SECTION 1. Identification

Product identifier

Product No 2204
Product name Bortezomib
UN number UN2811

Recommended use of the chemical and restrictions on use

Identified uses This product is intended for research purposes only.

Manufacturer, importer, supplier

Manufacturer address Cell Signaling Technology, Inc.
3 Trask Lane
Danvers, MA 01923
United States
TEL: +1 978 867 2300
FAX: +1 978 867 2400

Website www.cellsignal.com
Email address support@cellsignal.com
Emergency telephone number In case of emergency call CHEMTREC 1-800-424-9300

SECTION 2. Hazard(s) identification

Classification

This substance/mixture is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

<table>
<thead>
<tr>
<th>Hazard Category</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute oral toxicity</td>
<td>Category 1</td>
</tr>
<tr>
<td>Skin corrosion/irritiation</td>
<td>Category 2</td>
</tr>
<tr>
<td>Serious eye damage/eye irritation</td>
<td>Category 2</td>
</tr>
<tr>
<td>Reproductive toxicity</td>
<td>Category 2</td>
</tr>
<tr>
<td>Specific target organ toxicity - repeated exposure (STOT RE)</td>
<td>Category 1</td>
</tr>
</tbody>
</table>

GHS Label elements, including precautionary statements

Signal Word Danger
Hazard statement(s)
Fatal if swallowed. Causes skin irritation. Causes serious eye irritation. Suspected of damaging fertility or the unborn child. Causes damage to organs through prolonged or repeated exposure.

Precautionary Statement(s)
Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wash face, hands and any exposed skin thoroughly after handling. Do not eat, drink or smoke when using this product. Do not breathe dust/fume/gas/mist/vapors/spray. Wear protective gloves/protective clothing/eye protection/face protection.
IF exposed or concerned: Get medical advice/attention.
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Rinse mouth.
IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician.
Store locked up.
Dispose of contents/container to an approved waste disposal plant.

Supplementary Hazard Information
No information available.
Hazards not otherwise classified (HNOC)
Not applicable.

SECTION 3. Composition/information on ingredients

<table>
<thead>
<tr>
<th>Formula</th>
<th>C₁₉H₂₅BN₄O₄</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molecular Weight</td>
<td>384.24 g/mol</td>
</tr>
<tr>
<td>Chemical nature</td>
<td>Monoconstituent substance</td>
</tr>
<tr>
<td>Synonyms</td>
<td>Bortezomib; VelcadeÒ; PS-341; Boronic acid, (3-methyl-1-((1-oxo-3-phenyl-2-(pyrazine-2-carbonylamino)propyl)amino)butyl)-(S-(R*,S*))-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>[(1R)-3-methyl-1-([(2S)-3-phenyl-2-(pyrazine-2-carbonylamino)propanoyl]amino]butyl]boronic acid</td>
<td>179324-69-7</td>
<td>100</td>
</tr>
</tbody>
</table>

SECTION 4. First-aid measures

Eye contact
Rinse thoroughly with plenty of water, also under the eyelids. Keep eye wide open while rinsing.

Skin contact
Immediate medical attention is required. Wash off immediately with soap and plenty of water removing all contaminated clothes and shoes.

Inhalation
Immediate medical attention is required. IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing. If not breathing, give artificial respiration.

Ingestion
Clean mouth with water and afterwards drink plenty of water. Immediate medical attention is required. Never give anything by mouth to an unconscious person.

Most important symptoms and effects, both acute and delayed

Indication of any immediate medical attention and special treatment needed
Treat symptomatically.
Advice for emergency responders

General advice
Immediate medical attention is required. Show this safety data sheet to the doctor in attendance. If symptoms persist, call a physician.

Protection of first-aiders
Use personal protective equipment. Avoid contact with skin, eyes and clothing.

SECTION 5. Fire-fighting measures

Extinguishing media

Suitable Extinguishing Media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable Extinguishing Media
CAUTION: Use of water spray when fighting fire may be inefficient.

Specific hazards arising from the chemical
No information available.

Explosion Data

Sensitivity to Mechanical Impact
None.

Sensitivity to Static Discharge
None.

Protective Equipment and Precautions for Firefighters

Wear self-contained breathing apparatus and protective suit. Wear self contained breathing apparatus for fire fighting if necessary.

SECTION 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel
Use personal protective equipment. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas.

