Not appropriate for regulatory submission. Please visit www.spectrumchemical.com or contact Tech Services for the most up-to-date information contained in this information package.
Dear Customer,

Thank you for your interest in Spectrum’s quality products and services.

Spectrum has been proudly serving the scientific community for over 45 years. It is our mission to manufacture and distribute fine chemicals and laboratory products with Quality and delivery you can count on every time.

To accomplish our mission, Spectrum utilizes our sourcing leverage and supplier qualification expertise in offering one of the industry’s most comprehensive line of fine chemical products under one brand, in packaging configurations designed to meet your research and production requirements. Our product grades include: USP, NF, BP, EP, JP, FCC, ACS, KSA, Reagent grade, as well as DEA controlled substances. We operate facilities in the United States on the East Coast, West Coast, as well as in Shanghai, China in order to provide the best logistical support for our customers.

At Spectrum, Quality is priority number one. Suppliers with the best qualifications are preferred and we employ full-functioning in-house analytical laboratories at each of our facilities. Our facilities and systems are USFDA registered and ISO certified. We frequently host customer audits and cherish opportunities for improvements. Quality is engrained into our culture. Quality is priority number one.

In the following pages, we have designed and prepared documented scientific information to aid you in your initial qualification or your continual use of our products. Please do not hesitate to contact us if further information or the most up-to-date documentation is desired from any of the covered areas.

We appreciate your business and we look forward to hearing from you.

Sincerely,

Alan Wang, MSQA, ASQ CQA
Director of Technical Services
techservices@spectrumchemical.com

7 June 2017
## Specification for L-Menthol, Crystal, USP (ME110)

<table>
<thead>
<tr>
<th>Item Number</th>
<th>ME110</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
<td>L-Menthol, Crystal, USP</td>
</tr>
<tr>
<td>CAS Number</td>
<td>2216-51-5</td>
</tr>
<tr>
<td>Molecular Formula</td>
<td>C_{10}H_{20}O</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>156.27</td>
</tr>
<tr>
<td>MDL Number</td>
<td></td>
</tr>
<tr>
<td>Synonyms</td>
<td>Levomenthol ; (-)-(1R,3R,4S)-Menthol ; 3-p-Menthanol ; Natural Menthol</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Test</th>
<th>Specification</th>
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<tbody>
<tr>
<td></td>
<td>Min</td>
</tr>
<tr>
<td>ASSAY</td>
<td>98.0</td>
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<tr>
<td>MELTING RANGE</td>
<td>41</td>
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<tr>
<td>SPECIFIC ROTATION $[\alpha]_{D25}$</td>
<td>-45°</td>
</tr>
<tr>
<td>NONVOLATILE RESIDUE</td>
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</tr>
<tr>
<td>RELATED COMPOUNDS</td>
<td>TO PASS TEST</td>
</tr>
<tr>
<td>IDENTIFICATION</td>
<td>TO PASS TEST</td>
</tr>
<tr>
<td>EXPIRATION DATE</td>
<td>TO PASS TEST</td>
</tr>
<tr>
<td>RESIDUAL SOLVENTS</td>
<td>TO PASS TEST</td>
</tr>
</tbody>
</table>

_Spectrum Chemical Mfg Corp_  

**Corporate Headquarters:**  
760 Jersey Ave.  
New Brunswick, NJ 08901  
732.214.1300

**West Coast Facility:**  
14422 S. San Pedro St.  
Gardena, CA 90248  
310.516.8000
SAFETY DATA SHEET

Preparation Date: 1/25/2017
Revision Date: 2/7/2017
Revision Number: G2

1. IDENTIFICATION

Product identifier

Product code: ME110
Product Name: L-MENTHOL, CRYSTAL, USP

Other means of identification

Synonyms:
(1alpha,2beta,5alpha)-5-Methyl-2-(1-methylethyl)cyclohexanol
(-)-Menthol
(-)-Methyl alcohol; 1R,3R,4S)-(-)-Menthol
(1R-(1-alpha,2-beta,5-alpha))-5-Methyl-2-(1-methylethyl)cyclohexanol
Cyclohexanol, 5-methyl-2(1-methylethyl)-,(1R,2S,5R)-
Cyclohexanol1,
5-methyl-2-(methylethyl)-,[1R-(1,alpha,,2.beta.,5.alpha.,)]-
(-)-trans-p-Methan-cis-3-ol; 1R-(--)-Menthol; (1R,2S,5R)--Menthol
(R)-(--)Menthol; 1R-Menthol
I-Mentho;
Levomenthol

