

Safety Data Sheet (SDS)

Established Date: 01/Apr./2009
Revised Date: 01/Aug./2023

1. Identification of the Substance and of the Company

Product Identifier: Alloy Tool Steel (including coated or surface-treated Alloy Tool Steel)

Supplier Information:

Company Name: **OSG Corporation**
 Address: **3-22 Honnogahara Toyokawa-City Aichi-Pref.
 442-8543 Japan**
 Contact Department: **Quality Assurance Dept.**
 Phone Number: **(536)25-1315 (International Dept.)**
 FAX Number: **(536)25-1310**
 Emergency Phone Number: **(536)25-1315**

Recommended Use of the Alloy Tool Steel:

Cutting and drilling tools for metallic materials

Restrictions on Use of the Alloy Tool Steel:

Do not use for other than the specified purpose

Attention to the Phase/State of the Alloy Tool Steel:

- Alloy Tool Steel as a solid state is chemically stable and safe from explosives, flammable, combustible, pyrophoric, water reactive, and oxidizable in a normal environment.
- Alloy Tool Steel is safe for use as cutting tools (grinding, machining, rolling for metals) under normal conditions.
- This SDS informs about the dust, fumes or vapors which occur from Alloy Tool Steel producing process such as raw material powder handling and grinding.

2. Hazard Identification

The GHS Classification

Some data (such as the burning rate test data, etc.) for the dust, fumes or vapors which occur from Alloy Tool Steel producing process are unavailable. Therefore, they are not classified by GHS.

The hazards of the individual metal ingredients (cobalt, nickel, chromium, and manganese) that make up the Alloy Tool Steel are classified as follows. In addition, other hazards and harmful effects (health, environmental, physical and chemical) that are not listed are not applicable or classifiable under GHS.

- GHS classification for the hazards of cobalt alone is below.

(When cobalt is included as a metal ingredient of Alloy Tool Steel)

Health Hazard:	<ul style="list-style-type: none"> • Acute toxicity (oral) Category 4 • Acute toxicity (inhalation: dust, mist) Category 1 • Serious eye damage/Eye irritation Category 2B • Respiratory sensitization Category 1A • Skin sensitization Category 1A • Carcinogenicity Category 2 • Reproductive toxicity Category 1B • Specific target organ toxicity (single exposure) Category 1 (respiratory system) • Specific target organ toxicity (repeated exposure) Category 1 (respiratory system, heart, thyroid, blood system, reproductive system (male))
Environmental Hazard:	<ul style="list-style-type: none"> • Hazardous to the aquatic environment – long-term (chronic) Category 1 • Hazardous to the aquatic environment – short-term (acute) Category 1

- GHS classification for the hazards of nickel alone is below.

(When nickel is included as a metal ingredient of Alloy Tool Steel)

Health Hazard:	<ul style="list-style-type: none"> • Respiratory sensitization Category 1 • Skin sensitization Category 1 • Carcinogenicity Category 2 • Specific target organ toxicity (single exposure) Category 1 (respiratory kidney) • Specific target organ toxicity (repeated exposure) Category 1 (respiratory system)
Environmental Hazard:	<ul style="list-style-type: none"> • Hazardous to the aquatic environment – long-term (chronic) Category 4

- GHS classification for the hazards of chromium alone is below.
(When chromium is included as a metal ingredient of Alloy Tool Steel)


Health Hazard:	<ul style="list-style-type: none"> • Serious eye damage Category 2 • Respiratory sensitization Category 1A • Skin sensitization Category 1A • Specific target organ toxicity (single exposure) Category 3 (systemic irritation)
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- GHS classification for the hazards of manganese alone is below.
(When manganese is included as a metal ingredient of Alloy Tool Steel)

Health Hazard:	<ul style="list-style-type: none"> • Skin Corrosion/Irritation Category 3 • Serious eye damage Category 2B • Reproductive toxicity Category 1B • Specific target organ toxicity (single exposure) Category 1 (respiratory system) • Specific target organ toxicity (repeated exposure) Category 1 (nervous system, respiratory system)
Environmental Hazard:	<ul style="list-style-type: none"> • Hazardous to the aquatic environment – long-term (chronic) Category 4

GHS Label Elements

GHS label elements for the individual metal ingredients (cobalt, nickel, chromium and manganese) that make up the Alloy Tool Steel are as follows.

