| **Tungsten Carbide/Cobalt Nanoparticles** |
| **Tungsten Carbide/Cobalt Rod** |
| **Tungsten Carbide/Cobalt Sheet** |
| **Tungsten Carbide/Cobalt Spheres** |
| **Tungsten Carbide/Cobalt Sputtering Target** |
| **Tungsten Carbide/Cobalt Tube** |
| **Tungsten Carbide/Cobalt Wire** |

| Linear Formula | WCCo |
| Pubchem CID | N/A |
| MDL Number | MFCD00064847 |
| EC No. | N/A |
| IUPAC Name | N/A |
| Beilstein Registry No. | N/A |
| SMILES | [W+4].[C-4].[Co] |
| InChI Identifier | InChI=1S/C.Co.W/q-4;;+4 |
| InChI Key | UONOETXJSWQNOL-UHFFFAOYSA-N |
| Signal Word | Warning |
| Hazard Statements | H334-H317-H228 |
| Hazard Codes | F, Xn |
| Risk Codes | 11-42/43 |
| Safety Statements | 22-23-24-37-45-60 |
| RTECS Number | N/A |
| Transport Information | UN3178 4.1/Pg III |
| WGK Germany | 3 |
GHS Pictograms

<table>
<thead>
<tr>
<th>GHS02 Flame</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHS08 Health Hazard</td>
</tr>
<tr>
<td>GHS07 Exclamation Point</td>
</tr>
</tbody>
</table>

SAFETY DATA SHEET

Date Accessed: 10/15/2019
Date Revised: 05/15/2015

SECTION 1. IDENTIFICATION

Product Identifiers: All applicable American Elements product codes for CAS #12774-15-1

Relevant identified uses of the substance:
Scientific research and development

Supplier details:
American Elements
10884 Weyburn Ave.
Los Angeles, CA 90024
Tel: +1 310-208-0551
Fax: +1 310-208-0351

Emergency telephone number:
Domestic, North America +1 800-424-9300
International +1 703-527-3887

SECTION 2. HAZARDS IDENTIFICATION

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)
GHS02 Flame
Flam. Sol. 2 H228 Flammable solid.
GHS08 Health hazard
Resp. Sens. 1 H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled.
GHS07
Skin Sens. 1 H317 May cause an allergic skin reaction.
Hazards not otherwise classified No data available
GHS label elements, including precautionary statements
Hazard pictograms

Signal word Danger
Hazard statements
H228 Flammable solid.
H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H317 May cause an allergic skin reaction.
Precautionary statements
P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P284 In case of inadequate ventilation wear respiratory protection.
P261 Avoid breathing dust/fume/gas/mist/vapors/spray.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P342+P311 If experiencing respiratory symptoms:
Call a POISON CENTER/doctor
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.
WHMIS classification
B4 - Flammable solid
D2A - Very toxic material causing other toxic effects
Classification system
HMIS ratings (scale 0-4)
(Hazardous Materials Identification System)
HEALTH
FIRE
REACTIVITY
1
2
1
Health (acute effects) = 1
Flammability = 2
Physical Hazard = 1
Other hazards
Results of PBT and vPvB assessment
PBT: N/A
vPvB: N/A

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substances
SECTION 4. FIRST AID MEASURES

Description of first aid measures
If inhaled:
Supply patient with fresh air. If not breathing, provide artificial respiration. Keep patient warm.
Seek immediate medical advice.
In case of skin contact:
Immediately wash with soap and water; rinse thoroughly.
Seek immediate medical advice.
In case of eye contact:
Rinse opened eye for several minutes under running water. Consult a physician.
If swallowed:
Seek medical treatment.
Information for doctor
Most important symptoms and effects, both acute and delayed:
No data available
Indication of any immediate medical attention and special treatment needed:
No data available

