

Safety Data Sheet (SDS)

Established Date: 16/Feb/2017

Revised Date: - / - / -

1. Identification of the Substance and of the Company

Product Identifier:

Ceramic (include the coated or surface treated Ceramic)

Supplier Information:

Company Name: KANEFUSA CORPORATION

Address: 1-1 Nakaoguchi Ohguchi-cho Niwa-gun Aichi-ken 480-0192 Japan

Phone Number: +81-587-95-7221

FAX Number: +81-587-95-7226

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Recommended Use and Restrictions on Use of the Ceramic

Cutting tools mainly for wood-base and metallic materials, wear-resistant tools for plastic forming process, tools for macadam, civil engineering, and urban development, etc.

Attention to the Phase/State of the Ceramic

- Ceramic as solid state like cutting tools is chemically stable and safe at explosive, flammable, combustible, pyrophoric, water-reactive, and oxidizability under normal environment.
- Ceramic is safe for use as the cutting tools (grinding, machining, rolling) for wood and metals under normal condition.
- This SDS informs about the dust, fume or vapor which occur from Ceramic 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 Ceramic 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 Ceramic 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 Ceramic.)

| | | |
|-----------------------|---|---|
| Health Hazard | <ul style="list-style-type: none"> • Respiratory sensitization • Skin sensitization • Carcinogenicity • Reproductive toxicity • Specific target organ toxicity (Single exposure) • Specific target organ toxicity (Repeated exposure) | Category1 Category1 Category2 Category2 Category3 (Respiratory tract irritation) Category1 (Respiratory) |
| Environmental Hazard: | • Hazardous to the aquatic environment | Category4 |

GHS classification for the hazards of nickel alone in below,
(When nickel is included as ingredients of Ceramic.)


| | | |
|-----------------------|--|--|
| Health Hazard | <ul style="list-style-type: none"> • 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 | Category4 |

GHS classification for the hazards of chromium alone in below,
(When chromium is included as ingredients of Ceramic.)

| | | |
|---------------|---|--|
| Health Hazard | <ul style="list-style-type: none"> • 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 Ceramic can be disclosed in below.

| | Cobalt | Nickel | Chromium |
|---------------------|--|--|--|
| Hazard Pictograms : |  | | |
| Signal Words : | Danger | | |
| Hazard Statements : | <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. • May cause adverse effects on fertility or the unborn child. • Risk of respiratory irritation. • Cause of respiratory failure due to long-term or repetitive exposure. • May be harmful to aquatic life due to long-term effects | <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 • Cause of respiratory failure due to long-term or repetitive exposure. • May be harmful to aquatic life due to long-term effects | <ul style="list-style-type: none"> • 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 • Risk of respiratory irritation. |

| | |
|----------------------------|--|
| Precautionary Statements : | <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. • 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. <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 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. <p>【Storage】</p> <ul style="list-style-type: none"> • Avoid sudden changes of temperature and high humidity for storage. <p>【Disposal】</p> <ul style="list-style-type: none"> • Dispose of contents/container to an approved waste disposal plant under the laws. |
|----------------------------|--|

3. Composition/Information on Ingredients

- Distinction between substance and mixture: Mixture
- Ceramic may be coated or surface treated with the following substances.
AlCrN, AlN, Al₂O₃, (Al,Ti)N, B₄C, Cr₃C₂, CrN, MoS₂, Ti(B,C,N), TiC, TiCN, TiN, (Ti,Si)N, (Ti,Zr)N, WC
- Ingredients and concentration or concentration range (composition) of the Ceramic

| Ingredient | Chemical Formula | CAS No | Official Number of Law for PRTR | Official Number of Industrial Safety and Health Law | Composition mass% |
|-----------------|--------------------------------|------------|---------------------------------|---|-------------------|
| Aluminum oxide | Al ₂ O ₃ | 1344-28-1 | | Appendix 9-189 | |
| Zirconium oxide | ZrO ₂ | 1314-23-4 | | Appendix 9-313 | |
| Titanium oxide | TiO ₂ | 13463-67-7 | | Appendix 9-191 | |
| Ytterbium oxide | Yb ₂ O ₃ | 1314-37-0 | | | |
| Yttrium oxide | Y ₂ O ₃ | 1314-36-9 | | Appendix 9-54 | |
| Erbium oxide | Er ₂ O ₃ | 12033-89-5 | | | |
| Magnesium oxide | MgO | 1309-48-4 | | | |
| Chromium oxide | Cr ₂ O ₃ | 1308-38-9 | Class 1:87 | Appendix 9-142 | |
| Cerium oxide | CeO ₂ | 1306-38-3 | | | |