	Cobalt	Nickel	Chromium	Manganese
Hazard Pictograms:				
Signal Words:	Danger			
Hazard Statements:	<ul style="list-style-type: none"> • Harmful if swallowed • Life threatening if inhaled • Eye irritation • Risk of causing allergies, asthma or breathing difficulties if inhaled • Risk of causing an allergic skin reaction 	<ul style="list-style-type: none"> • Risk of causing allergies, asthma or breathing difficulties if inhaled • Risk of causing an allergic skin reaction • May cause cancer • Respiratory and kidney disorders • Respiratory disorder due 	<ul style="list-style-type: none"> • Severe eye irritation • Risk of causing allergies, asthma or breathing difficulties if inhaled • Risk of causing an allergic skin reaction • Risk of respiratory irritation 	<ul style="list-style-type: none"> • Mild skin irritation • Eye irritation • Respiratory disorder • May cause adverse effects on fertility or the unborn child • Nervous and respiratory disorders due to long-term or repeated exposure • May be harmful to

	<p>May cause cancer</p> <ul style="list-style-type: none"> • May cause adverse effects on fertility or the unborn child • Organ disorder (respiratory system) • Organ disorder due to long-term or repeated exposure (respiratory system, heart, thyroid, blood system, reproductive system (male)) • Very toxic to aquatic life • Very toxic to aquatic life due to long-lasting effects 	<p>to long-term or repeated exposure</p> <ul style="list-style-type: none"> • May be harmful to aquatic life due to long-lasting effects 		<p>aquatic life due to long-lasting effects</p>
<p>Precautionary Statements:</p>	<p>【Prevention】</p> <ul style="list-style-type: none"> • Obtain safety instructions* before use. • Do not handle until all safety precautions have been read and understood. • Use appropriate personal protection and ventilation system keeping away from exposure. • Wear suitable protective gloves. • If ventilation is inadequate, wear a suitable respirator. • Do not breathe dust, fumes or vapors. • Do not eat, drink or smoke in handling area. • Wash skin thoroughly after handling. • Do not release into the environment. <p>【Responses】</p> <ul style="list-style-type: none"> • If inhaled, move to fresh air and take a rest with posture easy to breathe. • If respiratory symptoms occur, contact a doctor. • When feeling ill, get medical advice/attention. • Take off contaminated clothing and wash before reuse. • If on skin, rinse away immediately with a large amount of water and soap. • If skin irritation occurs, contact a doctor and get medical advice/attention. • If exposed or concerned, get medical advice/attention. 			

- If dust is in eyes, immediately wash away with clean water (remove the contact lenses if possible). If irritation persists, get medical advice/attention.
- If a large amount of dust is swallowed, get medical advice/attention after ingesting plenty of water to dilute.

【Storage】

- Avoid sudden changes of temperature and high humidity for storage.

【Disposal】

- Contact a specialized waste disposal company licensed by the governor.

*For safety instructions, refer to the Japan Cutting & Wear-resistant Tool Association website (<http://www.jta-tool.jp/>).

3. Composition/Information on Ingredient

- Distinction between substance and mixture: Mixture (alloy)
- Chemical name or general name: Alloy Tool Steel

Alloy Tool Steel may be coated or surface treated with the following substances.

Coating materials: CrN, TiAlN, TiC, TiCN, TiN, AlCrN, TiSiN

Surface treatment: Steam treatment (Fe₃O₄), Nitriding treatment (Fe₄N, Fe₂N)

- Ingredients and concentration or concentration range (composition) of the Alloy Tool Steel

Ingredient	Chemical Formula	CAS No	PRTR Law No	Cabinet Order No	Official Number of Industrial Safety and Health Law	Composition mass%
Iron	Fe	7439-89-6		n/a	n/a	Remaining amount
Silicon	Si	7440-21-3		n/a	n/a	0 to 2.2
Manganese	Mn	7439-96-5	412	1-465	Appendix 9-550	0 to 1.2
Chromium	Cr	7440-47-3	87	1-111	Appendix 9-142	0.2 to 1.3
Molybdenum	Mo	7439-98-7	453	1-505	Appendix 9-603	0.3 to 6
Tungsten	W	7440-33-7		n/a	Appendix 9-337	0 to 4.5
Vanadium	V	7440-62-2		n/a	n/a	0.05 to 2.5
Cobalt	Co	7440-48-4	132	1-156	Appendix 9-172	0 to 4.5
Nickel	Ni	7440-02-0	308	1-354	Appendix 9-418	0 to 1.8

※ For the details regarding the content of the designated chemical material (effective digit: 2) such as cobalt, nickel, chromium, manganese, and molybdenum, please contact the responsible department.

