Safety Data Sheet（SDS）

Date of Issue: 1st September, 2005
Date Revised: 3rd April, 2023

1. Identification of the Substance and of the Company

Product Identifier:

CBN (Cubic boron nitride) and Cemented Carbide base metal
(hereinafter referred to "CBN/Cemented Carbide")

Supplier Information:

Company Name: CUTTING TOOLS .CO., Ltd.
Address: 2808 Iwasaki, Komaki-shi, Aichi, Japan <485-8510>
Telephone Number: +81-568-76-1270
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Recommended Use of the CBN/Cemented Carbide

Cutting and drilling tools for metallic materials

Restrictions on Use of the CBN/Cemented Carbide

Do not use for other than the specified purpose

Attention to the Phase/State of the CBN/Cemented Carbide

- CBN/Cemented Carbide as solid state like cutting tools is chemically stable and safe at explosive, flammable, combustible, pyrophoric, water-reactive, and oxidizability under normal environment.
- CBN/Cemented Carbide are safe for use as the cutting tools (grinding, machining, rolling for metals) under normal condition.
- This SDS informs about the dust, fume or vapor which occur from CBN/Cemented Carbide 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, fume or vapor which occur from CBN/Cemented Carbide producing process are unavailable. Therefore, they are not be classified by GHS.

In here, GHS classification of the each metallic ingredients (cobalt, nickel and chromium) for composing the CBN/Cemented Carbide can be disclosed. In addition, other hazards and harmful effects (for health, environment, physical and chemical) which are not listed are unclassifiable or non-applicable by GHS.

GHS classification for the hazards of cobalt alone in below,
(When cobalt is included as ingredients of CBN/Cemented Carbide.)

Health Hazard	・Acute toxicity (oral)	Category4
	・Acute toxicity (inhaled: dust, mist)	Category1
	・Serious eye damage / eye irritation	Category2B
	・Respiratory sensitization	Category1A
	・Skin sensitization	Category1A
	・Carcinogenicity	Category2
	・Reproductive toxicity	Category1B
	・Specific target organ toxicity (Single exposure)	Category1 (Respiratory)
	・Specific target organ toxicity (Repeated exposure)	Category1 (Respiratory, Heart, Thyroid, Blood)

Environmental Hazard:	・Hazardous to the aquatic environment – prolonged (Chronic hazard) ・Hazardous to the aquatic environment – repeated (Acute hazard)	Category1 Category1

GHS classification for the hazards of nickel alone in below,
(When nickel is included as ingredients of CBN/Cemented Carbide.)

Health Hazard	・Respiratory sensitization ・Skin sensitization ・Carcinogenicity ・Specific target organ toxicity (Single exposure) ・Specific target organ toxicity (Repeated exposure)	Category1 Category1 Category2 Category1 (Respiratory tract irritation) Category1 (Respiratory)
Environmental Hazard:	・Hazardous to the aquatic environment – prolonged (Chronic hazard)	Category4

GHS classification for the hazards of chromium alone in below,
(When chromium is included as ingredients of CBN/Cemented Carbide.)

Health Hazard	・Serious eye damage ・Respiratory sensitization ・Skin sensitization ・Germ cell mutagenicity ・Specific target organ toxicity (Single exposure) ・Specific target organ toxicity (Repeated exposure)	Category2B Category1 Category1 Category2 Category2 (Respiratory tract irritation) Category3 (Respiratory)

GHS Label Elements

GHS label elements of the each metallic ingredients (cobalt, nickel and chromium) for composing the CBN/Cemented Carbide can be disclosed in below.

	Cobalt	Nickel	Chromium
Hazard Pictograms :			
Signal Words :	Danger		
Hazard statements:	・Risk of causing allergies, asthma or breathing difficulties if inhaled. ・Risk of causing an allergic skin reaction. ・May cause cancer. ・May cause adverse effects on fertility or the unborn child. ・Risk of respiratory	・Risk of causing allergies, asthma or breathing difficulties if inhaled. ・Risk of causing an allergic skin reaction. ・May cause cancer. ・Respiratory and kidney disorders ・Cause of respiratory failure due to long-	・Risk of causing allergies, asthma or breathing difficulties if inhaled. ・Risk of causing an allergic skin reaction. ・Suspected of causing genetic disease ・Failure to systemic toxicity

	irritation. ・Cause of respiratory failure due to long-term or repetitive exposure. ・May be harmful to aquatic life due to long-lasting effects	term or repetitive exposure. ・May be harmful to aquatic life due to long-lasting effects	・Risk of respiratory irritation.
Precautionary Statements：	【Prevention】 ・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. ・When insufficient ventilation, wear respirator as required. ・Do not breathe dust, fume or vapor. ・Do not eat, drink or smoke in handling area. ・Wash skin thoroughly after handling. ・Do not release into the environment. 【Responses】 ・If inhaled, move to fresh air and take a rest with posture easy to breathe. ・If respiratory symptoms occurs, 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】 ・Dispose of contents/container to an approved waste disposal plant under the laws.		