CAS #: 2216-51-5
RTECS #: OTO700000
CI#: Not available

Recommended use of the chemical and restrictions on use

Recommended use: Medication. In chewing gum.
Uses advised against: No information available

Supplier:
Spectrum Chemical Mfg. Corp
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: Martin LaBenz (West Coast)
Contact Person: Ibad Tirmiz (East Coast)

2. HAZARDS IDENTIFICATION

Classification

This chemical is considered hazardous according to the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Considered a dangerous substance or mixture according to the Globally Harmonized System (GHS)

<table>
<thead>
<tr>
<th>Skin corrosion/irritation</th>
<th>Category 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious eye damage/eye irritation</td>
<td>Category 2A</td>
</tr>
<tr>
<td>Specific target organ toxicity (single exposure)</td>
<td>Category 3</td>
</tr>
</tbody>
</table>

Label elements

Product code: ME110
Product name: L-MENTHOL, CRYSTAL, USP
Warning

Hazard statements
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation

Hazard statements
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation

Hazards not otherwise classified (HNOC)
Not Applicable

Other hazards
May be harmful if swallowed

Precautionary Statements - Prevention
Wash face, hands and any exposed skin thoroughly after handling
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear protective gloves
Wear eye/face protection

Precautionary Statements - Response
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
IF ON SKIN: Wash with plenty of water
If skin irritation occurs: Get medical advice/attention
Take off contaminated clothing and wash it before reuse
IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor/physician if you feel unwell.

Precautionary Statements - Storage
Store in a well-ventilated place. Keep container tightly closed
Store locked up

Precautionary Statements - Disposal
Dispose of contents/container to an approved waste disposal plant

3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS-No.</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-Menthol</td>
<td>2216-51-5</td>
<td>100</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

First aid measures

General Advice:
National Capital Poison Center in the United States can provide assistance if you have a poison emergency and need to talk to a poison specialist. Call 1-800-222-1222.

Skin Contact:
Wash off immediately with soap and plenty of water removing all contaminated clothing and
shoes. Get medical attention if irritation develops.

**Eye Contact:**
Flush eyes with water for 15 minutes. Get medical attention. 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. Obtain medical attention.

**Most important symptoms and effects, both acute and delayed**

**Symptoms**
Causes serious eye irritation. Causes skin irritation. Irritating to respiratory system.

**Indication of any immediate medical attention and special treatment needed**

**Notes to Physician:**
Treat symptomatically.

**Protection of first-aiders**
First-Aid Providers: Avoid exposure to blood or body fluids. Wear gloves and other necessary protective clothing. Dispose of contaminated clothing and equipment as bio-hazardous waste.

**5. FIRE-FIGHTING MEASURES**

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

**Unsuitable Extinguishing Media:**
No information available.

**Specific hazards arising from the chemical**

**Hazardous Combustion Products:**
Carbon Dioxide, Carbon Monoxide.

**Specific hazards:**
No information available.

**Special Protective Actions for Firefighters**

**Specific Methods:**
No information available.

**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.
6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal Precautions: Ensure adequate ventilation. Keep people away from and upwind of spill/leak. Use personal protective equipment. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Avoid contact with skin, eyes and clothing. Remove all sources of ignition.

Environmental precautions: Do not let product enter drains. Prevent further leakage or spillage if safe to do so. Prevent entry into waterways, sewers, basements or confined areas.

Methods and material for containment and cleaning up

Methods for containment: Stop leak if you can do it without risk. Cover with plastic sheet to prevent spreading.

Methods for cleaning up: Use appropriate tools to put the spilled solid in a suitable waste disposal container. Clean contaminated surface thoroughly.

7. HANDLING AND STORAGE

Precautions for safe 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. Remove all sources of ignition.

Safe Handling Advice: Wear personal protective equipment. Avoid contact with skin, eyes and clothing. Do not ingest. Do not breathe vapors/dust. Keep away from heat and sources of ignition. Use only in well-ventilated areas. Handle in accordance with good industrial hygiene and safety practice.

Conditions for safe storage, including any incompatibilities

Technical Measures/Storage Conditions: Keep container tightly closed in a dry and well-ventilated place. Store at room temperature in the original container. Store away from incompatible materials.