※ Even if the alloy tool steel does not contain cobalt, nickel, chromium, manganese as an active ingredient, it may contain cobalt, nickel, chromium, manganese as an impurity.

4. First-Aid Measures

If Inhaled

- If the high concentration of dust is inhaled or respiratory symptoms (coughs, gasping, shortness of breath, etc.) are experienced, move to fresh air and take a rest with posture easy to breathe. If breathing difficulties occur, administer oxygen inhalation. If breathing has stopped, immediately administer artificial respiration and get medical advice/attention.
- If irritation or rash persists, get medical advice/attention.

If on Skin

- If dust is contacted with skin, take off contaminated clothing and rinse the affected area with soapy water thoroughly. If irritation or rash persists, get medical advice/attention.

If in Eyes

- If dust is in eyes, immediately wash away with clean water (remove the contact lenses if possible). If irritation persists, get medical advice/attention.

If Swallowed

- If a large amount of dust is swallowed, get medical advice/attention after ingesting plenty of water to dilute.

5. Fire-Fighting Measures

Suitable Extinguishing Media and Unsuitable Extinguishing Media

- To extinguish dust fire, use dry sand, expanded vermiculite, dilatible perlite, ABC type (general, oil, electric fire) powder extinguishers or water (no water allowed for the dust containing cut powders of light metal such as magnesium and aluminum).

Special Protective Equipment and Emergency Procedures for Fire-Fighters

- In fighting a fire, wear a protective clothing, dust-proof respirator or respiratory protective equipment.

6. Accidental Release Measures

Personal Precautions, Protective Equipment, and Emergency Procedures

- It is recommended that someone who cleans dust should wear clothing and respiratory protective equipment to minimize exposure.

Environmental Precautions

- Dispose of dust as industrial waste and prevent release in water systems.

Containment and Cleanup Methods and Equipment

- If there is dust which occurs from Alloy Tool Steel producing process, isolate the area and remove the dust with a cleaner equipped with a filter which can take up fine particles very efficiently. If appropriate removing methods are not available, wet with water mist or wet floor mop to remove dust.

7. Handling and Storage

Handling

■ Technical Measures

- If the disperse of dust containing cobalt, nickel or manganese is concerned, provide local exhaust ventilation and use personal protective equipment to minimize exposure to human body.

■ Precautions for Safe Handling

- Obtain safety instructions before use.
- Do not handle until all safety precautions have been read and understood.

■ Contact Avoidance

- Take measures described in “Exposure Controls/Personal Protection.”
- Do not breathe dust, fumes or vapors.
- Do not eat, drink or smoke in handling area.

■ Hygiene Measures

- Wash skin thoroughly after handling.
- Do not release into the environment.

Storage

■ Conditions for Safe Storage

- Avoid sudden changes of temperature and high humidity for storage.
- If storing fine powder, dust, and swarf generated by cutting or polishing, cover them with a cover to prevent dispersal.

■ Materials for Safe Container

- Use materials meeting the specific gravity of Alloy Tool Steel

8. Exposure Controls/Personal Protection

Exposure Prevention

- Permissible concentration in working environment (reference value)

Ingredient	Chemical Formula	OSHA* PEL* mg/m ³	ACGIH* TLV* mg/m ³	Japan Society for Occupational Health Exposure Limit* mg/m ³
Iron	Fe	N/A	N/A	N/A
Silicon	Si	15	10	N/A
Manganese	Mn	5	0.2	0.3
Chromium	Cr	0.5	0.5	0.5
Molybdenum	Mo	15	10	N/A
Tungsten	W	5	5	N/A
Vanadium	V	N/A	N/A	N/A
Cobalt	Co	0.1	0.02	0.05
Nickel	Ni	1	1.5	1

*OSHA: Occupational Safety & Health Administration U.S. Department

*PEL: Permissible Exposure Limit

- *ACGIH: American Conference of Governmental Industrial Hygienists Inc.
- *TLV: Threshold Limit Value
- *Exposure Limit: If processing such as polishing and cutting that generates dust, for ingredients with no indicated value, refer to the exposure limit of the Japan Society for Occupational Health
- *N/A: Not Applicable

- Facility measures

Provide local exhaust ventilation so that dust in the air may not exceed the exposure limits in the above table.