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

3. Composition/Information on Ingredients

- Distinction between substance and mixture: Mixture (alloy)
- Chemical name or general name: CBN/Cemented Carbide
  CBN/Cemented Carbide may be coated or surface treated with the following substances.
  AlN、Al_2O_3、TiC、TiCN、TiN、(Al,Ti)N、(Al,Cr)N、(Ti,Al,Cr)N、Cr_3C_2、CrN、(Ti,Si)N、(Ti,Zr)N、WC、VC 、TiVN、C(Diamond、DLC)
- Ingredients and concentration or concentration range (composition) of the CBN/Cemented Carbide.

Ingredient	Chemical Formula	CAS No	Official Number of Law for PRTR	Official Number of Industrial Safety and Health Law	Composition mass%
CBN					
Boron nitride	BN	10043-11-5	Class1:405		25-95
Cobalt	Co	7440-48-4	Class1:132	Appendix9-172	0-20
Aluminum nitride	AlN	24304-00-5			0-20
Aluminum boride	AlB_2	12041-50-8	Class1:405		0-20
Aluminum oxide	Al_2O_3	1344-28-1		Appendix9-189	0-30
Titanium boride	TiB_2	12045-63-5	Class1:405		0-10
Titanium carbide	TiC	12070-08-05			0-50
Titanium carbonitride	TiCN	12347-09-0			0-50
Titanium nitride	TiN	25583-20-4			0-50
Aluminum Titanium	TiAl	12004-78-3			0-2
Tungsten boride	WB	12007-09-9	Class1:405		0-5
Tungsten Carbide	WC	12070-12-1			0-50
Cemented Carbide					
Tungsten Carbide	WC	12070-12-1			55-95
Tantalum carbide	TaC	12070-06-3			0-20
Niobium carbide	NbC	12069-94-2			0-20
Titanium carbide	TiC	12070-08-5			0-20
Titanium nitride	TiN	25583-20-4			0-5
Vanadium carbide	VC	12070-10-9	Class1:321		0-5
Cobalt	Co	7440-48-4	Class1:132	Appendix9-172	0-30
Nickel	Ni	7440-02-0	Class1:308	Appendix9-418	0-30
Chromium	Cr	7440-47-3	Class1:87	Appendix9-142	0-5

*For the details regarding the content of the designated chemical material such as Cobalt, Nickel, Chromium, Boron nitride, Aluminum boride, Titanium boride, Tungsten boride, Vanadium carbide, and Molybdenum carbide (effective digit: 2), please contact the responsible department.

*Even if the cemented carbide do not contain cobalt, nickel, chromium as an active ingredient may include cobalt, nickel, chromium 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 and 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 the fire of dust, use dry sand, expanded vermiculite, dilatable 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 wastes and prevent release in water systems.

Containment and Cleanup Methods and Equipment

- If there is dust which occur from CBN/Cemented Carbide producing process, isolate the area and remove with a cleaner equipped with a filter which can take up fine particles very efficiently. If appropriate removing methods are not available, sweep with water sprayers or wet mops.

7. Handling and Storage

Handling

■ Technical Measures

- If the disperse of dust containing cobalt or nickel 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, fume or vapor.
- 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 Cemented Carbide

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
CBN				
Boron nitride	BN	10	10	N/A
Cobalt	Co	0.1	0.02	0.05
Aluminum nitride	AlN	N/A	N/A	N/A
Aluminum boride	AlB_2	N/A	N/A	N/A
Aluminum oxide	Al_2O_3	5	10	N/A
Titanium boride	TiB_2	N/A	N/A	N/A
Titanium carbide	TiC	N/A	N/A	N/A
Titanium carbonitride	TiCN	N/A	N/A	N/A
Titanium nitride	TiN	N/A	N/A	N/A
Aluminum Titanium	TiAl	N/A	N/A	N/A
Tungsten boride	WB	N/A	N/A	N/A
Tungsten Carbide	WC	5 (as W)	5 (as W)	N/A
Cemented Carbide				
Tungsten Carbide	WC	5 (as W)	5 (as W)	N/A
Tantalum carbide	TaC	5 (as Ta)	5 (as Ta)	N/A
Niobium carbide	NbC	N/A	N/A	N/A
Titanium carbide	TiC	N/A	N/A	N/A
Titanium nitride	TiN	N/A	N/A	N/A
Vanadium carbide	VC	N/A	N/A	N/A
Cobalt	Co	0.1	0.02	0.05
Nickel	Ni	1.0	1.5	1.0
Chromium	Cr	1.0	0.5	0.5

