

SAFETY DATA SHEET

PRODUCT NAME: CEMENTED CARBIDE

1. Identification of the Substance and of the Company

1-1. Product Identifier :

Cemented Carbide, Coated Carbide and Cemented Carbide Tools

1-2. Company Information

Manufacturer : Kyocera Corporation

Address : 6 Takeda Tobadono-Cho, Fushimi-Ku Kyoto 612-8501

Division : Corporate Cutting Tool Group

Phone No. : +81-75-604-3651 FAX No. : +81-75-604-3472

Emergency Contact : Sendai Quality Assurance Section (Sendai Plant) Phone No. : +81-996-23-4116

1-3. Recommended use and Restriction on use :

Cutting tools for mainly metal materials, wear-resistant tools for deformation processing, special cutters and knives, and tools for printed-circuit board.

1-4. Attention to the Phase/State of the Cemented Carbide

- 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.
- Cemented Carbide is safe for use as the cutting tools (grinding, machining, rolling for metals) under normal condition.
- This informs about the dust, fume or vapor which occur from Cemented Carbide producing process such as raw material powder handling and grinding.

2. Hazards Identification

2-1. The GHS Classification

Some data (such as the burning rate test data, etc.) for the dust, fume or vapor which occur from Cemented Carbide producing process are unavailable. Therefore, they are not be classified by GHS.

In here, GHS classification of the each metallic ingredient (cobalt, nickel and chromium) for composing the 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 Cemented Carbide.)

| | | |
|-----------------------|---|---|
| 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: | <ul style="list-style-type: none"> • Hazardous to the aquatic environment | Category4 |

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

| | | |
|---------------|--|--|
| Health Hazard | <ul style="list-style-type: none"> • Respiratory sensitization • Skin sensitization • Carcinogenicity • Specific target organ toxicity (Single exposure) | Category1 Category1 Category2 Category1 (Respiratory tract irritation) |
|---------------|--|--|

| | | |
|-----------------------|--|-------------------------|
| | <ul style="list-style-type: none"> • Specific target organ toxicity (Repeated exposure) | Category1 (Respiratory) |
| Environmental Hazard: | <ul style="list-style-type: none"> • Hazardous to the aquatic environment | Category4 |

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

| | | |
|---------------|---|--|
| 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) |
|---------------|---|--|

2-2. GHS Label Elements

GHS label elements of the each metallic ingredients (cobalt, nickel and chromium) for composing the Cemented Carbide 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> | | |

- 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

- Cemented carbide may be coated with the following materials:
TiN, TiC, Ti(C, N), (Ti, Al)N, Al₂O₃, DLC, (Al, Ti, M)N : M represents one or more metal elements selected from the group consisting of Si, Cr, Mo, W and Nb.
- Distinction between substance and mixture : Mixture (Alloyed Metal)
- Ingredients and concentration or concentration range (composition) of the Cemented Carbide

| Ingredient | Chemical Formula | CAS# | Official Number ,Law for PRTR* | Industrial Safety and Health Law(Official Number) | Composition mass% |
|-------------------|------------------|------------|--------------------------------|---|-------------------|
| Tungsten Carbide | WC | 12070-12-1 | N/A | N/A | 55--96 |
| Tantalum Carbide | TaC | 12070-06-3 | N/A | N/A | 0--20 |
| Niobium Carbide | NbC | 12069-94-2 | N/A | N/A | 0--20 |
| Titanium Carbide | TiC | 12070-08-5 | N/A | N/A | 0--20 |
| Zirconium Carbide | ZrC | 12070-14-3 | N/A | Appendix 9-313 | 0--5 |
| Titanium Nitride | TiN | 25583-20-4 | N/A | N/A | 0--5 |
| Vanadium Carbide | VC | 12070-10-9 | Class-I: 321 | N/A | 0--5 |
| Cobalt | Co | 7440-48-4 | Class-I: 132 | Appendix 9-172 | 0--30 |
| Nickel | Ni | 7440-02-0 | Class-I: 308 | Appendix 9-418 | 0--30 |
| Chromium | Cr | 7440-47-3 | Class-I: 87 | Appendix 9-142 | 0--5 |

*Law for PRTR : Law concerning Reporting, etc. of Releases to the Environment of Specific Chemical Substances and Promoting Improvements in Their Management.

