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MATERIAL SAFETY DATA SHEET

CHEMICAL NAME: DIAMOND (PCD: Polycrystalline Diamond) Tools

1. CHEMICAL AND MANUFACTURER INFORMATION

1-1. Chemical Name：

DIAMOND (PCD: Polycrystalline Diamond) Tools and Cemented carbide (Base Insert)

1-2. Company Information

Manufacturer ：Kyocera Corporation
Address ：6 Takeda Tobadono-Cho, Fushimi-Ku Kyoto 612-8501
Division ：Corporate Cutting Tool Group
Phone No. ：075-604-3651 FAX No. ：075-604-3472
Emergency Contact ：General Administration Dept. (Yohkaichi Plant) Phone No. ：0748-22-1550

1-3. Chemical Family ：Refractory Metal Carbide

2. COMPOSITION / INGREDIENTS / IDENTITY INFORMATION

■ Single / Mixture : Mixture

Ingredients and Composition of PCD

Ingredient	Chemical Formula	CAS#	Official Number ,Law for PRTR*	Industrial Safety and Health Law(Official Number)	Composition wt%
PCD layer and Cemented Carbide layer					
Carbon	C	7440-44-0	N/A	N/A	30--95
Tungsten Carbide	WC	12070-12-1	N/A	N/A	0--70
Cobalt	Co	7440-48-4	Class 1:100	Appendix 9-172	10--30
Junction layer					
Silver	Ag	7440-22-4	Class 1:64	Appendix 9-137	20--60
Cupper	Cu	7440-50-8	N/A	Appendix 9-379	15--50
Nickel	Ni	7440-02-0	Class 1:231	Appendix 9-418	0--10
Cemented Carbide(Base Insert)					
Tungsten Carbide	WC	12070-12-1	N/A	N/A	85--95
Cobalt	Co	7440-48-4	Class 1:100	Appendix 9-172	5--15
Titanium Carbide	TiC	12070-08-05	N/A	N/A	0--10
Zirconium Carbide	ZrC	12070-14-3	N/A	Appendix 9-313	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, silver, and nickel (effective digit: 2), please contact the above address.

3. HAZARDOUS DATA

3-1. Fire and Explosion Hazard: PCD tool is nonflammable in the solid state. However, dusts produced from grinding may trigger a spontaneous ignition an explosion if allowed to accumulate.
There is no information available regarding the flash point, ignition limit, and explosion limit etc.

3-2. Health Hazard: Polycrystalline Diamond (PCD) is in inert state and does not present a health hazard. Dust from grinding can cause irritation of skin and eyes. Recent studies indicate that the repeated Inhalation or long-term contact of cobalt affects skin, respiratory organs and heart.

3-3. Environmental Impact: There is no information available to be harmful.

4. EMERGENCY AND FIRST AID PROCEDURES

Inhalation:

- When inhaling high concentrations of dust from grinding, or if symptoms of pulmonary involvement develop (coughing, wheezing, shortness of breath, etc.), remove the worker from exposure. Give oxygen in the case of breathing difficulty.
- If irritation or rash persists, or in the case of breath-holding, seek medical attention after giving artificial respiration.

Skin Contact: If the dust from grinding contacts on skin, thoroughly wash affected area with soap and water and isolate from exposure. If irritation or rash persists, seek medical attention.

Eye Contact: If the dust from grinding contacts on the eyes, flush with large amounts of water. If irritation persists, seek medical attention.

Ingestion: If a large amount of dust is swallowed, drink copious amounts of water to dilute it and seek medical attention.

5. FIRE AND EXPLOSION HAZARD DATA

Extinguishing Media: For dust explosion or fire, use dry sand, dry dolomite, ABC type dry chemical extinguisher (for general, oil, and electricity fire), or water (avoid using water for the dust from grinding of light metals such as Magnesium, Aluminum, etc.)

Unusual Fire and Explosion Hazards: The dust from grinding may trigger a spontaneous ignition under the specific conditions when the particle size is extremely fine and mixed with the grinding fluid with low flash point. When the dust under the specific condition for easily-to-ignite is dispersed into the air, it may exceed the explosion limit. In such cases, assure the personal safety firstly and take the necessary extinguishing measures.

Special Firefighting Procedures: Wear dust-protective mask or other respiratory protective devices.

* There is no statement about PCD and cemented carbide regarding a danger classification by NFPA (National Fire Protection Association)

6. SPILL OR LEAK PROCEDURES:

Health Hazard Protection: Wearing the clothing to minimize the exposure of dust and the respirator is recommended to those who will clean up the dust from grinding.

Environmental Conservation: Dispose of as industrial waste in accordance with appropriate government regulations and avoid leaking into water systems.

Removal Method: About the dust leaked from grinding or machining, isolate a place and remove using the cleaner equipped with the filter which can collect particulates in high efficiency etc. When there is no suitable removal method, let a dust become wet with fog-like water or the wet mop for floors, and remove it.

7. PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:

Handling: PCD is a stable material and is not considered to be a physical or health hazard. However, there is the possibility of causing skin problems when contacting the dust or grinding fluid containing cobalt for long hours or repeatedly.
When dealing with the large-sized product or large quantity, it is necessary to handle with care because cemented carbide has high specific gravity.

Wash hands thoroughly after handling, before eating or smoking. Do not eat, drink and smoke at the handling area.
Periodic medical examination is recommended for individuals regularly exposed to dust or mist.

Storage: Store in a dry form within doors. Avoid the sudden temperature change and the humid conditions.