*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 dusts in the air may not exceed the exposure limits in the above table. It is to be noted that management concentration of the cobalt (and its inorganic compounds) is to be 0.02mg/m^3 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) in the storage or handling, and that to take the necessary action conforming to the Ordinance on Prevention of Hazards due to Specified Chemical Substances.

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 with suitable filters but not by whisking off. Change the contaminated clothing into clean one.

Hygiene Measure

Wash skin thoroughly after handling.

9. Physical and Chemical Properties

Physical State:	Solid state
Color :	Dark gray color (in case of the coated or surface treated CBN/Cemented Carbide, the appearance color is often different.)
Odor:	Odorless
Melting/Freezing Point:	No data available
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:	3.0 – 15.5
Relative Gas Density:	No data available
Particle Properties:	No data available

10. Stability and Reactivity

A grain of dust which occur from CBN/Cemented Carbide producing process is very fine and under the specific conditions in which the dusts are mixed with grinding oil with low flash point, it is possible to become pyrophoric. If dusts under very flammable conditions are dispersed in the air, it is possible to explode.

The each metallic ingredients (cobalt, nickel and chromium) for composing the CBN/Cemented Carbide has the following information about stability and reactivity under specific conditions.

Stability and reactivity of cobalt alone in below,
(When cobalt is included as ingredients of CBN/Cemented Carbide.)

Reactivity, chemical stability:	Stable to heat and contact with water Ignite spontaneously in air
Hazardous reactions:	It reacts with strong oxidizing agents It reacts violently with oxygen, and it poses a risk of fire or explosion It reacts violently with acid to generate hydrogen
Conditions to avoid:	Contact with incompatible materials
Incompatible materials:	Strong oxidizing agents, acid
Hazardous decomposition products:	By combustion, cobalt oxide and fumes of cobalt oxide may occur

Stability and reactivity of nickel alone in below,
(When nickel is included as ingredients of CBN/Cemented Carbide.)

Reactivity, chemical stability:	It is considered stable in storage and handling in accordance with the laws and regulations

Hazardous reactions:	Metallic nickel is usually stabilized against oxidation by the oxide film, fresh metal surfaces without oxide film is rapidly oxidized by air. Thus, fresh metallic nickel powder, there is a risk of ignition in air.
Conditions to avoid:	No data available
Hazardous decomposition products:	No data available

Stability and reactivity of chromium alone in below,
(When chromium is included as ingredients of CBN/Cemented Carbide.)

Reactivity, chemical stability:	Stable under normal handling conditions
Hazardous reactions:	Reacts violently with strong oxidizing agents such as hydrogen peroxide, it poses a risk of fire or explosion. It reacts with dilute hydrochloric acid and dilute sulfuric acid.
Conditions to avoid:	The alkali or alkaline carbonate is Incompatible. When mixed with air in powder or granular form, there is a possibility of dust explosion.
Incompatible materials:	Strong oxidizing agents, dilute hydrochloric acid, dilute sulfuric acid, alkali, alkali carbonate
Hazardous decomposition products:	During combustion, there can be irritating or toxic fumes and gases.

11. Toxicological Information

Acute Toxicity:	No data available on CBN/Cemented Carbide
Skin Corrosion/Irritation:	No data available on CBN/Cemented Carbide
Serious Eye Damage/Eye Irritation:	No data available on CBN/Cemented Carbide
Respiratory or Skin Sensitization:	No data available on CBN/Cemented Carbide
Germ Cell Mutagenicity:	No data available on CBN/Cemented Carbide
Carcinogenicity:	Group 2A on IARC, as cobalt powder coexisting with tungsten carbide powder. Suspected to be carcinogenic in humans (Ref.1)
Reproductive Toxicity:	No data available on CBN/Cemented Carbide
Specific Target Organ Toxicity/Systemic Toxicity (Single Exposure):	No data available on CBN/Cemented Carbide
Specific Target Organ Toxicity/Systemic Toxicity (Repeated Exposure):	No data available on CBN/Cemented Carbide
Aspiration Hazard:	No data available on Ceramic

12. Ecological Information

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

- Not reported on CBN/Cemented Carbide

13. Disposal Considerations

Safe and environmentally desirable disposal or recycle method

- The main ingredients such as tungsten carbide, cobalt, nickel are rare metal. It is desirable to collect and recycle them.
- For disposal, conform to the applicable laws regarding industrial wastes such as 'Waste Disposal and Public Cleansing Law' and relevant local by laws.

