MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product code: C1454
Product Name: VITAMIN B12, FCC
Chemical Name: Cobinamide, cyanide phosphate 3'-ester with 5,6-dimethyl-1-alpha-D-ribofuranosylbenzimidazole, inner salt
Synonyms: Vitamin B12, Cyclomin, Crystamin, Cobalin, Cobamin, Cyanocobalamine, Dimethylbenzimidazoylcobamide, 5,6-Dimethylbenzimidazolylcobamide cyanide
Recommended use: Vitamin, Medication.
CAS #: 68-19-9
RTECS #: GG3750000
Formula: C63-H88-Co-N14-O14-P
CI#: Not available
Supplier: Spectrum Chemicals and Laboratory Products, Inc.
14422 South San Pedro St.
Gardena, CA 90248
(310) 516-8000
Order Online At: https://www.spectrumchemical.com
Emergency Telephone Number: CHEMTREC: 1-800-424-9300
Contact Person: Regina Wachenheim (East Coast)
Contact Person: Martin LaBenz (West Coast)

2. HAZARDS IDENTIFICATION

- Health Hazard: 1
- Fire Hazard: 1
- Reactivity: 0

Personal Protective Equipment

See Section 8.
2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW
May cause skin and eye irritation
May cause irritation of respiratory tract

|-----------------|-----------------------|----------------------------------------|-----------------|

OSHA Regulatory Status
This material is not considered hazardous by the OSHA Hazard Communication Standard (29 1910.1200)

POTENTIAL HEALTH EFFECTS

Principal Routes of Exposure:
Ingestion. Inhalation.

Acute Potential Health Effects:

Skin Contact:
May cause skin irritation.

Eye Contact:
Contact with eyes may cause irritation.

Inhalation:
May cause irritation of respiratory tract.

Ingestion:
May cause nausea. May cause diarrhea. May cause upset stomach. May affect the cardiovascular system. May cause central nervous system effects. May affect the liver. It may affect the kidneys. May cause musculoskeletal side effects.

Chronic Potential Health Effects:

<table>
<thead>
<tr>
<th>Component</th>
<th>Carcinogen Status:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyanocobalamin 68-19-9 (100)</td>
<td>No information available</td>
</tr>
</tbody>
</table>

Target Organs: No information available
Mutagenic Effects: No information available
Teratogenic Effects: No information available
Aggravated Medical Conditions: No information available

See Section 11 for additional Toxicological Information

POTENTIAL ENVIRONMENTAL EFFECTS
No information available

3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS-No.</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyanocobalamin</td>
<td>68-19-9</td>
<td>100</td>
</tr>
</tbody>
</table>

Product code: C1454
Product name: VITAMIN B12, FCC
4. FIRST AID MEASURES

General Advice: Poison information centres in each State capital city can provide additional assistance for scheduled poisons (13 1126)

Skin Contact: Wash off immediately with soap and plenty of water removing all contaminated clothes and shoes. Get medical attention if irritation develops. Consult a physician if necessary.

Eye Contact: Flush eye with water for 15 minutes. Get medical attention if irritation occurs. If symptoms persist, call a physician.

Inhalation: Move to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion: Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Consult a physician if necessary.

Notes to Physician: Treat symptomatically

5. FIRE-FIGHTING MEASURES

Flammable Properties

Flashpoint (°C/°F): No information available.

Flash Point Tested according to: Not available

Lower Explosion Limit (%): No information available

Upper Explosion Limit (%): No information available

Autoignition Temperature (°C/°F): No information available

Suitable Extinguishing Media: Carbon dioxide (CO2). Dry chemical. Water spray mist or foam.

Unsuitable Extinguishing Media: No information available.

Hazardous Combustion Products: Carbon monoxide; Carbon dioxide; Nitrogen oxides; phosphorus oxides; cobalt oxides

Specific hazards: May be combustible at high temperatures
Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard

Special Protective Equipment for Firefighters: As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear

Specific Methods: No information available.

6. ACCIDENTAL RELEASE MEASURES

Product code: C1454
Product name: VITAMIN B12, FCC
**Personal Precautions:**
Ensure adequate ventilation. Use personal protective equipment. Avoid contact with skin, eyes and clothing. Avoid dust formation. Remove all sources of ignition.

**Environmental Precautions:**
No information available.

**Methods for Cleaning Up:**
Sweep up and shovel into suitable containers for disposal. Clean contaminated surface thoroughly.

### 7. HANDLING AND STORAGE

**Handling**

**Technical Measures/Precautions:**
Provide sufficient air exchange and/or exhaust in work rooms. Avoid dust formation. All equipment used when handling the product must be grounded. Keep away from incompatible materials.