It is to be noted that the management concentration of cobalt (and its inorganic compounds) and manganese (and its inorganic compounds) are to be 0.02 mg/m³ and 0.2 mg/m³ respectively in accordance with the working environment assessment standard by Japanese Minister of Health, Labour and Welfare under the paragraph (2), Article 65-2 of the Industrial Safety and Health Act in Japan.

In addition, cobalt (and its inorganic compounds) and manganese (and its inorganic compounds) in storage or handling, take the necessary action conforming to the Ordinance on Prevention of Hazards due to Specified Chemical Substance.

Protection Measures

- Respiratory Protection: Dust-proof respirators and respiratory protective equipment are recommended.
- Hand Protection: Protective gloves for dust are recommended.
- Eye/Face Protection: Eye/Face protections for dust are recommended.
- Skin/Body Protection: Avoid direct skin contact.
Clean up deposited dust on clothing, rags, etc. by washing or absorbing it with suitable filters, but not by whisking it off. Clothing exposed to dust should be replaced with new clothing.

Hygiene Measures

Wash skin thoroughly after handling.

9. Physical and Chemical Properties

Physical State:	Solid state
Color:	Shiny silver color (In case of the coated or surface treated Alloy Tool Steel, the appearance color is often different)
Odor:	Odorless
Melting/Freezing Point:	1,200 to 1,400°C
Boiling or Initial Boiling Point and Boiling Range:	No data available
Flammability, Explosion Limits, Flammability Limit, Flash Point, Spontaneous Ignition Temperature, Resolution Temperature:	No data available
pH:	No data available
Kinematic Viscosity:	No data available
Solubility:	Insoluble
Vapor Pressure:	No data available
Density and/or Relative Density:	7 to 9
Relative Gas Density:	No data available
Particle Properties:	No data available

10. Stability and Reactivity

A grain of dust which occurs from Alloy Tool Steel producing process is very fine and under the specific conditions in which the dust is mixed with grinding oil with low flash point, it is possible to become pyrophoric. If dust under very flammable conditions is dispersed in the air, it is possible to explode.

The individual metal ingredients (cobalt, nickel, chromium, and manganese) for composing the Alloy Tool Steel have the following information about stability and reactivity under specific conditions.

- Stability and reactivity of cobalt alone is below.

(When cobalt is included as a metal ingredient of Alloy Tool Steel)

Reactivity, chemical stability:	<ul style="list-style-type: none"> • Stable to heat and contact with water. • It ignites spontaneously in air.
Hazardous reactions:	<ul style="list-style-type: none"> • It reacts with strong oxidizing agents. • It reacts violently with oxygen, posing a risk of fire or explosion. • It reacts violently with acid to generate hydrogen.
Conditions to avoid:	<ul style="list-style-type: none"> • Contact with incompatible materials.
Incompatible materials:	<ul style="list-style-type: none"> • Strong oxidizing agents, acid.
Hazardous decomposition products:	<ul style="list-style-type: none"> • By combustion, cobalt oxide and fumes of cobalt oxide may occur.

- Stability and reactivity of nickel alone is below.

(When nickel is included as a metal ingredient of Alloy Tool Steel)

Reactivity, chemical stability:	<ul style="list-style-type: none"> • It is considered stable in storage and handling in accordance with the laws and regulations.
Hazardous reactions:	<ul style="list-style-type: none"> • Although metal nickel is usually stabilized against oxidation by the oxide film, fresh metal surfaces without oxide film are rapidly oxidized by air. Therefore, there is a risk of ignition in the air for fresh metal nickel powder.
Conditions to avoid:	<ul style="list-style-type: none"> • No data available
Hazardous decomposition products:	<ul style="list-style-type: none"> • No data available

- Stability and reactivity of chromium alone is below.

(When chromium is included as a metal ingredient of Alloy Tool Steel)

Reactivity, chemical stability:	<ul style="list-style-type: none"> • Stable under normal handling conditions.
Hazardous reactions:	<ul style="list-style-type: none"> • It reacts violently with strong oxidizing agents such as hydrogen peroxide, posing a risk of fire or explosion. • It reacts with dilute hydrochloric acid and dilute sulfuric acid.
Conditions to avoid:	<ul style="list-style-type: none"> • Incompatible with alkalis and alkaline carbonates. • When mixed with air in powder or granular form, there is a possibility of dust explosion.
Incompatible materials:	<ul style="list-style-type: none"> • Strong oxidizing agents, dilute hydrochloric acid, dilute sulfuric acid, alkali, alkali carbonate.
Hazardous decomposition products:	<ul style="list-style-type: none"> • During combustion, there can be irritating or toxic fumes and gases.