Incompatible Materials:
- Oxidizing agents
- Mineral acids
- Phenol
- beta-naphthol
- Resorcinol
- thymol
- Potassium permanganate
- chromium trioxide
- Pyrogallol
- butylchloral hydrate
- choral hydrate
- camphor
- exalgine

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

National occupational exposure limits

Product code: ME110
Product name: L-MENTHOL, CRYSTAL, USP
United States

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS-No.</th>
<th>OSHA</th>
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<th>AIHA WHEEL</th>
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Canada

<table>
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<th>Canada - British Columbia</th>
<th>Canada - Ontario</th>
<th>Canada - Quebec</th>
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Australia and Mexico

<table>
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<th>Australia</th>
<th>Mexico</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-Menthol</td>
<td>2216-51-5</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

Appropriate engineering controls

Engineering measures to reduce exposure:
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.

Individual protection measures, such as personal protective equipment

Personal Protective Equipment

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

9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Molecular/Formula weight: 156.27 g/mol</td>
<td>Flammability: No information available</td>
<td>Flashpoint (°C/°F): 93-101°C/199-214°F</td>
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<tr>
<td>Flash Point Tested according to: Closed cup</td>
<td>Autoignition Temperature (°C/°F): No information available</td>
<td>Lower Explosion Limit (%): No information available</td>
</tr>
<tr>
<td>Upper Explosion Limit (%): No information available</td>
<td>Melting point/range(°C/°F): 41-44°C/105.8-111.2°F</td>
<td>Decomposition temperature(°C/°F): No information available</td>
</tr>
<tr>
<td>Boiling point/range(°C/°F): 212°C/ 413.6°F</td>
<td>Bulk density: No information available</td>
<td>Density (g/cm3): No information available</td>
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</tbody>
</table>

Product code: ME110
Product name: L-MENTHOL, CRYSTAL, USP
10. STABILITY AND REACTIVITY

Reactivity
Reactive with oxidizing agents
Reactive with phenol, b-naphthol, resorcinol, thymol, potassium permanganate, chromium trioxide, pyrogallol, butylchloral hydrate, camphor, choral hydrate, exalgine, betanaphthol

Chemical stability
Stability: Stable under recommended storage conditions.
Possibility of Hazardous Reactions: Hazardous polymerization does not occur
Incompatible Materials: Oxidizing agents
Mineral acids
Phenol
beta-naphthol
Resorcinol
thymol
Potassium permanganate
chromium trioxide
Pyrogallol
butylchloral hydrate
choral hydrate
camphor
exalgine

Hazardous decomposition products: Carbon oxides.

Other Information
Corrosivity: No information available

Special Remarks on Corrosivity: No information available

11. TOXICOLOGICAL INFORMATION

Specific gravity: 0.890
pH: No information available
Vapor pressure @ 20°C (kPa): No information available
Evaporation rate: No information available
Vapor density: No information available
VOC content (g/L): No information available
Odor threshold (ppm): No information available
Partition coefficient (n-octanol/water): Log Kow = 3.3
Miscibility: No information available
Solubility in Water: 456-508 mg/l @ 25 deg. C
Very soluble in Benzene

Product code: ME110
Product name: L-MENTHOL, CRYSTAL, USP
Information on likely routes of exposure

Principal Routes of Exposure:
Skin. Eyes. Ingestion.

Acute Toxicity

Component Information

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>LD50/oral/rat</th>
<th>LD50/oral/mouse</th>
<th>LD50/dermal/rabbit</th>
<th>LD50/dermal/rat</th>
<th>LC50/inhalation/rat</th>
<th>LC50/inhalation/mouse</th>
<th>Other LD50 or LC50 information</th>
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</thead>
<tbody>
<tr>
<td>L-Menthol</td>
<td>2216-51-5</td>
<td>3300 mg/kg Oral LD50 Rat</td>
<td>3400 mg/kg Oral LD50 Mouse</td>
<td>&gt; 5000 mg/kg Dermal LD50 Rabbit</td>
<td>No information available</td>
<td>No information available</td>
<td>No information available</td>
<td>No information available</td>
</tr>
</tbody>
</table>

Product Information

LD50/oral/rat = VALUE- Acute Tox Oral = 3300 mg/kg
LD50/oral/mouse = VALUE- Acute Tox Oral = 3400 mg/kg
LD50/dermal/rabbit = VALUE-Acute Tox Dermal = > 5000 mg/kg
LD50/dermal/rat = VALUE-Acute Tox Dermal = No information available

LC50/inhalation/rat = VALUE-Vapor = No information available
VALUE-Gas = No information available
VALUE-Dust/Mist = No information available

LC50/Inhalation/mouse = VALUE-Vapor = No information available
VALUE-Gas = No information available
VALUE-Dust/Mist = No information available

Symptoms

Skin Contact: May cause mild to moderate skin irritation. It can be absorbed through the skin.
Eye Contact: Causes serious eye irritation. Moderately irritating to the eyes.
Inhalation: Irritating to respiratory system.
Ingestion: May be harmful if swallowed.
Aspiration hazard: No information available.