**Safe Handling Advice:**
Wear personal protective equipment. Avoid contact with skin, eyes and clothing. Keep away from heat and sources of ignition. Avoid dust formation. Do not ingest. Do not breathe vapours/dust. Handle in accordance with good industrial hygiene and safety practice.

**Storage**

**Technical Measures/Storage Conditions:**

**Incompatible Materials:**

### 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**Engineering measures to reduce exposure:**
Ensure adequate ventilation. Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protective Equipment**

- **Eye protection:** Safety glasses. Safety glasses with side-shields.
- **Skin and body protection:** Long sleeved clothing. Chemical resistant apron. Gloves.
- **Respiratory protection:** Effective dust mask. Wear respirator with dust filter.
- **Hygiene measures:** Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product. When using, do not eat, drink or smoke.

**National occupational exposure limits**

**United States**
**U.S Occupational Exposure Limits:** Not determined

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**Product code:** C1454  **Product name:** VITAMIN B12, FCC
<table>
<thead>
<tr>
<th>Components</th>
<th>OSHA</th>
<th>NIOSH</th>
<th>ACGIH</th>
<th>AIHA WHEEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyanocobalamin - 68-19-9</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

Canada

Canada Occupational Exposure Limits: Not determined

<table>
<thead>
<tr>
<th>Components</th>
<th>Alberta</th>
<th>British Columbia</th>
<th>Ontario</th>
<th>Quebec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyanocobalamin 68-19-9</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
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</tbody>
</table>

Australia and Mexico

Occupational Exposure Limits for Australia and Mexico: Not determined

<table>
<thead>
<tr>
<th>Components</th>
<th>Australia</th>
<th>Mexico</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyanocobalamin 68-19-9</td>
<td>None</td>
<td>None</td>
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</tbody>
</table>

9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state:</td>
<td>Solid.</td>
</tr>
<tr>
<td>Odor:</td>
<td>Odorless.</td>
</tr>
<tr>
<td>Molecular/Formula weight:</td>
<td>1355.37</td>
</tr>
<tr>
<td>Color:</td>
<td>Dark red.</td>
</tr>
<tr>
<td>Taste</td>
<td>Tasteless.</td>
</tr>
<tr>
<td>Flash point (°C):</td>
<td>No data available</td>
</tr>
<tr>
<td>Lower Explosion Limit (%):</td>
<td>No information available</td>
</tr>
<tr>
<td>Autoignition Temperature (°C/°F):</td>
<td>No information available</td>
</tr>
<tr>
<td>Melting point/range(°C/°F):</td>
<td>No information available</td>
</tr>
<tr>
<td>Boiling point/range(°C/°F):</td>
<td>&gt;300 °C/&gt;572 °F</td>
</tr>
<tr>
<td>pH:</td>
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</tr>
<tr>
<td>Decomposition temperature(°C/°F):</td>
<td>No information available</td>
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<tr>
<td>Specific gravity:</td>
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<tr>
<td>Density (g/cm3):</td>
<td>No information available</td>
</tr>
<tr>
<td>Bulk density:</td>
<td>No information available</td>
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<tr>
<td>Vapor pressure @ 20°C (kPa):</td>
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</tr>
<tr>
<td>Evaporation rate:</td>
<td>No information available</td>
</tr>
<tr>
<td>Vapor density:</td>
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<tr>
<td>VOC content (g/L):</td>
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</tr>
<tr>
<td>Odor threshold (ppm):</td>
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<tr>
<td>Partition coefficient (n-octanol/water):</td>
<td>No information available</td>
</tr>
<tr>
<td>Miscibility:</td>
<td>No information available</td>
</tr>
<tr>
<td>Solubility:</td>
<td>Insoluble in Acetone</td>
</tr>
<tr>
<td></td>
<td>Soluble in alcohol</td>
</tr>
<tr>
<td></td>
<td>Insoluble in Chloroform</td>
</tr>
<tr>
<td></td>
<td>Insoluble in Ether</td>
</tr>
<tr>
<td></td>
<td>Partially soluble in water</td>
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<tr>
<td></td>
<td>Solubility in Water* 12500 mg/l @ 25 °C</td>
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</table>

10. STABILITY AND REACTIVITY

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stability:</td>
<td>Stable at normal conditions</td>
</tr>
<tr>
<td>Conditions to avoid:</td>
<td>Heat. Avoid dust formation. Dust may form explosive mixture in air. Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.</td>
</tr>
</tbody>
</table>

Product code: C1454
Product name: VITAMIN B12, FCC


Possibility of Hazardous Reactions: No information available

Polymerization: Hazardous polymerisation does not occur

Corrosivity: No information available

Special Remarks on Corrosivity: No information available

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Component Information

Cyanocobalamin - 68-19-9
  LD50/oral/rat = No information available
  LD50/oral/mouse = >5000 mg/kg
  LD50/dermal/rat = No information available
  LD50/dermal/rabbit = No information available
  LC50/inhalation/rat = No information available
  LC50/inhalation/mouse = No information available
  Other LD50 or LC50 information = No information available

Product Information

LC50/inhalation/rat = No information available
LC50/inhalation/mouse = No information available
LD50/dermal/rabbit = No information available
LD50/dermal/rat = No information available
LD50/oral/mouse = >5000 mg/kg
LD50/oral/rat = No information available

Local Effects

Skin irritation: May cause skin irritation.

