
Water	H_2O (18.02)	7732-18-5	—	—	59.4 %

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 contaminated clothing, shoes, etc.
	Rinse skin immediately with water.
	If changes in appearance manifest, or pain continues, consult a physician.
Eye contact :	Rinse cautiously with water for several minutes.
	Remove contact lenses if present and easy to do.
	Continue rinsing.
	If eye irritation persists : Get medical advice/attention.
Ingestion :	Rinse mouth.
	Get medical advice/attention if you feel unwell.
Most important symptoms/effects, acute and delayed :	Corrosiveness, burning sensation, sore throat, cough, breathlessness, shortness of breath, redness, pain, blisters, severe skin burns, abdominal pain, shock or collapse.
Protection of people implementing emergency measures :	Rescuers should wear suitable protective equipment according to the circumstances. (See section 8. Exposure controls / personal protection)
Special precautions for physicians :	Symptoms of pulmonary edema are often unknown until a few hours have passed, so rest and follow-up are required.

5. Fire-fighting measures

Suitable extinguishing media :	This substance does not burn itself.
	Use extinguishing media appropriate for surrounding fire.
Do not use extinguishing media :	No information
Specific hazards :	This substance is nonflammable and does not burn itself, but can decompose when heated to outbreak harmful gas(SOx), so wear protective equipment when firefighting.

Characteristic extinguishing methods :	In case of fire in the surroundings, immediately move the container to a safe place. If it cannot be moved, cool it by spraying water around the container and its surroundings. In case of ignition, extinguish with large amounts of water. At this time, care should be taken so that the concentrated waste liquid is not discharged into rivers.
Protection of firefighters :	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. Ventilate enclosed area before entering.
Environmental precautions:	Avoid discharging into the environment.
Methods and materials for containment and cleaning up :	No information
Collection and neutralization :	Collect spills from containers, neutralize using soda ash, etc., and rinse off with plenty of water.
Preventing secondary accidents :	Prevent inflow to drainage ditches, sewers, cellars, or sealed locations.

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 :	Do not handle until all safety precautions have been read and understood. Do not eat, drink or smoke when using this product. Do not contact, inhale or swallow. Use only outdoors or in a well-ventilated area. Wash hands thoroughly after handling. Avoid release to the environment.
Contact evasion :	See “10. Stability and reactivity” section.

Storage

Safe storage conditions :	Store in keep away from heat, strong alkalis and contact with reducing substances. Store locked up. Store in a closed container, and well-ventilated place.
Container and packing materials :	Use containers regulated by UN transportation laws.

8. Exposure controls/personal protection

Control concentration :	No information
Tolerable concentration :	
Japan Society for Occupational Health (2021)	1 mg/m^3 (as Sulfuric acid)
ACGIH (2014)	0.2 mg/m^3 (TLV-TWA) (as Sulfuric acid)
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 (such as air supply mask, air respirator, or oxygen respirator). (Refer to JIS T8153 Supplied-air respirators, JIS T8155 Compressed air open-circuit self-contained breathing apparatus, JIS T8156 Oxygen-Generating Closed-Circuit Breathing Apparatus)

Hand protection :	Wear suitable protective gloves. (neoprene gloves, etc.) (Refer to JIS T8116 Chemical protective gloves)
Eye protection :	Wear suitable eye protective equipment. (goggles, etc.) (Refer to JIS T8147 Protective Glasses)
Skin and body protection :	Wear suitable protective face equipment, clothing, and protective shoes, etc. (Impermeable protective clothing, protective boots, etc.) (Refer to JIS T8115 Chemical Protective Clothing, JIS T8117 Chemical Protective Boots)

9. Physical and chemical properties

Physical state :	Liquid
Color :	Reddish-brown
Odor :	Odorless
Melting point/freezing point :	No information
Boiling point, initial boiling point, and boiling range :	No information
Dlammability :	No information
Lower and upper explosion limit / flammability limit :	No information
Flash point :	No information
Aut-ignition temperature :	No information
Decomposition temperature :	No information
pH :	≦1
Kinematic viscosity :	No information
Solubility :	Mix arbitrarily in water
Partition coefficient: n-octanol / water (log value) :	No information
Vapor pressure :	No information
Density and/or relative density	About 1.2～1.3
Relative vapour density :	No information
Particle characteristics :	No information