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

Product code: ME110  Product name: L-MENTHOL, CRYSTAL, USP
Chronic Toxicity: No information available.

Sensitization: No information available.

Mutagenic Effects: May affect genetic material.

Carcinogenic effects: Not considered carcinogenic.

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS-No.</th>
<th>IARC</th>
<th>ACGIH - Carcinogens</th>
<th>NTP</th>
<th>OSHA HCS - Carcinogens</th>
<th>Australia - Notifiable Carcinogenic Substances</th>
<th>Australia - Prohibited Carcinogenic Substances</th>
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<tr>
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<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
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</tr>
</tbody>
</table>

ACGIH (American Conference of Governmental Industrial Hygienists)

IARC (International Agency for Research on Cancer)

NTP (National Toxicology Program)

OSHA (Occupational Safety and Health Administration of the US Department of Labor)

Reproductive toxicity: No data is available.

Reproductive Effects: No information available.

Developmental Effects: No information available.

Teratogenic Effects: No information available.

Specific Target Organ Toxicity

STOT - single exposure: No information available.

STOT - repeated exposure: No information available.

Target Organs: No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity effects: Aquatic environment.

L-Menthol - 2216-51-5

Freshwater Fish Species Data: 18.9 mg/L LC50 Pimephales promelas 96 h flow-through 1

Persistence and degradability: No information available.

Bioaccumulative potential: Indication of bioaccumulation.

Mobility: No information available.

13. DISPOSAL CONSIDERATIONS

Disposal Methods

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.

Product code: ME110

Product name: L-MENTHOL, CRYSTAL, USP
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>L-Menthol</td>
<td>2216-51-5</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
- Subsidiary Class: No information available
- Packing group: No information available
- Emergency Response Guide Number: No information available
- Marine Pollutant: No data available
- DOT RQ (lbs): No information available
- Special Provisions: No Information available
- Symbol(s): No information available
- Description: No information available

TDG (Canada)

- UN-No: Not Regulated
- Proper Shipping Name: No information available
- Hazard Class: No information available
- Subsidiary Risk: No information available
- Packing Group: No information available
- Marine Pollutant: No Information available
- Description: No information available

ADR

- 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

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

RID

- 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

ICAO

- 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

Product code: ME110
Product name: L-MENTHOL, CRYSTAL, USP
15. REGULATORY INFORMATION

International Inventories

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS-No.</th>
<th>U.S. TSCA</th>
<th>KOREA KECL</th>
<th>Philippines</th>
<th>Japan ENCS</th>
<th>CHINA</th>
<th>Australia</th>
<th>EINECS-No.</th>
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<td>Present</td>
<td>Present</td>
<td>Present</td>
<td>Present</td>
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</tr>
</tbody>
</table>

U.S. Regulations


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>CAS-No.</th>
<th>Carcinogen</th>
<th>Developmental Toxicity</th>
<th>Male Reproductive Toxicity</th>
<th>Female Reproductive Toxicity</th>
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</thead>
<tbody>
<tr>
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<td>Not Listed</td>
<td>Not Listed</td>
<td>Not Listed</td>
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</tbody>
</table>

CERCLA/SARA

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS-No.</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>
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</thead>
<tbody>
<tr>
<td>L-Menthol</td>
<td>2216-51-5</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
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</table>

U.S. TSCA

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS-No.</th>
<th>TSCA Section 5(a)2 - Chemicals With Significant New Use Rules (SNURS)</th>
<th>TSCA 8(d) - Health and Safety Reporting</th>
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</thead>
<tbody>
<tr>
<td>L-Menthol</td>
<td>2216-51-5</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
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</tbody>
</table>

Canada

WHMIS hazard class:
D2B  Toxic materials

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.