Eye irritation: Contact with eyes may cause irritation.

Inhalation: May cause irritation of respiratory tract.
Ingestion: Vitamin B12 is usually nontoxic even large doses. However, ingestion may cause upset stomach, nausea, vomiting, dyspepsia, mild transient diarrhea, skin eruption resembling acne rosacea. Excess vitamin B12 may also cause central nervous system side effects (headache, dizziness, anxiety, abnormal gait, weakness (loss of strength), incoordination, nervousness, convulsions, excitement), musculoskeletal effects (joint pain, myalgia, back pain, muscle cramps), numbness and tingling as well as blood clots in major blood vessels, and irregular heart beat or the heart to stop pumping properly, leading to symptoms of heart failure. It may also affect the blood (polycythemia vera). Vitamin B12 injections or intravenous administration are more likely to cause the central nervous system effects, musculoskeletal effects, blood clots, and immediate problems to the heart because it is administered directly into the bloodstream. May cause allergic reaction with transitory skin eruption (rash), hives, itching a feeling of swelling of the entire body, face, lips, tongue. Although rare, it may cause more serious side effects with symptoms such as chest pain, trouble breathing, shortness of breath, rapid, weight gain, and unusual warmth, redness or pain in an arm or leg. Although rare, it is more likely to occur when administered via injection or intravenously.

Sensitization: No information available

Chronic Toxicity

Chronic Toxicity Chronic exposure of the liver to high levels of B12 may cause damage to liver cells, leading to inflammation and scar formation and liver damage. Kidney tubules may also be damaged by excess of B12 as it is excreted from the body.

Carcinogenic effects: Not considered carcinogenic.

<table>
<thead>
<tr>
<th>Components</th>
<th>NTP</th>
<th>IARC</th>
<th>OSHA HCS - Carcinogens</th>
<th>ACGIH - Carcinogens</th>
<th>Australia - Prohibited Carcinogenic Substances</th>
<th>Australia - Notifiable Carcinogenic Substances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyanocobalamin</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
</tr>
</tbody>
</table>

Mutagenic Effects: No information available

Reproductive Effects: The Registry of Toxic Effects of Chemical Substances (RTECS) notes reproductive effects data for animal studies on mice and rats (Specific Developmental Abnormalities: Musculoskeletal system and Urogenital system; Effects on Embryo or Fetus: Fetotoxicity). However, the route of exposure was intramuscular, which is not a route of exposure for normal handling. RTECS does note effects on newborn of reduced weight gain when pregnant rats were exposed orally to large amounts of Cyanocobalamin Crosses the placenta in humans It has not been shown to affect reproduction in humans There are no adequate and well-controlled studies in humans. Data in humans were insufficient to evaluate the effects on reproduction

Teratogenic Effects: No information available

Target Organs: No information available

12. ECOLOGICAL INFORMATION

ECOTOXICITY

Toxicity to terrestrial and aquatic plants and animals: No information available

Ecotoxicity effects: No data available.

Product code: C1454 Product name: VITAMIN B12, FCC
Aquatic toxicity: No information available
Mobility: No information available
Persistence and degradability: No information available
Bioaccumulative potential: No information available

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products:
Waste must be disposed of in accordance with Federal, State and Local regulation.

Contaminated packaging:
Empty containers should be taken for local recycling, recovery or waste disposal

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyanocobalamin</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

14. TRANSPORT INFORMATION

DOT
UN-No: Not regulated
Proper Shipping Name: No information available
Hazard Class: No information available
Packing Group: None
Subsidiary Risk: Not applicable
Marine Pollutant: No data available
ERG No: No information available
DOT RQ (lbs): No information available

TDG (Canada)
UN-No: Not Regulated
Proper Shipping Name: No information available
Hazard Class: No information available
Packing Group: No information available
Subsidiary Risk: No information available
Description: No information available

ADR
UN-No: No information available
Proper Shipping Name: No information available
Hazard Class: No information available
Packing Group: No information available
Subsidiary Risk: No information available
Classification Code: No information available
Description: No information available
CEFIC Tremcard No: No information available

