MATERIAL SAFETY DATA SHEET

CEMENTED CARBIDE PRODUCT WITH COBALT/NICKEL BINDER

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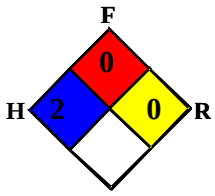
Section 1 - Chemical Product and Company Identification

Material Name	Cemented Carbide Product with Cobalt/Nickel Binder
Chemical Formula	Co, Cr_3C_2, Al_2O_3, Mo, NbC, Ni, TaC, TiC, TiAlN, TiCN, VC, WC (See also Section 2)
CAS No.	See Section 2
Manufacturer	Iscar Ltd., Box 11, Tefen 24959 ISRAEL. Tel: +972 4 997 0311. Fax: +972 4 987 3741

Section 2 - Hazards Identification

During normal operation and usage, cemented carbide products do not present inhalation, ingestion or other chemical hazards. However, operations such as grinding, cutting, melting or processing in any other fashion of these products may produce or release dust, fumes or vapors of potentially hazardous ingredients, which can be swallowed, inhaled or come in contact with the skin and/or eyes and may present health hazards, if the exposure limits described in Section 2 are exceeded. These products are cutting tools which may contain sharp edges.
Cutting tools can break during normal usage. To avoid injury, equipment with guards and safety shields should be used.

Potential Health Effects



According to EC Directive 2001/58/EC

Risk Phrases

R40: Limited evidence of a carcinogenic effect.
R42/43: May cause sensitization by inhalation and skin contact.
R48/23: Toxic: danger of serious damage to health by prolonged exposure through inhalation.

Classification:

T- Toxic

GHS- Classification

Hazard Statements

H351: Suspected of causing cancer.
H334: May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H317: May cause an allergic skin reaction.
H372: Causes damage to organs through prolonged or repeated exposure.

Classification:

Danger

Primary Routes of Entry: Inhalation, ingestion, skin and/or eye contact.

Wet or dry grinding of cemented carbide products will produce dust of potentially hazardous ingredients which can be inhaled, swallowed or come in contact with the skin and/or eyes.

Acute Health Effects: Dust from grinding or other non-normal operations can cause irritation of the nose, throat, lungs, eyes and mucous membranes. Skin exposure can cause an allergic reaction including red rash (cobalt itch).

Chronic Health Effects: Chronic exposure to respirable dust containing cobalt and tungsten carry the potential to cause permanent respiratory diseases, including occupational asthma, interstitial pneumonitis and fibrosis (hard-metal disease), and emphysema. Symptoms include productive cough, wheezing, dyspnea (upon exertion), soreness of breath, soreness in the chest, nausea and weight loss. Skin sensitization is also noted in a small percentage of cases. Reports outside of the industry suggest that ingestion of significant amounts of cobalt can cause blood, heart and other organ effects. Long-term or repeated exposure to dusts may have effects on the central nervous system.

Carcinogenic Assessment:

Aluminum oxide
ACGIH A4 - Not classifiable as human carcinogen.
Cobalt
ACGIH A3 - Confirmed animal carcinogen.
IARC GROUP 2B - Possibly carcinogenic to humans.

Nickel

ACGIH A5 - Not suspected as human carcinogen.
IARC GROUP 2B - Possibly carcinogenic to humans.
NTP 2 - Reasonably anticipated to be a human carcinogen.

Section 3 - Composition / Information on Ingredients

Substance Name	Chemical Formula	CAS No.	EC No.	W/W %	OSHA PEL (mg/m3)	ACGIH TLV-(mg/m3)***
Aluminum Oxide****	Al_2O_3	1344-28-1	215-691-6	0-0.5%****	15 mg/m^3	10 mg/m^3
Aluminum Nitride****	AlN	24304-00-5	246-140-8	0-0.5%****	15 mg/m^3	10 mg/m^3
Chromium Carbide	Cr_3C_2	12012-35-0	234-576-1	0 – 1%*	1 mg/m^3 **	0.5 mg/m^3 **
Cobalt	Co	7440-48-4	231-158-0	4 – 15%*	0.1 mg/m^3	0.02 mg/m^3
Molybdenum	Mo	7439-98-7	231-107-2	0 – 10%*	15.0 mg/m^3	10.0 mg/m^3
Nickel	Ni	7440-02-0	231-111-4	0 – 10%*	1.0 mg/m^3 **	1.5 mg/m^3 **
Niobium Carbide	NbC	12069-94-2	235-117-8	0 – 5%*	Not Established	Not Established
Tantalum Carbide	TaC	12070-06-3	235-118-3	0 – 15%*	5.0 mg/m^3 **	5.0 mg/m^3 **
Titanium Carbide	TiC	12070-08-5	235-120-4	0 – 10%*	Not established	Not established
Titanium Nitride	TiN	25583-20-4	247-117-5	0 – 10%*	Not established	Not established
Tungsten Carbide	WC	12070-12-1	235-123-0	5 – 95%*	5.0 mg/m^3 **	5.0 mg/m^3 **
Vanadium Carbide	VC	12070-10-9	235-122-5	0 – 10%*	Not established	Not established