Product code: ME110  Product name: L-MENTHOL, CRYSTAL, USP
Inventory

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS-No.</th>
<th>Canada (DSL)</th>
<th>Canada (NDSL)</th>
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<tbody>
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<td>L-Menthol</td>
<td>2216-51-5</td>
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<table>
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<tr>
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<th>CEPA - 2010 Greenhouse Gases Subject to Mandatory Reporting</th>
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<tr>
<td>L-Menthol</td>
<td>2216-51-5</td>
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</table>

EU Classification

R-phrase(s)
R36 - Irritating to eyes.

S-phrase(s)
S26 - In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS-No.</th>
<th>Classification</th>
<th>Concentration Limits:</th>
<th>Safety Phrases</th>
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<td>2216-51-5</td>
<td>Not listed</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:
Xi - Irritant.

16. OTHER INFORMATION

Preparation Date: 1/25/2017
Revision Date: 2/7/2017
Prepared by: Sonia Owen

Disclaimer:
All chemicals may pose unknown hazards and should be used with caution. This Safety Data Sheet (SDS) 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 SDS. The physical properties reported in this SDS 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 SDS is based on technical data judged to be reliable, Spectrum assumes no responsibility for the completeness or accuracy of the information contained herein.

End of Safety Data Sheet

Product code: ME110  Product name: L-MENTHOL, CRYSTAL, USP
Manufacturer

Product Covered: ME110, L-Menthol, Crystal, USP

Spectrum takes ownership as the manufacturer for the Spectrum product listed above and provides full quality assurance, customer service, and technical product support.

While information concerning the raw material manufacturer of our starting materials is considered proprietary, such information can be made available upon request contingent on demonstration of business volume justification and successful execution of confidential disclosure agreement (CDA).

Requests for disclosure of proprietary raw material manufacturer information may be submitted to the assigned account representative for consideration.

Sincerely,

Alan Wang, MSQA, ASQ CQA
Director of Technical Services
techservices@spectrumchemical.com
Manufacturing Process Flowchart

L-Menthol, Crystal, USP - ME110

Receiving of raw material

- Fractional distillation
- SSC fraction, QC check
- Filtration through high speed centrifugal machine
- Filling into crystallization chambers
- Crystallization
- Decanting
- Cutting
- Centrifugation
- Drying, QC check

Grading

- Crystal
- Sorting
- Checking through metal detector
- Packing
- Weighing & labeling
- Dispatch, QC check
- Customer

Mother liquor

Spectrum Chemical Mfg Corp

Corporate Headquarters:
769 Jersey Ave.
New Brunswick, NJ 08901
732.214.1300

West Coast Facility:
14422 S. San Pedro St.
Gardena, CA 90248
310.516.8000
Certificate of Registration

Intertek

This is to certify that the quality management system of

Spectrum Chemicals and Laboratory Products, Inc.

Main Site: 14422 South San Pedro Street, Gardena, California, 90248, USA
Additional Sites: 13915 South Main Street, Los Angeles, California, 90061, USA
755 Jersey Avenue, New Brunswick, New Jersey, 08901, USA
769 Jersey Avenue, New Brunswick, New Jersey, 08901, USA
7400 North Oracle Road, Suite 221, Tucson, Arizona, 85704, USA

has been assessed and registered by Intertek as conforming to the requirements of

ISO 9001:2008

The quality management system is applicable to

California and New Jersey sites: The manufacture and distribution of specialty fine chemicals, solutions, equipment, supplies and products for the laboratory, pharmaceutical, food, healthcare, cosmetic, fragrance, biotechnology, environmental and process industries.

Arizona site: Supporting Spectrum’s two manufacturing facilitates by: selecting and qualifying distributors of Laboratory and Safety Equipment; processing bids and quotes to generate new sales opportunities; sourcing bulk chemicals in support of bulk bids and quotes; assisting production operations through order expediting and IT infrastructure support.

Certificate Number: 94-316m-01
Initial Certification Date: 27 December 1994
Certificate Issue Date: 29 January 2016
Certificate Expiry Date: 14 September 2018

Calin Moldovean, President
Intertek Testing Services NA, Inc.
900 Chelmsford Street, Suite 301-3, Lowell, MA, USA

In the issuance of this certificate, Intertek assumes no liability to any party other than to the Client, and then only in accordance with the agreed upon Certification Agreement. This certificate’s validity is subject to the organization maintaining their system in accordance with Intertek’s requirements for systems certification. Validity may be confirmed via email at certificate.validation@intertek.com or by scanning the code to the right with a smartphone.

The certificate remains the property of Intertek, to whom it must be returned upon request.

