SAFETY DATA SHEET

PRODUCT NAME: CERAMIC (Aluminum Oxide / Titanium Carbide base)

1. Identification of the Substance and of the Company

1-1. Product Identifier :

Ceramics, Coated Ceramics and Ceramic Tools (Aluminum Oxide / Titanium Carbide base)

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.

1-4. 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 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

2-1. 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 and nickel) 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	• 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	• 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

2-2. GHS Label Elements

GHS label elements of the each metallic ingredients (cobalt and nickel) for composing the Ceramic can be disclosed in below.

	Cobalt	Nickel
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 irritation. ・Cause of respiratory failure due to long-term or repetitive exposure. ・May be harmful to aquatic life due to long-term effects	・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
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.	

3. Composition/Information on Ingredients

- Distinction between substance and mixture : Mixture
- Chemical name or generic name : Ceramic: Aluminum Oxide / Titanium Carbide base
- Ceramics may be coated with the following materials:

  TiN、TiC、Ti(C,N), (Al,Ti,M)N : M represents one or more metal elements selected from the group consisting of Si, Cr, Mo, W and Nb.
- Ingredients and concentration or concentration range (composition) of Ceramic

Ingredient	Chemical Formula	CAS#	Official Number, Law for PRTR*	Industrial Safety and Health Law (Official Number)	Composition mass%
Aluminum Oxide	Al_2O_3	1344-28-1	N/A	Appendix 9-189	65--75
Titanium Carbide	TiC	12070-08-5	N/A	N/A	15--30
Titanium Carbonitride	TiCN	N/A	N/A	N/A	1--15
Nickel Oxide / metal Nickel	NiO / Ni	1313-99-1/ 7440-02-0	Class-1:355/354	Appendix 9-418	0--2
Cobalt Oxide / metal Cobalt	Co_3O_4 / Co	1308-06-1 / 7440-48-4	Class-1:156	Appendix 9-172	0--2

*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 and nickel (effective digit: 2), please contact the above address.

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 is in eyes, immediately wash away with clean 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 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, Protective Equipment

・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 (Metal dust concentration)	ACGIH*TLV* mg/m^3 (Metal dust concentration)	JSOH*OEL* mg/m^3 (Respirable dust conc.)
Aluminum oxide	Al_2O_3	5	10	N/A
Titanium Carbide	TiC	N/A	N/A	N/A
Charcoal titanium nitride	TiCN	N/A	N/A	N/A
Nickel Oxide / metal Nickel	NiO / Ni	1.0 (as Ni)	1.5 (as Ni)	1.0 (as Ni)
Cobalt Oxide / metal Cobalt	Co_3O_4 / Co	0.1	0.02	0.05

* 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

Protective equipment

- 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

Physical state	Solid
Appearance:	Black color (In case of the coated Ceramic, the appearance color is often different.)
Odor:	Odorless
Melting point:/Freezing point	No data available
Boiling point:	No data available
Combustibility	Incombustibility
Flash point:	No data available
Spontaneous ignition point	Not spontaneously ignited
pH:	No data available
Kinematic viscosity	No data available
Solubility:	Insoluble
Vapor pressure:	No data available
Specific gravity:	4.0 - 4.5
Relative gas density	No data available
Particle characteristic	No data available

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.

Reactivity: It dissolves in an acid and an alkali in very small quantities.
Chemical stability: The product concerned is in a solid state, and there are not explosiveness, inflammability, combustibility, spontaneous combustibility, water-reactivity, and an oxidation nature, and it is chemically stable under the usual environment.
Possibility of hazardous reactions: None
Conditions to avoid: Contact with the following incompatible hazardous materials.
Incompatible hazardous materials: Oxidizing substances (Strong oxidants, Strong acids, etc.)
Others (Strong base, etc.)
Hazardous decomposition products: None

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

Information on safe and environmentally preferable disposal or recycling

- 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 occurs 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 Table 9 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."

In other region, follow the local regulations.

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

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Numerical values, such as content, physics/chemical property, are not guaranteed values.

Reference URI

- 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: https://www.nite.go.jp/en/index.html

References 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).