** Depends on grade specifications* *** Values given are "as metal"*

**** Last updating by Threshold Limit Values by ACGIH –2009* *****If coated*

Substance Name	R-Phrases	H-Statements
Cobalt	R42/43, R53	Resp. Sens. 1: H334, Skin Sens. 1: H317, Aquatic Chronic 4: H413
Molybdenum	R11	Flam. Sol.: H228
Nickel	R43, R40, R48/23	Skin Sens. 1: H317, Carc. 2: H351, STOT RE 1: H372
Vanadium carbide	R20/21/22	Acute. Tox. 4: H332, H312, H302

Section 4 - First Aid Measure

Inhalation: If symptoms of pulmonary involvement develop (coughing, wheezing, dyspnea, etc.) remove the exposed person to fresh air immediately; restore and/or support his or her breathing as needed. If breathing is difficult, administer oxygen. If breathing has stopped, give artificial respiration. If symptoms persist, keep affected person warm and at rest. Seek medical attention immediately.

Eye Contact: If irritation occurs, remove contact lenses at once. Flush eyes immediately, including under the eyelids, gently but thoroughly, with plenty of running water for at least 15 minutes. If irritation persists, seek medical attention.

Skin Contact: If irritation or rash occurs, remove contaminated clothing and thoroughly wash the affected area with soap and water. If irritation or rash persists, seek medical attention.

Ingestion: If swallowing of greater than trace amounts is suspected, seek medical attention immediately. If the person is conscious, immediately give person large amounts of water. Induce vomiting only if specifically instructed by a physician. Caution: Never give anything by mouth to an unconscious or convulsing person.

After first aid, get appropriate in-plant, paramedic or community medical support.

Section 5 - Fire Fighting Measures

Flash Point N/A
Auto-Ignition Temperature N/A **NFPA 2 : 0 : 0**
LEL ---

UEL ---

Extinguishing Media: For powder and dust fires, smother with dry sand, dry dolomite, ABC type fire extinguisher or flood with water.

Unusual Fire or Explosion Hazards: Dusts may present a fire or explosion hazard under rare favoring conditions of particle size, dispersion, concentration, a static discharge or strong ignition source. However, this is not expected to be a problem under normal handling conditions.

Special Fire-Fighting Procedures: For dust fires, smother with dry sand, dry dolomite, ABC type fire extinguisher or flood with water. If fire is in a container, move the container from fire area if possible. Cool container exposed to flame with water from side until well after fire is out. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; else withdraw and let fire burn.

Fire-Fighting Equipment: For a powder fire confined to a small area, use a respirator approved for toxic dusts and fumes. For a large fire, fire fighters should use NIOSH/MSHA approved full-face-piece self-contained breathing apparatus (SCBA) operated in positive pressure mode and full turnout gear. See Sections 3 and 8 for specific hazard identification and exposure control measures.

Hazardous Combustion Products: Oxides of aluminum, cobalt, titanium and tungsten; carbon dioxide and carbon monoxide. See Section 3 for specific hazard identification.

Section 6 - Accidental Release Measure

Spill/Leak Procedures: Do not walk through or otherwise scatter or disperse spilled material. Ventilate area of spill. Clean up area using methods which avoid dust generation such as a high efficiency particular air (HEPA) vacuum (with appropriate filter to prevent airborne dust levels which exceed the PEL or TLV), wet dust mop or wet clean-up. Use an appropriate National Institute of Occupational Safety and Health (NIOSH)-approved respirator whenever airborne concentrations of hazardous components exceed exposure limits listed in Section

Section 7 - Handling and Storage

Under normal operating conditions and usage, cemented carbide products do not require special safety precautions beyond the normal safety procedures for handling and using cutting tools, including the use of safety glasses and gloves. However, other non-routine operations such as grinding, welding, cutting and burning of cemented carbide products may produce dusts or fumes that may require special handling procedures. The procedures described below are especially important for these non-routine operations.

Hygienic Practices: Wash hands thoroughly after handling and before eating, smoking, using the toilet or applying cosmetics. Wash all exposed skin at the end of the work shift. The consumption of food and beverages as well as smoking should be prohibited in areas where hazardous components may be present. Do not shake clothing, rags or other articles to remove dust. Dust should be removed from clothing, rags or other articles by laundering or vacuuming (with the appropriate filters).