CT-ISO 9001-2008-ANAB-EN-LT-L-26.jun.15
Certificate of Registration

Intertek Certification Limited is a UKAS accredited body under schedule of accreditation no. 014.

In the issuance of this certificate, Intertek assumes no liability to any party other than to the client, and then only in accordance with the agreed upon Certification Agreement. This certificate’s validity is subject to the organization maintaining their system in accordance with Intertek’s requirements for systems certification. Validity may be confirmed via email at certificate.validation@intertek.com or by scanning the code to the right with a smartphone.

The annual validity of the certificate can also be checked through the website http://www.cnca.gov.cn of CNCA in China.

The certificate remains the property of Intertek, to whom it must be returned upon request.

Certificate of Registration

Intertek

This is to certify that the quality management system of

Spectrum China Ltd.

Building A20, No. 3802, Shengang Road, Songjiang District, Shanghai, China

has been assessed and registered by Intertek as conforming to the requirements of

**ISO 9001: 2008**

The quality management system is applicable to:

_Provision of service of purchase, testing and sales for chemical products, repacking of non-hazardous chemical products._

Organization Code: 77762704-8
Certificate Number: 111310001-01
Certificate Issue Date: 17 November 2015
Certificate Expiry Date: 14 September 2018

Authorised Signature: Calin Moldovean – President, Business Assurance
Intertek Certification Limited, 10A Victory Park, Victory Road, Derby DE24 8ZF, United Kingdom

In the issuance of this certificate, Intertek assumes no liability to any party other than to the client, and then only in accordance with the agreed upon Certification Agreement. This certificate’s validity is subject to the organization maintaining their system in accordance with Intertek’s requirements for systems certification. Validity may be confirmed via email at certificate.validation@intertek.com or by scanning the code to the right with a smartphone.

The annual validity of the certificate can also be checked through the website http://www.cnca.gov.cn of CNCA in China.

The certificate remains the property of Intertek, to whom it must be returned upon request.
January 03, 2017

Certificate of cGMP

Dear Valued Customer:

Spectrum Chemicals and Laboratory Products certifies that our USP, NF, FCC, EP, BP, JP, and food grade products are produced, processed, packaged and held in compliance with current Good Manufacturing Practices (cGMP) in accordance with the applicable parts of 21 CFR, parts 210 and 211 of the Code of Federal Regulations.

Spectrum is an FDA registered and inspected drug establishment. Our United States Food and Drug Administration (USFDA) Registration numbers are as follow:

Spectrum Gardena, California: 2020632
Spectrum New Brunswick, New Jersey: 2246824

Thank you for your interest with Spectrum products. Please feel free to contact me at 310-516-8000, extension 5610 or via email at mdang@spectrumchemical.com if I may be of further assistance.

Sincerely,

Michael Dang
Manager, GMP Compliance
July 18, 2016

Certificate of cGMP

Dear Valued Customer:

Spectrum Chemicals and Laboratory Products certify that the following product(s) is produced, processed, packaged and held in compliance with current Good Manufacturing Practices (cGMP) in accordance with the applicable parts of 21 CFR, parts 210 and 211 of the Code of Federal Regulations.

<table>
<thead>
<tr>
<th>Catalog Number</th>
<th>Product Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME110</td>
<td>L-Menthol, Crystal, USP</td>
</tr>
</tbody>
</table>

Spectrum is an FDA registered and inspected drug establishment. Our United States Food and Drug Administration (USFDA) Registration numbers are as follows:

- Spectrum-Gardena, CA: 2020632
- Spectrum-New Brunswick, NJ: 2246824
- Spectrum-Shanghai, China: 3006174778

Thank you for your interest with Spectrum products. Please feel free to contact the Quality Assurance department at 310-516-8000 or via email at qualityassurance@spectrumchemical.com if we may be of further assistance.

Sincerely,

Oralia Chavez
Quality Assurance Specialist
June 17, 2016

Re: L-Menthol, Crystal, USP- ME110

To Whom It May Concern:

Thank you for your interest in Spectrum high quality chemicals.

We at Spectrum Chemical Mfr. Corp. understand the concern regarding Bovine Spongiform Encephalopathy (BSE). Please be assured that the chemical L-Menthol, Crystal, USP- ME110 is BSE/TSE free.

If you have any further questions, please contact Tech Services at (310) 516-8000 Extension 5471, or by email at techservices@spectrumchemical.com.

Sincerely,

Darlene Dagdag-Lyudmirskiy
Technical Services
Spectrum Chemical Mfr. Corp.