Other information
No information available.

Environmental precautions

Do not flush into surface water or sanitary sewer system.

Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Use personal protective equipment. Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry. Take up mechanically, placing in appropriate containers for disposal. Avoid dust formation. Soak up with inert absorbent material. Take precautionary measures against static discharges.

SECTION 7. Handling and storage

Precautions for safe handling

Avoid contact with skin, eyes and clothing. Wear personal protective equipment. Prevent the formation of vapors, mists and aerosols. Do not eat, drink or smoke when using this product. Use only in area provided with appropriate exhaust ventilation.

Conditions for safe storage, including any incompatibilities

Technical measures/Storage conditions
Keep away from direct sunlight.

Packaging material
No information available.

Incompatible products
None known based on information supplied.
SECTION 8. Exposure controls/personal protection

Control parameters

Appropriate engineering controls

Showers, eyewash stations, and ventilation systems.

Individual protection measures, such as personal protective equipment

Personal protective equipment (PPE) needs to be selected depending on the implemented engineering controls, frequency/duration of work activities and the concentrations of the hazardous substance.

Eye/face protection
Tightly fitting safety goggles

Skin and body protection
Wear protective gloves/clothing.

Respiratory protection
If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.

Hygiene measures
Provide regular cleaning of equipment, work area and clothing. Wash hands before breaks and immediately after handling the product.

SECTION 9. Physical and chemical properties

Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
<th>Remarks</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state</td>
<td>Solid</td>
<td>Color</td>
<td>White</td>
</tr>
<tr>
<td>Appearance</td>
<td>Powder</td>
<td>Odor Threshold</td>
<td>No information available</td>
</tr>
<tr>
<td>Odor</td>
<td>No information available</td>
<td>Odor Threshold</td>
<td>No information available</td>
</tr>
<tr>
<td>pH</td>
<td>2-6.5</td>
<td>@ 0.0033 - 0.0038 g/L in water</td>
<td></td>
</tr>
<tr>
<td>Melting point/freezing point</td>
<td>124-140 °C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial boiling point and boiling range</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flash point</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper flammability limit</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower flammability limit</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vapor density</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Relative density</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solubility</td>
<td>Partly soluble</td>
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<td></td>
</tr>
<tr>
<td>Solubility in other solvents</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partition coefficient: n-octanol/water</td>
<td>2.0</td>
<td>estimated</td>
<td></td>
</tr>
<tr>
<td>Autoignition temperature</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viscosity</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viscosity, dynamic</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explosive properties</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxidizing properties</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Softening point</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>384.24 g/mol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VOC content</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Density</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bulk Density VALUE</td>
<td>No information available</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SECTION 10. Stability and reactivity

Reactivity
No information available.

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions

<table>
<thead>
<tr>
<th>Hazardous reactions</th>
<th>None under normal processing.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazardous polymerization</td>
<td>None under normal processing.</td>
</tr>
</tbody>
</table>

Conditions to Avoid
No information available.

Incompatible Materials
None known based on information supplied.

Hazardous Decomposition Products
None known based on information supplied.

SECTION 11. Toxicological information

Information on likely routes of exposure

<table>
<thead>
<tr>
<th>Route</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhalation</td>
<td>There is no data available for this product.</td>
</tr>
<tr>
<td>Eye contact</td>
<td>May cause irreversible damage to eyes.</td>
</tr>
<tr>
<td>Skin contact</td>
<td>Irritating to skin. May be harmful in contact with skin.</td>
</tr>
<tr>
<td>Ingestion</td>
<td>Very toxic if swallowed. Target Organ Effects. Reproductive Toxicity.</td>
</tr>
</tbody>
</table>

Information on toxicological effects

This material should only be handled by, or under the close supervision of, those properly qualified in the handling and use of potentially hazardous chemicals. It should be borne in mind that the toxicological and physiological properties of this compound is not well defined.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Symptoms

Skin corrosion/irritation
Causes skin irritation.

Serious eye damage/eye irritation
Risk of serious damage to eyes.

Sensitization
No information available.

Mutagenic effects
The weight of evidence demonstrates that this material is not genotoxic. Bortezomib showed clastogenic activity (structural chromosomal aberrations) in the in vitro chromosomal aberration assay using Chinese hamster ovary cells. Bortezomib was not genotoxic when tested in the in vitro mutagenicity assay (Ames test) and in vivo micronucleus assay in mice.