Handling and Storage Precautions: Maintain good housekeeping procedures to prevent dust accumulation, especially during grinding. Avoid dust inhalation and direct skin or eye contact with dust. See Section 3 for specific health hazards. Store in a cool, dry, well-ventilated area. Keep away from sparks or ignition source. Keep away from strong acids and strong oxidizers.

Other Precautions: Always perform clean up operations using methods that avoid dust generation such as a HEPA vacuum, wet dust mop or wet clean-up. Use an appropriate NIOSH-approved respirator whenever airborne concentrations of hazardous components exceed exposure limits listed in Section 2.

Comments: Periodic health monitoring is suggested for individuals regularly exposed to dust or fumes, with particular attention to any potential sensitization effects of such materials.

Section 8 - Exposure Controls/Personal Protection

Threshold values:

Aluminum oxide

- ACGIH-TLV 10 mg/m^3 (TWA)
- OSHA-PEL 15 mg/m^3 (TWA), total dust
- OSHA-PEL 5 mg/m^3 (TWA), respirable fraction
- MAK-GER 1.5 mg/m^3 (TWA), respirable, fume

Chromium carbide (As Cr)

- ACGIH-TLV 0.5 mg/m^3 (TWA)
- OSHA-PEL 1 mg/m^3 (TWA)
- NIOSH-REL 0.5 mg/m^3 (TWA)

Cobalt
- ACGIH-TLV 0.02 mg/m^3 (TWA)
- OSHA-PEL 0.1 mg/m^3 (TWA)
- NIOSH-REL 0.05 mg/m^3 (TWA)

Molybdenum
- ACGIH-TLV 3 mg/m^3 (TWA), respirable
- ACGIH-TLV 10 mg/m^3 (TWA), inhalable
- OSHA-PEL 15 mg/m^3 (TWA), total dust

Tantalum carbide (As Ta)
- ACGIH-TLV 5 mg/m^3 (TWA)
- OSHA-PEL 5 mg/m^3 (TWA)
- MAK-GER 1.5 mg/m^3 (TWA), respirable
- NIOSH-REL 5 mg/m^3 (TWA), 10 mg/m^3 (STEL)

Nickel
- ACGIH-TLV 1.5 mg/m^3 (TWA), inhalable
- OSHA-PEL 1 mg/m^3 (TWA)
- NIOSH-REL 0.015 mg/m^3 (TWA)

Tungsten carbide
- ACGIH-TLV 5 mg/m^3 (TWA), 10 mg/m^3 (STEL)
- NIOSH-REL 0.015 mg/m^3 (TWA)

IDLH: (Immediately Dangerous to Life and Health):
Nickel: 10 mg Ni/m^3 NIOSH 1995
Cobalt: 20 mg Co/m^3 NIOSH 1995
Chromium: 250 mg Cr (II)/m^3 NIOSH 1995
Molybdenum: 5000 mg Mo/m^3 NIOSH 1995 (insoluble compound, as Mo)

Ventilation: Provide local exhaust ventilation or general dilution ventilation to maintain exposure levels below TLV - TWA.

Protective Clothing and Equipment: Always wear protective gloves and protective safety eyeglasses with side shields when performing a non-routine operation such as grinding, welding, cutting and burning cemented carbide products, or when contact with dust is anticipated. Use barrier cream and protective clothing to prevent prolonged or repeated skin contact. Prior to applying barrier cream or use of protective gloves, wash thoroughly. Wear protective eyeglasses with side shields.
These products are cutting tools which may contain sharp edges. Appropriate precautions should be taken. Cutting tools can break during normal usage. To avoid injury, equipment with guards and safety shields should be used.

Respirator: Use an appropriate NIOSH-approved respirator with a HEPA or similar cartridge if airborne dust concentrations exceed the appropriate PEL or TLV as shown in Section 2. Follow OSHA respirator regulations (29 CFR 1910.134).

Contaminated Clothing and Equipment: Soiled clothing should be laundered separately. Dust should be removed by water wash or vacuuming with the appropriate filters. Do not shake clothing, rags or other items to remove dust.

Comments: Never eat, drink or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet or applying cosmetics.