This document has been produced electronically and is valid without a signature
June 2, 2016

Re: L-Menthol, Crystal, USP- ME110

To Whom It May Concern:

Thank you for your interest in Spectrum high quality chemicals.

We at Spectrum Chemical Mfr. Corp. understand the concern regarding the presence of allergens in raw materials. Please be assured that the following chemical does not contain (Milk; Egg; Fish; Shellfish; Tree nuts; Wheat; Peanuts; Soy).

L-Menthol, Crystal, USP- ME110

If you have any further questions, please contact Tech Services at (310) 516-8000 Extension 5471, or by email at techservices@spectrumchemical.com.

Sincerely,

Darlene Dagdag-Lyudmirskiy
Technical Services
Spectrum Chemical Mfr. Corp.

This document has been produced electronically and is valid without a signature.
May 26, 2017

Re: L-Menthol, Crystal, USP- ME110

To Whom It May Concern:

Thank you for your interest in Spectrum high quality chemicals.

We at Spectrum Chemical Mfg. Corp. understand the concern regarding Aflatoxins in raw materials. To the best of our knowledge, the product listed below is not contaminated with Aflatoxins. Aflatoxins are not used in production. The following product does not come in contact with Aflatoxins at any stage of production.

L-Menthol, Crystal, USP- ME110

If you have any further questions, please contact Tech Services at (310) 516-8000 Extension 5471, or by email at techservices@spectrumchemical.com.

Sincerely,

Darlene Dagdag-Lyudmirskiy
Technical Services
Spectrum Chemical Mfr. Corp.

This document has been produced electronically and is valid without a signature
# Certificate Of Analysis

<table>
<thead>
<tr>
<th>Item Number</th>
<th>ME110</th>
<th>Lot Number</th>
<th>1EF0856</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
<td>L-Menthol, Crystal, USP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAS Number</td>
<td>2216-51-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Molecular Formula</td>
<td>C_{10}H_{20}O</td>
<td>Molecular Weight</td>
<td>156.27</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Specification</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ASSAY</strong></td>
<td>98.0 - 102.0 %</td>
<td>100.55 %</td>
</tr>
<tr>
<td><strong>MELTING RANGE</strong></td>
<td>41 - 44°C</td>
<td>43.0°C</td>
</tr>
<tr>
<td><strong>SPECIFIC ROTATION</strong> [(\alpha)]_{D25}</td>
<td>-45° to -51°</td>
<td>49.8°</td>
</tr>
<tr>
<td><strong>NONVOLATILE RESIDUE</strong></td>
<td>0.05 %</td>
<td>0.025 %</td>
</tr>
<tr>
<td><strong>RELATED COMPOUNDS</strong></td>
<td>TO PASS TEST</td>
<td>PASSES TEST</td>
</tr>
<tr>
<td><strong>IDENTIFICATION</strong></td>
<td>TO PASS TEST</td>
<td>PASSES TEST</td>
</tr>
<tr>
<td><strong>EXPIRATION DATE</strong></td>
<td>28-JUN-2019</td>
<td></td>
</tr>
<tr>
<td><strong>RESIDUAL SOLVENTS</strong></td>
<td>TO PASS TEST</td>
<td>NO RESIDUAL SOLVENTS USED</td>
</tr>
<tr>
<td><strong>APPEARANCE</strong></td>
<td>WHITE CRYSTALS</td>
<td></td>
</tr>
<tr>
<td><strong>MANUFACTURE DATE</strong></td>
<td>29-JUN-2014</td>
<td></td>
</tr>
</tbody>
</table>

Spectrum Chemical Mfg Corp  
14422 South San Pedro Street  
Gardena 90248 CA

All pharmaceutical ingredients are tested using current edition of applicable pharmacopeia.

Read and understand label and MSDS/SDS before handling any chemicals. All Spectrum’s chemicals are for manufacturing, processing, repacking or research purposes by experienced personal only. The customer must ensure to provide its users adequate hazardous material training and appropriate protective gears before handling our chemicals.
Label Information

The Spectrum label presents technical and safety information in an easily understood format. Our technical specialists stay abreast of the latest requirements of the Globally Harmonized System for Classification and Labelling of Chemicals (GHS), as well as the Occupational Safety and Health Administration (OSHA), the Food and Drug Administration (FDA) and other government regulatory agencies in order to ensure compliance, accuracy and concise hazard communication.