SECTION 5. FIREFIGHTING MEASURES

Extinguishing media
Suitable extinguishing agents Special powder for metal fires. Do not use water.
For safety reasons unsuitable extinguishing agents
Water
Special hazards arising from the substance or mixture
If this product is involved in a fire, the following can be released:
Carbon monoxide and carbon dioxide
Metal oxide fume
Advice for firefighters
Protective equipment:
Wear self-contained respirator.
Wear fully protective impervious suit.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Keep unprotected
persons away.
Ensure adequate ventilation
Keep away from ignition sources
Environmental precautions: Do not allow product to
enter drains, sewage systems, or other water courses.
Methods and materials for containment and cleanup:
Dispose of contaminated material as waste according
to section 13.
Ensure adequate ventilation.
Prevention of secondary hazards: Keep away from
ignition sources.
Reference to other sections
See Section 7 for information on safe handling
See Section 8 for information on personal protection
equipment.
See Section 13 for disposal information.

SECTION 7. HANDLING AND STORAGE

Handling
Precautions for safe handling
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.
Prevent formation of dust.
Information about protection against explosions and
fires: Protect against electrostatic charges.
Conditions for safe storage, including any
incompatibilities
Requirements to be met by storerooms and
receptacles: Store in a cool location.
Information about storage in one common storage
facility:
Do not store together with acids.
Store away from oxidizing agents.
Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well-sealed containers.
Specific end use(s) No data available

SECTION 8. EXPOSURE
CONTROLS/PERSONAL PROTECTION

Additional information about design of technical
systems:
Properly operating chemical fume hood designed for
hazardous chemicals and having an average face
velocity of at least 100 feet per minute.
Control parameters
Components with limit values that require monitoring
at the workplace:
None.
Additional information: No data
Exposure controls
Personal protective equipment
Follow typical protective and hygienic practices for handling chemicals.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Maintain an ergonomically appropriate working environment.
Breathing equipment: Use suitable respirator when high concentrations are present.
Protection of hands:
Impervious gloves
Inspect gloves prior to use.
The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.
Penetration time of glove material (in minutes) No data available
Eye protection: Safety glasses
Body protection: Protective work clothing.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties
Appearance:
Form: Powder or solid in various forms
Color: Dark grey
Odor: Odorless
Odor threshold: No data available.
pH: N/A
Melting point/Melting range: No data available
Boiling point/Boiling range: No data available
Sublimation temperature / start: No data available
Flammability (solid, gas) Highly flammable.
Ignition temperature: No data available
Decomposition temperature: No data available
Autoignition: No data available.
Danger of explosion: No data available.
Explosion limits:
Lower: No data available
Upper: No data available
Vapor pressure: N/A
Density: No data available
Relative density No data available.
Vapor density N/A
Evaporation rate N/A
Solubility in / Miscibility with
Water: Insoluble
Partition coefficient (n-octanol/water): No data available.
Viscosity:
Dynamic: N/A
Kinematic: N/A
Other information No data available

SECTION 10. STABILITY AND REACTIVITY
Reactivity No data available
Chemical stability Stable under recommended storage conditions.
Thermal decomposition / conditions to be avoided:
Decomposition will not occur if used and stored according to specifications.
Possibility of hazardous reactions Reacts with strong oxidizing agents
Conditions to avoid No data available
Incompatible materials:
Acids
Oxidizing agents
Hazardous decomposition products:
Carbon monoxide and carbon dioxide
Metal oxide fume