| | | | | | |
|------------------------|---|------------|-------------|----------------|--|
| Yttrium aluminum oxide | Y ₂ Al ₅ O ₃ | | | | |
| Silicon carbide | SiC | 409-21-2 | | Appendix 9-336 | |
| Aluminum nitride | AlN | 24304-00-5 | | | |
| Silicon nitride | Si ₃ N ₄ | 12033-89-5 | | | |
| Titanium nitride | TiN | 25583-20-4 | | | |
| Cobalt | Co | 7440-48-4 | Class 1:132 | Appendix 9-172 | |
| Cobalt oxide | Co ₃ O ₄ | 1308-06-1 | Class 1:132 | | |
| Nickel | Ni | 7440-02-0 | Class 1:308 | Appendix 9-418 | |
| Nickel oxide | NiO | 1313-99-1 | Class 1:309 | | |
| Tungsten Carbide | WC | 12070-12-1 | | | |
| Tantalum carbide | TaC | 12070-06-3 | | | |
| Niobium carbide | NbC | 12069-94-2 | | | |
| Titanium carbide | TiC | 12070-08-5 | | | |
| Titanium carbonitride | TiCN | | | | |

*For the details regarding the content of the designated chemical material such as cobalt, nickel and chromium (effective digit: 2), please contact to the above supplier.

*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

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 Actions for Fire-Fighters

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

6. Accidental Release Measures

Personal Precautions

- 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 Ceramic 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

- Ceramic is a stable substance and has little influence on health, but if it contacts dust or grinding liquid containing cobalt or nickel for a long time or repeatedly, rough skin may occur.
- 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.
- Obtain safety instructions before use.
- Do not handle until all safety precautions have been read and understood.
- 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.

Storage

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

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 |
|------------------------|---|---------------------------------|----------------------------------|--|
| Aluminum oxide | Al ₂ O ₃ | 5 (as Al) | 10 | N/A |
| Zirconium oxide | ZrO ₂ | 5 (as Zr) | 5 (as Zr) | 0.5 (as Zr) |
| Titanium oxide | TiO ₂ | 15 | 10 | N/A |
| Ytterbium oxide | Yb ₂ O ₃ | N/A | N/A | N/A |
| Yttrium oxide | Y ₂ O ₃ | 1 (as Y) | 1 (as Y) | N/A |
| Erbium oxide | Er ₂ O ₃ | N/A | N/A | N/A |
| Magnesium oxide | MgO | 15 | 10 | N/A |
| Chromium oxide | Cr ₂ O ₃ | 0.5 (as Cr) | 0.5 (as Cr) | 0.5 (as Cr) |
| Cerium oxide | CeO ₂ | N/A | N/A | N/A |
| Yttrium aluminum oxide | Y ₂ Al ₅ O ₃ | 1 (as Y) | 1 (as Y) | N/A |
| Silicon carbide | SiC | 5 | 3 | N/A |
| Aluminum nitride | AlN | 5 (as Al) | 1 (as Al) | N/A |
| Silicon nitride | Si ₃ N ₄ | N/A | N/A | N/A |
| Titanium nitride | TiN | N/A | N/A | N/A |
| Cobalt | Co | 0.1 (as Co) | 0.02 (as Co) | 0.05 (as Co) |
| Cobalt oxide | Co ₃ O ₄ | | | |
| Nickel | Ni | 1.0 | 1.5 | 1.0 |

| Nickel oxide | NiO | (as Ni) | (as Ni) | (as Ni) |
|-----------------------|------|-----------|-----------|---------|
| 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 carbonitride | TiCN | N/A | N/A | N/A |

- *OSHA : Occupational Safety & Health Administration U.S. Department
- *PEL : Permissible Exposure Limit
- *ACGIH : American Conference of Governmental Industrial Hygienists Inc.
- *TLV : Threshold Limit Value
- *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/m³ 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 Protection: Protective glasses 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

- Appearance: White, gray or black color
(in case of the coated or surface treated Ceramic, the appearance color is often different.)
- Odor: Odorless
- pH: No data available
- Melting Point: No data available
- Boiling Point: No data available
- Flash Point: No data available
- Vapor Pressure: No data available
- Specific Gravity: 3.0 - 10.0
- Solubility: Insoluble