10. Stability and reactivity

Reactivity :	No information
Chemical stability :	No information
Possibility of hazardous reactions :	It is reduced to metallic palladium by a strong reducing agent. Contact with metal, or exposure to high temperatures generates harmful gases (SOx). Contact or mixture with flammable substances may cause heating and ignition due to the catalytic reaction of palladium.
Conditions to avoided :	Heat , Humidity
Incompatible materisls :	Reducing agents, metals, strong alkalis, and organic substances
Hazardous decomposition products :	Sulfur oxides

11. Toxicological information

Acute toxicity	
Oral:	Based on sulfuric acid oral rat LD_{50} value 2,140mg / kg (SIDS (2001)), and reports of deaths from human ingestion (the amount is unknown), it was classified into Category 5. (As Sulfuric acid)
Dermal :	Classification is not possible due to lack of data.
Inhalation : Gases	The definition of GHS is a liquid.
Inhalation : Vapours	The definition of GHS is a liquid.
Inhalation : Dusts and mists	Based on sulfuric acid rat LC_{50} value (4 hour exposure): 0.375 mg / L (SIDS (2001)) and (1 hour exposure): 7 ppm (4 hour equivalent: 0.347 mg / L) (SIDS (2001)), it was classified into Category 2. (As Sulfuric acid)

Skin corrosios/irritation :	Since the pH is 1 or less, it was determined to be corrosive in accordance with the GHS classification criteria and was classified as Category 1. (As Sulfuric acid)
Serious eye damage/irritation :	In a case of personal injury caused by sulfuric acid, severe eye damage accompanied by dissolution of the anterior chamber was observed (ATSDR (1998)), Sulfuric acid caused moderate irritation to rabbit eyes with 5% solution and severe irritation with 10% solution (SIDS (2001)), and pH of sulfuric acid is less than 1, based on these results, it was classified as Category 1. (As Sulfuric acid)
Respiratory sensitization :	Classification is not possible due to lack of data.
Skin sensitization :	There are no experimental data on the skin sensitization of sulfuric acid. Sulfuric acid has been used industrially for decades, but while skin disorders caused by skin irritation are well known, there are no case reports of skin sensitization. There are large amounts of sulfate ions in the body (sulfate ions in serum are ~33 mmol/L, 50 times that in cells), but allergic reactions do not occur. In the allergic test of metal sulfate, it is presumed from the negative result of zinc sulfate that although it may be allergic positive due to metal, it will be negative for sulfate ions. From the above results, it can be concluded that sulfuric acid does not show allergic properties to humans (SIDS, 1998), and it could not be classified. (As Sulfuric acid)
Germ-cell mutagenicity :	In vivo, there is no test data using germ cells or somatic cells, and in vitro mutagenicity tests have positive results only in the test system of a single index (chromosomal aberration test) (ATSDR, 1998), but since they are negative for other indicators, they cannot be classified. (As Sulfuric acid)
Carcinogenicity :	Occupational exposure to mist of inorganic strong acids containing sulfuric acid is classified as Group 1 in IARC (1992), A2 in ACGIH (2004), and K in NTP (2005), so it is classified as Category 1 in respect of IARC's assessment and recent NTP evaluation, but sulfuric acid itself is classified as Category 4 by DFGOT (vol.15, 2001). Since none of the institutions classified it as carcinogenic, it could not be classified. (As Sulfuric acid)
Reproductive toxicity :	In studies inhaled and exposed during fetal organogenesis in rabbits and mice, no embryotoxicity or teratogenicity was observed in both species at doses that were not toxic to mother animals (SIDS, 2001), and no effects on the reproductive organs of females and males were found in chronic toxicity and carcinogenicity studies, and direct irritating/ corrosive effects were the main toxicity, Since it is judged that there is no concern that there is reproductive toxicity (SIDS, 2001), it does not fall under the category. (As Sulfuric acid)
Specific target organ toxicity (single exposure) :	Sulfuric acid is respiratory tract symptoms such as cough and shortness of breath have been observed with low-level inhalation exposure (DFGOT 2001), at high -level exposures acute effects such as coughing, shortness of breath, and excretion of bloody sputum, as well as permanent effects such as reduced lung function and fibrosis, emphysema were observed (ATSDR 1998), and pulmonary bleeding and dysfunction were observed in guinea pig 8-hour inhalation exposure (ATSDR1998), based on these results, it was classified as Category 1 (respiratory) (As Sulfuric acid)
Specific target organ toxicity (repeated exposure) :	In a 28-day inhalation exposure test of sulfuric acid in rats, cell proliferation was observed in the laryngeal mucosa within the guidance value range of Category 1 (SIDS (2001)), Repeated inhalation exposure test of sulfuric acid in guinea pigs from 14 to 139 days showed airway and lung disorders such as nasal septum edema, emphysema, atelectasis, bronchiolar hyperemia, edema, bleeding and thrombus at concentrations within the guidance value range of Category 1. (ATSDR (1998)), In addition, in a 78-week inhalation exposure study in cynomolgus monkeys, histological findings such as cell hyperplasia and wall thickening in the bronchioles of the lung at doses within the guidance value range of Category 1 (0.048 mg / L, 23.5 hr / day) were performed. Changes were observed (ATSDR (1998), based on these results, it was classified as Category 1 (respiratory). (As Sulfuric acid)
Aspiration hazard :	Classification is not possible due to lack of data.