SECTION 11. TOXICOLOGICAL INFORMATION
Information on toxicological effects
Acute toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains acute toxicity data for this substance.
LD/LC50 values that are relevant for classification: No data
Skin irritation or corrosion: May cause irritation
Eye irritation or corrosion: May cause irritation
Sensitization:
May cause allergy or asthma symptoms or breathing difficulties if inhaled.
May cause an allergic skin reaction.
Germ cell mutagenicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains mutation data for this substance.
Carcinogenicity:
IARC-2B: Possibly carcinogenic to humans: limited evidence in humans in the absence of sufficient evidence in experimental animals.
ACGIH A3: Animal carcinogen: Agent is carcinogenic in experimental animals at a relatively high dose, by route(s) of administration, at site(s), of histologic type(s),
or by mechanism(s) not considered relevant to worker exposure. Available epidemiologic studies do not confirm an increased risk of cancer in exposed humans. Available evidence suggests that the agent is not likely to cause cancer in humans except under uncommon or unlikely routes or levels of exposure. The Registry of Toxic Effects of Chemical Substances (RTECS) contains tumorigenic and/or carcinogenic and/or neoplastic data for this substance. Reproductive toxicity: No effects known. Specific target organ system toxicity - repeated exposure: No effects known. Specific target organ system toxicity - single exposure: No effects known. Aspiration hazard: No effects known. Subacute to chronic toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains multiple dose toxicity data for this substance. Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

SECTION 12. ECOLOGICAL INFORMATION

Toxicity
Aquatic toxicity: No data available
Persistence and degradability No data available
Bioaccumulative potential No data available
Mobility in soil No data available
Additional ecological information: Avoid transfer into the environment.
Results of PBT and vPvB assessment
PBT: N/A
vPvB: N/A
Other adverse effects No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Waste treatment methods
Recommendation Consult official regulations to ensure proper disposal.
Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

SECTION 14. TRANSPORT INFORMATION

UN-Number
DOT, IMDG, IATA UN3178
UN proper shipping name
DOT Flammable solid, inorganic, n.o.s. (Tungsten carbide Cobalt)
IMDG, IATA FLAMMABLE SOLID, INORGANIC,
N.O.S. (Tungsten carbide Cobalt)
Transport hazard class(es)
DOT
Class 4.1 Flammable solids, self-reactive substances
and solid desensitised explosives.
Label 4.1
Class 4.1 (F3) Flammable solids, self-reactive
substances and solid desensitised explosives
Label 4.1
IMDG, IATA
Class 4.1 Flammable solids, self-reactive substances
and solid desensitised explosives.
Label 4.1
Packing group
DOT, IMDG, IATA III
Environmental hazards: N/A
Special precautions for user Warning: Flammable solids, self-reactive substances and solid desensitised explosives
EMS Number: F-A,S-G
Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code N/A
Transport/Additional information:
DOT
Marine Pollutant (DOT): No
UN "Model Regulation": UN3178, Flammable solid, inorganic, n.o.s. (Tungsten carbide Cobalt), 4.1, III

SECTION 15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture
GHS label elements, including precautionary statements
Hazard pictograms
GHS02 GHS08
Signal word Danger
Hazard statements
H228 Flammable solid.
H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H317 May cause an allergic skin reaction.
Precautionary statements
P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P284 In case of inadequate ventilation wear respiratory protection.
P261 Avoid breathing dust/fume/gas/mist/vapors/spray.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P342+P311 If experiencing respiratory symptoms: Call a POISON CENTER/doctor
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.
National regulations
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.
All components of this product are listed on the Canadian Domestic Substances List (DSL).
SARA Section 313 (specific toxic chemical listings)
12774-15-1 Tungsten carbide Cobalt
California Proposition 65
Prop 65 - Chemicals known to cause cancer Substance is not listed.
Prop 65 - Developmental toxicity Substance is not listed.
Prop 65 - Developmental toxicity, female Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.
Information about limitation of use:
For use only by technically qualified individuals.
This product is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right to Know Act of 1986 and 40CFR372.
Other regulations, limitations and prohibitive regulations
Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.
The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed. Substance is not listed.
Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.
Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16. OTHER INFORMATION

Safety Data Sheet according to Regulation (EC) No. 1907/2006 (REACH). The above information is believed to be correct but does not purport to be all
Research

- Phase transformation in tungsten carbide–cobalt composite during