10. Stability and Reactivity

A grain of dust which occur from Ceramic 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 Ceramic 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 Ceramic.)

| | |
|-----------------------------------|---|
| 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 Ceramic.)

| | |
|-----------------------------------|--|
| 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 Ceramic.)

| | |
|-----------------------------------|---|
| 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 Ceramic |
| Skin Corrosion/Irritation: | No data available on Ceramic |
| Serious Eye Damage/Eye Irritation: | No data available on Ceramic |
| Respiratory or Skin Sensitization: | No data available on Ceramic |
| Germ Cell Mutagenicity: | No data available on Ceramic |
| 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 Ceramic |

Specific Target Organ Toxicity/Systemic Toxicity: No data available on Ceramic
(Single Exposure)

Specific Target Organ Toxicity/Systemic Toxicity: No data available on Ceramic
(Repeated Exposure)

Aspiration Hazard: No data available on Ceramic

12. Ecological Information

The aquatic environment acute hazard

- Not reported on Ceramic

The aquatic environment chronic hazard

- Not reported on Ceramic

Mobility

- Not reported on Ceramic

13. Disposal Considerations

Safe and environmentally desirable disposal method

- 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

UN Hazard Class: Not applicable

Marine Pollutant: Not applicable

*When transporting a powder of metallic ingredients (cobalt, nickel) for composing the Ceramic, 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 Not applicable

UN Number: Not applicable

UN Hazard Class: Not applicable

Marine Pollutant: Not applicable

*When transporting a powder of metallic ingredients (cobalt, nickel) for composing the Ceramic, 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

When transporting the dust which occur from Ceramic 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

- Law for Pollutant Release and Transfer Register (PRTR)

Cobalt: "Class 1 designated chemical substances", Cabinet Order No.132

Cobalt oxide: "Class 1 designated chemical substances", Cabinet Order No.132

Nickel: "Class 1 designated chemical substances", Cabinet OrderNo.308

Nickel oxide: "Class 1 designated chemical substances", Cabinet OrderNo.309

Chromium oxide: "Class 1 designated chemical substances", Cabinet OrderNo.87

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

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.”

Zirconium oxide: The substances are defined in the Article 57-2 of the Act, and the zirconium oxide is listed by No.313 in Appended Table9 in the Article 18-2 of the Enforcement Order as “Dangerous or Harmful Substances to be notified their names, etc.”

Titanium oxide: The substances are defined in the Article 57-2 of the Act, and the titanium oxide is listed by No.191 in Appended Table9 in the Article 18-2 of the Enforcement Order as “Dangerous or Harmful Substances to be notified their names, etc.”

Yttrium oxide: The substances are defined in the Article 57-2 of the Act, and the yttrium oxide is listed by No.54 in Appended Table9 in the Article 18-2 of the Enforcement Order as “Dangerous or Harmful Substances to be notified their names, etc.”

Chromium oxide: The substances are defined in the Article 57-2 of the Act, and the chromium oxide 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.”

Silicon carbide: The substances are defined in the Article 57-2 of the Act, and the silicon carbide is listed by No.336 in Appended Table9 in the Article 18-2 of the Enforcement Order as “Dangerous or Harmful Substances to be notified their names, etc.”

Cobalt/Cobalt oxide: The substances are defined in the Article 57-2 of the Act, and the cobalt/cobalt oxide 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.

Nickel/Nickel oxide: The substances are defined in the Article 57-2 of the Act, and the nickel/nickel oxide 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.”

16. Other Information

Other Hazardous Information

The following attention should be paid for dust which occur from Ceramic 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, nickel oxide, chromium or zirconium oxide 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)

- Zirconium oxide can cause dizziness, increased perspiration, decreased capillary resistance, increased temperature sensation and pain sensation, skin granulomas, irritating symptoms of mild respiratory organs. (Ref.5)
- Magnesium oxide irritates the eyes and nose. Also, inhaling fumes may cause metal heat. (Ref.4)
- For carcinogenicity of metallic ingredients of 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). |
| Nickel oxide | ACGIH | A1: Confirmed carcinogenic to humans. |
| | IARC | 1: Proof to be 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. |
| Ceramic fiber (Whisker) | IARC | 2B: Possibly carcinogenic 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/ |

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).