Section 9 - Physical and Chemical Properties

Physical State	Solid	**Vapor Pressure (mm Hg)**	N/A
Color	Dark Gray Metal	**Vapor Density (Air = 1)**	N/A
Odor	Odorless	**pH**	N/A
Boiling Point	6000°C	**Specific Gravity (H_2O=1)**	10.7 to 15.5
Melting Point	2870°C	**Percent Volatile by Volume**	0
Water Solubility	Insoluble	**Evaporation Rate**	N/A

Section 10 - Stability and Reactivity

Stability: Stable
Polymerization: Hazardous polymerization cannot occur.
Chemical Incompatibilities: Contact of dust with strong oxidizers may cause fire or explosions.
Conditions to Avoid: Keep away from strong acids.
Hazardous Decomposition Products: None

Section 11 - Toxicological Information

Aluminum oxide: LD_{50} (Intraperitoneal mouse) > 3600 mg/kg **Nickel:** LD_{50} (Intraperitoneal rat) 250 mg/kg
Cobalt: LD_{50} (Oral rat) 6171 mg/kg
LD_{50} (Intraperitoneal rat) 100 mg/kg
Cobalt: Cobalt fumes or dust may cause pulmonary, skin, eyes and mucous membrane irritation. Cobalt may be a sensitizing agent for skin and respiratory system. Chronic exposure may affect the heart, pancreas, thyroid gland or bone marrow.
Chromium Carbide, Tungsten Carbide, Titanium Carbide, Tantalum Carbide, Niobium Carbide, Vanadium Carbide: Toxicity has not been quantified. May cause pulmonary and skin sensitization, eyes and mucous membrane irritation in dust form.

Section 12 - Ecological Information

Ecological testing has not been conducted on this product.

Section 13 - Disposal Consideration

Disposal: Burial at a permitted landfill is recommended. Consider recycling. Follow applicable federal, state, and local regulations.

Section 14 - Transport Information

Sea (IMO / IMDG)	Shipping Name:	Not regulated
Air (ICAO /IATA)	Shipping Name:	Not regulated
European Road / Rail (ADR/RID)	Shipping Name:	Not regulated
U. S. Department of Transportation	Shipping Name:	Not regulated
Canadian Transportation of Dangerous Goods	Shipping Name:	Not regulated

Section 15 - Regulatory Information

EPA and OSHA Designations: Not listed.

Labeling in accordance with EC directives

Symbol and indicating of hazard:

T - Toxic

Labeling in accordance with GHS

Signal word: Danger

Risk Phrases

R40: Limited evidence of a carcinogenic effect.
R42/43: May cause sensitization by inhalation and skin contact.
R48/23: Toxic: danger of serious damage to health by prolonged exposure through inhalation.

Hazard Statements

H351: Suspected of causing cancer.
H334: May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H317: May cause an allergic skin reaction.
H372: Causes damage to organs through prolonged or repeated exposure.

Safety Phrases

S53: Avoid exposure - obtain special instructions before use.
S45: In case of accident or if you feel unwell, seek medical advice immediately (show the label whenever possible.)
S22: Do not breathe dust.
S36/37/39: Wear suitable protective clothing and gloves.

Precautionary Statements

P201: Obtain special instructions before use.
P309+P311: IF exposed or you feel unwell: Call a POISON CENTER or doctor/physician.
P260: Do not breathe dust.
P280: Wear protective gloves/protective clothing/eye protection/face protection.

Section 16 - Other Information

Full text of R-phrases with No. appearing in section 3:

R11: Highly flammable.
R20/21/22: Harmful by inhalation, in contact with skin and if swallowed.
R40: Limited evidence of a carcinogenic effect.
R43: May cause sensitization by skin contact.
R42/43: May cause sensitization by inhalation and skin contact.
R48/23: Toxic: danger of serious damage to health by prolonged exposure through inhalation.
R53: May cause long-term adverse effects in the aquatic environment.

Full text of H-statements with No. appearing in section 3:

H228: Flammable solid.
H332: Harmful if inhaled.
H312: Harmful in contact with skin.
H302: Harmful if swallowed.
H351: Suspected of causing cancer.
H317: May cause an allergic skin reaction.
H334: May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H372: Causes damage to organs through prolonged or repeated exposure.
H413: May cause long lasting harmful effects to aquatic life.

This product, to the best of our knowledge, does not contain and is not manufactured with any Class I or Class II Ozone Depleting Chemicals (ODCs).

Disclaimer: This Material Safety Data Sheet and the information it contains is consistent with recommended applications of these products and anticipated non-routine activities involving the products. It is the user's responsibility to identify and protect against health and safety hazards presented by modification of Cemented Carbide products after manufacture. Individuals handling Cemented Carbide products or powders should be informed of all relevant hazards and recommended safety precautions, and should have access to the information contained in this MSDS.

The details contained in this MSDS are believed to be accurate and based on our recent state of knowledge and experience. However, ISCAR LTD. and INT'L METALWORKING COMPANIES (IMC Group) make no claim regarding the accuracy or completeness of the information and assume 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 contained in the MSDS by any person or entity.