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

Inhalation :

- 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.

Skin Contact :

- 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.

Eye Contact :

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

Ingestion :

- 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 Firefighting Procedures:

- 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 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:**

- 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 (Metal dust concentration) | ACGIH*TLV* mg/m ³ (Metal dust concentration) | JSOH*OEL* mg/m ³ (Respirable dust conc.) |
|-------------------|------------------|--|---|---|
| Tungsten Carbide | WC | 5(as W) | 5 (as W) | N/A |
| Tantalum Carbide | TaC | 5(as Ta) | 5(as Ta) | N/A |
| Titanium Carbide | TiC | N/A | N/A | N/A |
| Niobium Carbide | NbC | N/A | N/A | N/A |
| Zirconium Carbide | ZrC | 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 | 1.5 | 1.0 |
| Chromium | Cr | 1 | 0.5 | 0.5 |

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

* PEL: Permissible Exposure Limit

* ACGIH: American Conference of Governmental Industrial Hygienists Inc.

* TLV: Threshold Limit Value

* JSOH: Japan Society for Occupational Health

* OEL: Occupational Exposure Limit

* 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.

Protective Measures

- Respiratory Protection: Dust-proof respirators and respiratory protective equipment are recommended.
- Hand Protection: Protective gloves for dust are recommended.
- Eye Protection: Safety glasses with side shields or goggles are recommended.
- Skin & Body Protection: Avoid direct skin contact with dust.
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: | Dark gray color (In case of the coated or surface treated cemented carbide, 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: | 11.0 - 15.5 |
| Solubility: | Insoluble |

10. Stability and Reactivity

A grain of dust which occur from 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 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 Cemented Carbide.)

| | |
|-----------------------------------|---|
| 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 Cemented Carbide.)

| | |
|-----------------------------------|--|
| 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 Cemented Carbide.)

| | |
|-----------------------------------|---|
| 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 Cemented Carbide |
| Skin Corrosion / Irritation: | No data available on Cemented Carbide |
| Serious Eye Damage / Eye Irritation: | No data available on Cemented Carbide |
| Respiratory or Skin Sensitization: | No data available on Cemented Carbide |
| Germ Cell Mutagenicity: | No data available on 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 Cemented Carbide |
| Specific Target Organ Toxicity / Systemic Toxicity: (Single Exposure) | No data available on Cemented Carbide |
| Specific Target Organ Toxicity / Systemic Toxicity : (Repeated Exposure) | No data available on Cemented Carbide |
| Aspiration Hazard: | No data available on Cemented Carbide |

12. Ecological Information

The aquatic environment acute hazard

- Not reported on Cemented Carbide

The aquatic environment chronic hazard

- Not reported on Cemented Carbide

Mobility

- Not reported on Cemented Carbide

13. Disposal Considerations

Safe and environmentally desirable disposal 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 |
| UN Hazard Class: | Not applicable |
| Marine Pollutant: | Not applicable |

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

When transporting the dust which occur from 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

• Law for Pollutant Release and Transfer Register(PRTR)

- Vanadium carbide** : "Class 1 designated chemical substances", Cabinet Order No.321
- Cobalt** : "Class 1 designated chemical substances", Cabinet Order No.132
- Nickel** : "Class 1 designated chemical substances", Cabinet Order No.308
- Chromium** : "Class 1 designated chemical substances", Cabinet Order No. 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.

Nickel :The substances are defined in the Article 57-2 of the Act, and the nickel is listed by No.418 in Appended Table 9 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 Table 9 in the Article 18-2 of the Enforcement Order as "Dangerous or Harmful Substances to be notified their names, etc."

In other region, follow the local regulations.

16. Other Information

Other Hazardous Information

The following attention should be paid for dust which occur from 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)
- 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). |
| 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

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Reference URL

- Ministry of Economy, Trade and Industry : <http://www.meti.go.jp/>
- Ministry of Environment : <http://www.env.go.jp/>
- Ministry of Health, Labor and Welfare : <http://www.mhlw.go.jp/>
- Japan Industrial Safety and Health Association : <http://www.jaish.gr.jp/>
- IARC (International Agency for Research on Cancer) : <http://monographs.iarc.fr/>
- ICSC (International Chemical Safety Cards) : <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).