- Stability and reactivity of manganese alone is below.
(When manganese is included as a metal ingredient of Alloy Tool Steel)

Reactivity, chemical stability: Hazardous reactions:	<ul style="list-style-type: none"> • Stable under normal handling conditions • Toxic fumes occur when heated. • It reacts violently with nonmetals (chlorine, fluorine, oxygen, etc.) at high temperatures, posing a risk of fire and explosion. • It reacts violently with hydrogen peroxide, bromine pentafluoride, nitrogen dioxide, and aluminum dust, posing a risk of fire and explosion. • It reacts with boron, carbon, silicon, phosphorus, sulfur, oxidant. • It reacts explosively with nitric acid and ammonium nitrate. • In the case of powder, it reacts with water or steam to generate hydrogen.
Conditions to avoid:	<ul style="list-style-type: none"> • When mixed with air in powder or granular form, there is a possibility of dust explosion. • High temperature heating, mixing and contact with incompatible hazardous substances.
Incompatible materials:	<ul style="list-style-type: none"> • Strong oxidants, strong acids, hydrogen peroxide, bromine pentafluoride, nitrogen dioxide, nonmetals, aluminum dust, etc.
Hazardous decomposition products:	<ul style="list-style-type: none"> • Upon heating, irritating, corrosive, toxic gases and fumes are generated.

11. Toxicological Information

Acute Toxicity:	No data available on Alloy Tool Steel
Skin Corrosion/Irritation:	No data available on Alloy Tool Steel
Serious eye damage/Eye irritation:	No data available on Alloy Tool Steel
Respiratory or Skin Sensitization:	No data available on Alloy Tool Steel
Germ Cell Mutagenicity:	No data available on Alloy Tool Steel
Carcinogenicity:	Cobalt powder coexisting with tungsten carbide is IARC Group 2A. Suspected to be a human carcinogen. (Ref.1)
Reproductive Toxicity:	No data available on Alloy Tool Steel
Specific Target Organ Toxicity/Systemic Toxicity (Single Exposure):	No data available on Alloy Tool Steel
Specific Target Organ Toxicity/Systemic Toxicity (Repeated Exposure):	No data available on Alloy Tool Steel
Respirator Hazard:	No data available on Alloy Tool Steel
Aspiration Hazard:	No data available on Alloy Tool Steel

12. Ecological Information

Ecotoxicity, Persistence/Degradability, Bioaccumulation, Mobility in soil, Hazardous to the ozone layer

- No data available on Alloy Tool Steel.

13. Disposal Considerations

Safe and environmentally desirable disposal or recycle method

- The main ingredients such as tungsten, cobalt or nickel are rare metals, so it is desirable to collect and recycle them.
- For disposal, comply with the applicable laws and regulations regarding industrial waste.

14. Transport Information

International Regulations

UN Number:	Not applicable
Proper Shipping Name:	Not applicable
UN Hazard Class:	Not applicable
Packing Group:	Not applicable
Marine Pollutant:	Not applicable

- ※ When transporting a powder of metal ingredients (cobalt, nickel, manganese) for composing the Alloy Tool Steel, there is a possibility that it is necessary to take appropriate action in accordance with the relevant provisions established by IMO (International Maritime Organization), ICAO (International Civil Aviation Organization), IATA (International Air Transport Association).

Domestic Regulations

Land Regulatory Information:	In accordance with the Fire Service Act/ the Road Act
Marine Transportation Information:	In accordance with the Ship Safety Act/ the Act on Port Regulations
Marine Pollutant:	Not applicable
Aviation Transportation Information:	In accordance with the Civil Aeronautics Act

- ※ When transporting a powder of metal ingredients (cobalt, nickel, manganese) for composing the Alloy Tool Steel, there is a possibility that it is necessary to take appropriate action in accordance with the relevant provisions of the Ship Safety Act and the Civil Aeronautics Act.

Special Safety Measures for Transportation and Transportation Method

When transporting the dust which occurs from Alloy Tool Steel producing process, make sure that there is no damage or corrosion or leakage of the container, to ensure implementation of the prevention of collapse of cargo.