Additional Process such as Grinding:

When grinding or machining this product, minimize the exposure of the dust and sludge possibly containing cobalt by local exhaust ventilation and other protective devices.
Be sure to use diamond wheel for finishing.
Grinding the products will produce dusts of potentially hazardous ingredients when inhaling a large amount.
When regrinding, make sure there is no crack on the product surface after regrinding process.
Laser marking on the products may produce cracks. Do not apply laser marker on the stressed part.

8. SPECIAL PROTECTION INFORMATION

Use dust-protective mask, respirator or implement local exhaust ventilation. Airborne dust should not exceed the permissible level on the following table.

☐ Occupational Exposure Limit values

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.)
PCD layer and Cemented Carbide layer				
Carbon	C	N/A	N/A	N/A
Tungsten Carbide	WC	N/A	5 (as W)	**
Cobalt	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
* ** It is classified the third dust, respirable dust concentration is max. 2 mg/m^3.

☐ Protective Equipments:

Respiratory Protection: Dust-protective mask and respirator are recommended.
Hand protection: Protective gloves are recommended.
Eye Protection: Safety glasses with side shields or goggles are recommended.
Skin & Body Protection: Avoid the direct skin contact with dust.
Do not shake clothing, rags or other items to remove dust. Dust should be removed by washing or vacuuming (with appropriate filters) the clothing, rags or other items. Clean work clothing should be worn daily.
Local exhaust ventilation is recommended.

9. PHYSICAL AND CHEMICAL DATA

Appearance and Odor	Gray No Odor Solid		
Boiling Point	N/A	Specific Gravity (H_2O=1)	11.0-15.5
Vapor Pressure (mmHg)	N/A	Percent Volatile by Volume	0
Vapor Density (Air=1)	N/A	Evaporation Rate	N/A
Solubility in Water	Insoluble		

Appearance may change depending on composition or coating materials.

10. STABILITY AND REACTIVITY DATA

Stability: PCB is stable under normal use conditions.
Conditions to avoid: Contact with the following materials
Materials to avoid: Strong oxidizers (Hydrogen peroxide, Fluoride, Iodide, Basic oxide, Oxidized nitrogen etc.)
Others (Hydrazine, Acetylene, Ammonia etc.)
Hazardous decomposition products: None

11. HEALTH HAZARD DATA

Acute effect of overexposure: Dust or fumes from grinding this product can cause irritation of the nose, mouth, throat, eye mucosa, upper respiratory tract and lungs when inhaled. Symptoms of overexposure include allergic dermatitis, productive cough, wheezing, shortness of breath, and chest tightness, etc.
Ingestion of the dust containing high levels of cobalt may cause damage of the blood, heart, thyroid gland, and spleen. (Reference: 1)

Local effect: Repeated or long-term skin contact with cobalt may cause irritation and skin rash.

Chronic effect of overexposure:
Repeated or long-term inhalation or exposure of cobalt (Reference:2,3,4,5) may cause asthma.

Repeated or long-term inhalation or exposure of cobalt or nickel or chromium may cause irritation of the lungs. (Reference: 3,4)
- There is no information available regarding carcinogenicity of PCD.
- Regarding carcinogenicity of cemented carbide, cobalt metal with tungsten carbide is listed as probably carcinogenic to humans(2A) by IARC.
- Cobalt is listed as an animal carcinogen (A3) by ACGIH and as possibly carcinogenic to humans (2B) by IARC and JSOH.

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

12. ENVIRONMENTAL IMPACT DATA

Mobility: There is no information available regarding PCD and cemented carbide.

Residual: There is no information available regarding PCD and cemented carbide.

Bioaccumulation: There is no information available regarding PCD and cemented carbide..

Environmental impact: There is no information available regarding PCD and cemented carbide..

*Cobalt may be potentially hazardous to the environment. Particular attention is required regarding the effect to the aquatic organism.

13. WASTE DISPOSAL PRECAUTIONS

Disposal Method:
Dispose of in accordance with “Waste Disposal and Public Cleaning Law” in Japan. In other region, follow the local regulations.
Some of the principal components such as tungsten carbide, cobalt and nickel are the rare metals and it is preferable to recover and recycle them.

14. TRANSPORT PRECAUTIONS

No transport regulations in Japan. In other region, follow the local regulations.

15. APPLICABLE LAW

Law concerning Reporting, etc. of Releases to the Environment of Specific Chemical Substances and Promoting Improvements in Their Management in Japan. Cobalt is “Class 1 designated chemical substances” and there is obligation to produce MSDS. (Ministry of Economy, Trade and Industry / Ministry of Environment)
Industrial Safety and Health Law (Obligation to produce MSDS: Ministry of Health, Labor and Welfare) in Japan.
In other region, follow the local regulations.

16. OTHER DATA

Although Kyocera has attempted to provide current and accurate information herein, Kyocera makes no representations regarding the accuracy or completeness of the information and assumes no liability for any loss, damage, or injury of any kind which may result from or arise out of the use of or reliance on the information by any person.

Please refer to the following websites.

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/

ICSC (International Chemical Safety Cards): http://www.nihs.go.jp/ICSC/

<Reference>

1. Food & Drug Research Laboratories, Study No.8005B (4.11.84)
2. T. Shirakawa et al., Chest.95.29 (1989)
3. International Chemical Safety Cards (cobalt, chromium, nickel)
4. Danger and hazardous property handbook of a chemical substance(Japan Industrial Safety & Health Association)
5. A.O.Bech et al., Brit.J.Ind.,19,239 (1962)