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 metallic ingredients (cobalt, nickel) for composing the CBN/Cemented Carbide, 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 metallic ingredients (cobalt, nickel) for composing the CBN/Cemented Carbide, there is a possibility that it is necessary to take appropriate action in accordance with the relevant provisions of Ship Safety Law and the Aviation Law.

Special Safety Measures for Transportation and Transportation Method

When transporting the dust which occur from CBN/Cemented Carbide 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)

  Boron nitride: "Class 1 designated chemical substances", Cabinet Order No.405
  Cobalt: "Class 1 designated chemical substances", Cabinet Order No.132
  Aluminum boride: "Class 1 designated chemical substances", Cabinet Order No.405
  Titanium boride: "Class 1 designated chemical substances", Cabinet Order No.405
  Tungsten boride: "Class 1 designated chemical substances", Cabinet Order No.405
  Vanadium carbide: "Class 1 designated chemical substances", Cabinet Order No.321
  Nickel: "Class 1 designated chemical substances", Cabinet OrderNo.308
  Chromium: "Class 1 designated chemical substances", Cabinet OrderNo.87

- Industrial Safety and Health Law, Ordinance on Prevention of Hazards due to Specified Chemical Substances

  Cobalt: The substances are defined in the Article 57-2 of the Act, and the cobalt is listed by No.172 in Appended Table9 in the Article 18-2 of the Enforcement Order as "Dangerous or Harmful Substances to be notified 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.
  When the content of cobalt and cobalt oxide is less than 1%, the Ordinance on Prevention of Hazards due to Specified Chemical Substance is not covered.

  Aluminum oxide: The substances are defined in the Article 57-2 of the Act, and the aluminum oxide is listed by No.189 in Appended Table9 in the Article 18-2 of the Enforcement Order as "Dangerous or Harmful Substances to be notified their names, etc."

Nickel: The substances are defined in the Article 57-2 of the Act, and the nickel is listed by No.418 in Appended Table9 in the Article 18-2 of the Enforcement Order as “Dangerous or Harmful Substances to be notified their names, etc.”

Chromium: The substances are defined in the Article 57-2 of the Act, and the chromium is listed by No.142 in Appended Table9 in the Article 18-2 of the Enforcement Order as “Dangerous or Harmful Substances to be notified their names, etc.”

- Water pollution prevention law

Boron nitride: Article 2, Paragraph 2, Item 1 of the Act, Enforcement Order Article 2 Hazardous Substance No. 24

Aluminum boride: Article 2, Paragraph 2, Item 1 of the Act, Enforcement Order Article 2 Hazardous Substance No. 24

Titanium boride: Article 2, Paragraph 2, Item 1 of the Act, Enforcement Order Article 2 Hazardous Substance No. 24

Tungsten boride: Article 2, Paragraph 2, Item 1 of the Act, Enforcement Order Article 2 Hazardous Substance No. 24

- Soil Contamination Countermeasures Act

Boron nitride: Article 2, Paragraph 1 of the Act, Enforcement Order Article 1 Specified Hazardous Substance No. 23

Aluminum boride: Article 2, Paragraph 1 of the Act, Enforcement Order Article 1 Specified Hazardous Substance No. 23

Titanium boride: Article 2, Paragraph 1 of the Act, Enforcement Order Article 1 Specified Hazardous Substance No. 23

Tungsten boride: Article 2, Paragraph 1 of the Act, Enforcement Order Article 1 Specified Hazardous Substance No. 23

16. Other Information

Other Hazardous Information

The following attention should be paid for dust which occur from CBN/Cemented Carbide producing process.

- 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 prolonged contact with cobalt, nickel, or chromium may affect skin, respiratory organs, heart, etc. (Ref.3 - 6)
- Inhaling high concentration dust of aluminum oxide may irritate the eyes and upper respiratory tract. (Ref.4)
- Repeated or prolonged inhalation and exposure of aluminum oxide may cause effects on the central nervous system. (Ref.4)
- For carcinogenicity of metallic ingredients of CBN/Cemented Carbide has the following knowledge.

Cobalt metal	ACGIH	A3: Confirmed animal carcinogen with unknown relevance to humans.
	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 Assoc.：　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)

Revision History

Rev.5	3rd April, 2023	Change of company name and update of latest information