IMO / IMDG
UN-No: Not Regulated
Proper Shipping Name: No information available
Hazard Class: No information available
Packing Group: No information available
Subsidiary Risk: No information available
Classification Code: No information available
Description: No information available
CEFIC Tremcard No: No information available

Product code: C1454  Product name: VITAMIN B12, FCC
15. REGULATORY INFORMATION

International Inventories

<table>
<thead>
<tr>
<th>Components</th>
<th>U.S. TSCA</th>
<th>Philippines (PICCS)</th>
<th>KOREA KECL</th>
<th>Japan ENCS</th>
<th>CHINA</th>
<th>Australia (AICS)</th>
<th>EINECS-No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyanocobalamin</td>
<td>Present</td>
<td>Present</td>
<td>Present KE-11218</td>
<td>Not present</td>
<td>Present</td>
<td>Present</td>
<td>Present 200-680-0</td>
</tr>
</tbody>
</table>

U.S. Regulations

**Cyanocobalamin**

**FDA - Food Additives Generally Recognized as Safe (GRAS):** 21 CFR 184.1945

**California Prop. 65: Safe Drinking Water and Toxic Enforcement Act of 1986.**

**Chemicals Known to the State of California to Cause Cancer:**
This product does not contain a chemical requiring a warning under California Prop. 65. (See table below)

**Chemicals Known to the State of California to Cause Reproductive Toxicity:**
This product does not contain a chemical requiring a warning under California Prop. 65. (See table below)

<table>
<thead>
<tr>
<th>Components</th>
<th>Carcinogen</th>
<th>Developmental Toxicity</th>
<th>Male Reproductive Toxicity</th>
<th>Female Reproductive Toxicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyanocobalamin</td>
<td>Not Listed</td>
<td>Not Listed</td>
<td>Not Listed</td>
<td>Not Listed</td>
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</tbody>
</table>

CERCLA/SARA

Product code: C1454  Product name: VITAMIN B12, FCC
### Components

<table>
<thead>
<tr>
<th>Components</th>
<th>CERCLA - Hazardous Substances and their Reportable Quantities</th>
<th>Section 302 Extremely Hazardous Substances and TPQs</th>
<th>Section 302 Extremely Hazardous Substances and RQs</th>
<th>Section 313 - Chemical Category</th>
<th>Section 313 - Reporting de minimis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyanocobalamin</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

### U.S. TSCA

<table>
<thead>
<tr>
<th>Components</th>
<th>TSCA Section 5(a)2 - Chemicals With Significant New Use Rules (SNURS)</th>
<th>TSCA 8(d) - Health and Safety Reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyanocobalamin</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>

### Canada

**WHMIS hazard class:**
Non-controlled

**Canada Controlled Products Regulation:**
This product has been classified according to the hazard criteria of the CPR (Controlled Products Regulation) and the MSDS contains all of the information required by the CPR.

### Inventory

<table>
<thead>
<tr>
<th>Components</th>
<th>Canada (DSL)</th>
<th>Canada (NDSL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyanocobalamin</td>
<td>Present</td>
<td>Not Listed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Components</th>
<th>CEPA Schedule I - Toxic Substances</th>
<th>CEPA - 2010 Greenhouse Gases Subject to Mandatory Reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyanocobalamin</td>
<td>Not listed</td>
<td>Not listed</td>
</tr>
</tbody>
</table>

### EU Classification

**R-phrase(s)**
not determined

**S -phrase(s)**
none

<table>
<thead>
<tr>
<th>Components</th>
<th>Classification</th>
<th>Concentration Limits</th>
<th>Safety Phrases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyanocobalamin</td>
<td></td>
<td>No information</td>
<td></td>
</tr>
</tbody>
</table>

The product is classified in accordance with Annex VI to Directive 67/548/EEC

**Indication of danger:**
Not dangerous
All chemicals may pose unknown hazards and should be used with caution. This Material Safety Data Sheet (MSDS) applies only to the material as packaged. If this product is combined with other materials, deteriorates, or becomes contaminated, it may pose hazards not mentioned in this MSDS. The physical properties reported in this MSDS are obtained from the literature and do not constitute product specifications. Information contained herein does not constitute a warranty, whether expressed or implied, as to the safety, merchantability or fitness of the goods for a particular purpose. Spectrum Chemicals & Laboratory Products, Inc. assumes no responsibility for results obtained or for incidental or consequential damages, including lost profits, arising from the use of these data. No warranty against infringement of any patent, copyright or trademark is made or implied. It shall be the user's responsibility to develop proper methods of handling and personal protection based on the actual conditions of use. While this MSDS is based on technical data judged to be reliable, Spectrum assumes no responsibility for the completeness or accuracy of the information contained herein.