**CAUTION:** For manufacturing, processing or repacking. Read and understand the label and Safety Data Sheet (SDS) prior to use.

**WARNING**
- Causes serious eye irritation
- Causes skin irritation
- May cause respiratory irritation
- May be harmful if swallowed.
- Wear protective gloves, eye protection, face protection. Avoid breathing dust. Use only outdoors or in a well-ventilated area. Wash face, hands and any exposed skin thoroughly after handling.

**FIRST AID:**
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.
- IF ON SKIN: Wash with plenty of water. Take off contaminated clothing and wash it before reuse. If skin irritation occurs: Get medical attention.
- IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or physician if you feel unwell.

**KEEP FROM CHILDREN**

---

**Item Name:** L-Menthol (Levomenthol; 3-menthanol)

**Crystal, U.S.P.**

**CAS 2216-51-5**

**Empirical Formula:** C_{10}H_{20}O

**Formula Weight:** 156.27

**Assay:** 98.0-102.0%

**Melting Range:** 41-44°C

**Specific Rotation, \([\alpha]_D^25\):** -45° to -51°

**MAXIMUM LIMITS**
- Nonvolatile Residue: 0.05%
- Related Compounds: To pass test
- Residual Solvents: To pass test

**Expiration Information**

**Lot Number:** 062233

**Chemical Emergency:** (800)424-9300

---

**Empirical Formula, Formula Weight and Technical Specifications Panel**

**Empirical Formula:** C_{10}H_{20}O

**Formula Weight:** 156.27

**Assay:** 98.0-102.0%

**Melting Range:** 41-44°C

**Specific Rotation, \([\alpha]_D^25\):** -45° to -51°

**MAXIMUM LIMITS**
- Nonvolatile Residue: 0.05%
- Related Compounds: To pass test
- Residual Solvents: To pass test

---

**Label Information**

This color-coded band indicates the hazard most likely to be posed by that material under storage conditions. The criteria used to assign band colors have been established by the Storage Code working group of the Society for Chemical Hazard Communication (SCHC). It is recommended that like colors be stored together, unless otherwise stated, based on the color codes indicated to the right. However, it is the responsibility of the customer to check with their local fire department for possible conflicts with our recommendations when storing hazardous chemicals.

---

**Spectrum Chemical Mfg Corp**

**Corporate Headquarters:**
769 Jersey Ave.
New Brunswick, NJ 08901
732.214.1300

**West Coast Facility:**
14422 S. San Pedro St.
Gardena, CA 90248
310.516.8000
January 26, 2016

RE: Lot Numbering System

Dear Valued Customer:

This letter is to inform you of Spectrum Chemicals and Laboratory Products’ Lot Numbering System. The system is based on an alpha-numerical sequence which provides the month, year and location of production.

The lot numbering system utilized until 2010 is a sequence of six characters, two letters followed by four numbers. The first letter represents the year, for example, Y denotes 2009 and Z denotes 2010. The second letter represents the month and site, for example, A-L denotes January through December at Spectrum’s Gardena, CA facility, while M-X denotes January through December at the New Brunswick, NJ facility. The following four numbers are sequentially assigned.

Example: ZI0928 = The 928th material produced in California in September 2010

The lot numbering system utilized for 2011 and forward, is a sequence of seven characters. The first character, a number, represents the production facility:

1 = Gardena, CA Facility
2 = New Brunswick, NJ Facility
3 = China Facility

The second character, a letter, represents the year. For example, A denotes 2011 and B denotes 2012. The third character, a letter, represents the month, with A denoting January and L denoting December. The following four numbers are sequentially assigned.

Example: 2AA0706 = The 706th material produced in New Jersey in January 2011

Thank you for your interest with Spectrum products. Please feel free to contact us at 310-516-8000 or via email at qualityassurance@spectrumchemical.com if we may be of further assistance.

Sincerely,

Michael Dang
Manager, GMP Compliance
Stability – Shelf Life Guidance

Product Covered: ME110, L-Menthol, Crystal, USP

Spectrum Chemical’s manufacturing partner has assigned the following shelf life guidance for the product listed above.

The product, ME110, L-Menthol, Crystal, USP, is assigned a 60 months shelf life from date of manufacturing. The quality and integrity of the chemical depends on the handling and storage conditions. Please refer to the Safety Data Sheet for proper storage and handling procedures.

Adan R. Hernandez
Quality Control Manager

Corporate Headquarters
769 Jersey Avenue
New Brunswick, NJ 08901-3605