Carcinogenicity
No component of this product present at levels greater than or equal to 0.1% is identifiable as probable, possible or confirmed carcinogen by IARC, ACGIH, NTP, or OSHA.

Reproductive toxicity
In a 6-month rat toxicity study, degenerative effects in the ovary were observed at doses =
2204 - Bortezomib

STOT - single exposure
No information available.

STOT - repeated exposure
In a repeat dose toxicity study in monkeys, myocardial hemorrhage, inflammation, and necrosis were observed. In animals, severe anemia and thrombocytopenia, and gastrointestinal, neurological and lymphoid system toxicities were observed during chronic dosing. Neurotoxic effects of bortezomib included axonal swelling and degeneration in peripheral nerves, dorsal spinal roots, and tracts of the spinal cord, multifocal hemorrhage and necrosis in the brain, eye, and heart.

Chronic Toxicity
Prolonged or repeated exposure increases the risk. Possible risks of irreversible effects. Avoid repeated exposure.

Target Organ Effects
Cardiovascular system, Gastrointestinal tract (GI), Hematopoietic System, Central nervous system (CNS), Peripheral Nervous System (PNS).

Neurological effects
No information available.

Aspiration Hazard
No information available.

SECTION 12. Ecological information

Ecotoxicity

Persistence and degradability
No information available.

Bioaccumulation
Not likely to bioaccumulate.

Mobility
Is predicted to have low mobility in the environment

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Octanol-Water Partition Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>[(1R)-3-methyl-1-[[2S)-3-phenyl-2-(pyrazine-2-carbonylamino)propanoyl]amino]butyl</td>
<td>boronic acid</td>
</tr>
</tbody>
</table>

Other adverse effects
No information available.

SECTION 13. Disposal considerations

Waste Disposal Methods
Should not be released into the environment.

Disposal considerations
Do not empty into drains; dispose of this material and its container in a safe way.

SECTION 14. Transport information

DOT

<table>
<thead>
<tr>
<th>UN number</th>
<th>UN proper shipping name</th>
<th>Transport hazard class(es)</th>
<th>Packing group</th>
<th>Special provisions</th>
<th>Emergency response guide number</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN2811</td>
<td>Toxic solid, organic, n.o.s. (Bortezomib)</td>
<td>6.1</td>
<td>I</td>
<td>IB7, T6, TP33</td>
<td>154</td>
</tr>
</tbody>
</table>

IATA
UN number  
UN2811
UN proper shipping name  
Toxic solid, organic, n.o.s. (Bortezomib)
Transport hazard class(es)  
6.1
Packing group  
I
ERG code  
6L

SECTION 15. Regulatory information

North American Inventory Listing

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>TSCA 8(b)</th>
<th>TSCA 12(b)</th>
<th>DSL</th>
<th>NDSL</th>
</tr>
</thead>
<tbody>
<tr>
<td>[(1R)-3-methyl-1-[(2S)-3-phenyl-2-(pyrazine-2-carbonylamino)propanoyl]amino]butyl]boronic acid</td>
<td>Not Listed</td>
<td>Not Listed</td>
<td>Not Listed</td>
<td>Not Listed</td>
</tr>
</tbody>
</table>

Canadian Workplace Hazardous Materials Information System (WHMIS) Classification

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class D1A</td>
<td>Very Toxic Materials at &gt;= 1%</td>
</tr>
<tr>
<td>Class D2A</td>
<td>Very Toxic Material at &gt;= 0.1%</td>
</tr>
</tbody>
</table>

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

SARA 311/312 Hazard Categories

- Acute Health Hazard: Yes
- Chronic Health Hazard: Yes
- Fire Hazard: No
- Sudden Release of Pressure Hazard: No
- Reactive Hazard: No

Clean Water Act

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42).

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material.

California Proposition 65

This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

This product does not contain any substances regulated under applicable state right-to-know regulations.
U.S. FIFRA Label Information

This product does not contain any substances regulated as pesticides.

US Commerce Department - Export Administration Regulations Information

This product does not contain any substances regulated under the Chemical Weapons Convention (CWC).

U.S. Drug Enforcement Administration Information

This product does not contain any substances regulated under the DEA.

SECTION 16. Other information

Issuing Date: 2014-05-20
Revision Date: 2018-04-09

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

End of Safety Data Sheet