15. Regulatory Information

Name and Information of Applicable Regulatory

- Law for Pollutant Release and Transfer Register (PRTR)

Manganese	Class 1 designated chemical substance No. 465
Chromium	Class 1 designated chemical substance No. 111
Molybdenum	Class 1 designated chemical substance No. 505
Cobalt	Class 1 designated chemical substance No. 156
Nickel	Class 1 designated chemical substance No. 354
- Industrial Safety and Health Law, Ordinance on Prevention of Hazards due to Specified Chemical Substances

Manganese	The substance is defined in Article 57-2 of the Act, and manganese is listed as No.550 in Appended Table 9 in Article 18-2 of the Enforcement Order as “Dangerous or Harmful Substances to be notified of their names, etc. Article 2, Paragraph 1, Items 2 and 5 of Ordinance on Prevention of Hazards due to Specified Chemical Substance, Specified chemical substance class 2, Management class 2.
Chromium	The substance is defined in Article 57-2 of the Act, and chromium is listed as No.142 in Appended Table 9 in Article 18-2 of the Enforcement Order as “Dangerous or Harmful Substances to be notified of their names, etc.
Molybdenum	The substance is defined in Article 57-2 of the Act, and molybdenum is listed as No.603 in Appended Table 9 in Article 18-2 of the Enforcement Order as “Dangerous or Harmful Substances to be notified of their names, etc.

Tungsten	The substance is defined in Article 57-2 of the Act, and tungsten is listed as No.337 in Appended Table 9 in Article 18-2 of the Enforcement Order as “Dangerous or Harmful Substances to be notified of their names, etc.
Cobalt	The substance is defined in Article 57-2 of the Act, and cobalt is listed as No.172 in Appended Table 9 in Article 18-2 of the Enforcement Order as “Dangerous or Harmful Substances to be notified of their names, etc. Article 2, Paragraph 1, Items 2 and 5 of Ordinance on Prevention of Hazards due to Specified Chemical Substance, Specified chemical substance class 2, Management class 2.
Nickel	The substance is defined in Article 57-2 of the Act, and nickel is listed as No.418 in Appended Table 9 in Article 18-2 of the Enforcement Order as “Dangerous or Harmful Substances to be notified of their names, etc.

16. Other Information

Other Hazardous Information

- If a large amount of dust containing cobalt is inhaled, blood, heart, thyroid gland, and spleen disorders may result. (Ref.2)
- It is reported that repeated or long-term contact with cobalt, nickel, or chromium may affect skin, respiratory organs, heart, etc. (Ref.3 to 6)
- Contact with molybdenum stimulates skin and eyes. Also, inhalation and swallowing of molybdenum may be harmful. (Ref.7)
- The carcinogenicity of Alloy Tool Steel metal ingredients is as follows.

Cobalt metal	ACGIH	A3: Confirmed to be carcinogenic to animals, but relevance to humans is unknown
	IARC	2B: Possibly carcinogenic to humans
	Japan Society for Occupational Health	2B: The substance has been determined to be possibly carcinogenic to humans (with relatively insufficient evidence)
Nickel metal	ACGIH	A5: Not suspected as a human carcinogen
	IARC	2B: Possibly carcinogenic to humans
	Japan Society for Occupational Health	2B: The substance has been determined to be possibly carcinogenic to humans (with relatively insufficient evidence)
Chromium metal	IARC	3: Not classifiable as to its carcinogenicity to humans

*ACGIH: American Conference of Governmental Industrial Hygienists Inc.
*IARC: International Agency for Research on Cancer

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.

Reference URL

- Ministry of Economy, Trade and Industry: <http://www.meti.go.jp/>
- Ministry of the Environment: <http://www.env.go.jp/>
- Ministry of Health, Labour and Welfare: <http://www.mhlw.go.jp/>
- Japan Industrial Safety and Health Association: <http://www.jaish.gr.jp/>
- International Agency for Research on Cancer: <http://monographs.iarc.fr/>
- International Chemical Safety Card: <http://www.nihs.go.jp/ICSC/>
- National Institute of Technology and Evaluation: <http://www.safe.nite.go.jp/ghs/list.html>

Reference Documents

- (1) IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, vol.86 (2006).
- (2) Food & Drug Research Laboratories, study No.8005B (4.11.84).
- (3) T. Shirakawa et al., Chest. 95, 29 (1989).
- (4) International Chemical Safety Cards (cobalt, chromium, nickel).
- (5) The Guide to Chemical Hazards (edited by Japan Industrial Safety & Health Association)
- (6) A. O. Bech et al., Brit. J. Ind., 19, 239 (1962).
- (7) Data Book for Safety Management of Chemicals (The Chemical Daily Co., Ltd.)