12. Ecological information

Toxicity

Hazardous to the aquatic environment (acute) :	Based on sulfuric acid 96 hours LC50 = 16-28mg / L ((fish : bluegill)(SIDS (2003)), it was classified into Category 3. (As Sulfuric acid)
Hazardous to the aquatic environment (chronic) :	When chronic toxicity data are used, the environmental kinetics of inorganic compounds are unknown, but NOEC (growth) (pH 6.0) = 0.025 mg/L (OECD SIDS: 2001) for 45 days in fish (Kadayashi) is category 1. Since Kadayashi is ovoviviparous, the results cannot be used for classification, but it was used because it has a large impact on the growth of the target substance and is expected to be equally or more toxic in other fish species. When acute toxicity data are used for trophic stages for which chronic toxicity data have not been obtained, the environmental kinetics of inorganic compounds are unknown, but since it is 24-hour LC50 = 29 mg/L (OECD SIDS: 2001) of crustaceans (Daphnia), it is classified as Category 3. Based on the above results, it was classified as category 1. (As Sulfuric acid)
Persistence and degradability :	No information
Bioaccumulative potential :	No information
Mobility in soil :	No information
Hazard to the ozone layer :	The relevant materials are not listed in the affiliated book of Montreal Protocol.

13. Disposal Precautions

Residual waste :	Recover palladium using reduction roasting or oxidative precipitation. Do not incinerate in an incinerator or the like without a cleaning device because a gas containing harmful components is generated during incineration (It is desirable to outsource to a specialized company). Outsource to an industrial waste disposal ontractor 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 of directly into rivers, or landfill, or dumping.
Dirty containers and packaging :	Containers should be disposed properly according to relevant laws and local government standards. When disposing of empty containers, completely remove the contents.

14. Transport information

International regulations

UN No. :	2796 SULPHURIC ACID (with not more than 51% acid)
Proper shipping name :	SULPHURIC ACID with not more than 51% acid
Class :	Class 8: Corrosive
Sub risk :	No information
Packing group :	II
Marine pollutant (sea) :	Applicable Class Y (sulfuric acid)
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC code :	Applicable Hazardous liquid (Class Y)

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 :	157 (As Sulfuric acid)

15. Regulatory information (Japanese law)

Fire service act:	Substances requiring notification of storage (As Sulfuric acid) 200kg
Poisonous and deleterious substances control act :	Deleterious substance not for medical use Law Article 2 appendix 2-89 (As Sulfuric acid)
Industrial safety and health act :	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 (as Sulfuric acid above)
Ordinance on prevention of hazards Due to specified chemical substances :	Specified chemical substance (Group 3) (As Sulfuric acid)
Regulations for the carriage and storage of dangerous goods in ship :	Corrosive Substances
Civil aeronautics act :	Corrosive Substances

＊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.