1. Identification of the Substance/Mixture and of the Company/Undertaking:

1.1 Product Identifier: AI-200-2CE in Cyclohexane

1.1.1 Substances: Not applicable

1.1.2 Mixture name: AI-200-2CE in Cyclohexane

1.2 Relevant Identified Uses of the Substance or Mixture and Uses Advised Against:

For use under Low Volume Exemption Modification LM-14-0020 and Low volume Exemption L-14-0196 only.

1.3 Details of the Supplier of the Safety Data Sheet

North America
FMC Corporation
2801 Yorkmont Road, Suite 300
Charlotte, NC 28208
Phone: +1.704.426.5300
Fax: +1.704.426.5370
Email: lithium.info@fmc.com
Web: www.fmclithium.com

Europe
FMC Chemicals
Commercial Road
Bromborough, Merseyside
CH62 3NL, England
Phone: +44.151. 334.8085
Fax: +44.151.482.7361

Asia Pacific
FMC Asia Innovation Center
No 3 Building No. 4560
Jinke Road
Shanghai, China 201203
T: +86.21.2067.5888

1.4 Emergency Telephone Number:

North America
CHEMTREC: +1.800.424.9300
+1.703.527.3887
Plant: +1.704.629.5361
Medical: +1.303.595.9048

Europe
24 hr Specialist advice number: CHEMTREC: +44 870 8200418

Asia Pacific
Phone: +86.21.2067.5888

2. Hazards Identification

2.1 Classification of the Mixture:

2.1.1 GHS Classification [EC Regulation No 1272/2008 and US OSHA regulations]

- Flammable liquid; Category 2
- Skin corrosive; Category 1B
- Eye damage; Category 1
- Acute toxicity, oral; Category 3
- Skin sensitization; Category 1
- Aspiration toxicity; Category 1
- Mutagen; Category 2
- Reproductive toxicity; Category 2
- Specific target organ systemic toxicity – SE Category 3
- Specific target organ systemic toxicity – RE; Category 2
- Hazardous to the aquatic environment – Acute; Category 1
- Hazardous to the aquatic environment – Chronic; Category 1

2.2.2 EC: Classification according to 67/548/EEC or 1999/45/EC [DSG/DPD]

- F, R11, C, R34; T, R25; Xn, R65, R68, R48/20; R43, R67;
- Repr Cat. 3, R62, R63; N R50/53
2.2 Label Elements:

2.2.3 Hazard Pictograms:

2.2.4 Signal Word: Danger

Hazard Statement(s):
- Highly flammable liquid and vapour. H225
- Causes severe skin burns and eye damage. H314
- Toxic if swallowed H301
- May cause an allergic skin reaction H317
- May be fatal if swallowed and enters airways. H304
- Suspected of causing genetic defects H341
- Suspected of damaging fertility or the unborn child H361fd
- May cause drowsiness or dizziness. H336
- May cause damage to organs through prolonged or repeated exposure. H373
- Very toxic to aquatic life with long lasting effects. H410

Precautionary Statement(s):
- Wear protective gloves/protective clothing/eye protection/ face protection. P280
- Do not breathe dust/fume/gas/mist/vapours/spray. P260
- In case of fire: Use dry chemical for extinction. P370 + P378
- IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. P301 + P330 + P331
- IF ON SKIN (or hair): Remove / Take off immediately all contaminated clothing. Rinse skin with water / shower. P303 + P361 + P353
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P305 + P351 + P338
- Immediately call a POISON Center or doctor/physician. P310

Additional Precautionary Statement(s):
- Obtain special instructions before use. P201
- Do not handle until all safety precautions have been read and understood. P202
- Keep away from heat/sparks/open flames/hot surfaces. – No smoking. P210
- Keep container tightly closed. P233
- Ground/bond container and receiving equipment. P240
- Use explosion-proof electrical/ventilating/lighting/…/equipment. P241
- Use only non-sparkling tools. P242
- Take precautionary measures against static discharge. P243
- Wash hands thoroughly after handling. P264
- Do not eat, drink or smoke when using this product. P270
- Use only outdoors or in a well-ventilated area. P271
- Contaminated work clothing should not be allowed out of the workplace. P272
- Use personal protective equipment as required. P281
- IF SWALLOWED: Immediately call a POISON Center or doctor/physician. P301 + P310
- IF ON SKIN: Wash with plenty of soap and water. P302 + P352
- If INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. P304 + P340
- If skin irritation or rash occurs: Get medical advice/attention. P333 + P313
- Wash contaminated clothing before reuse. P363
- Store in a well-ventilated place. Keep cool. P403 + P235
- Store locked up. P405
- Dispose of contents/ container to an approved waste disposal plant. P501

2.3 Other Hazards

None.
3. Composition / Information on Ingredients

3.1 Substances  Not applicable.

3.2 Mixtures

3.1.1 GHS Classification  [EC: Regulation No 1272/2008; US: OSHA regulations]

<table>
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<th>CAS #</th>
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* Contains n-hexane, CAS# 110-54-3

3.1.2 EC: Classification according to 67/548/EEC or 1999/45/EC [DSD/DPD]

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<th>Chemical Name</th>
<th>CAS #</th>
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<th>Wt.%</th>
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</table>

* Contains n-hexane, CAS# 110-54-3

(see Section 16 for R-phrase text)

4. First Aid Measures

4.1 Description of First Aid Measures

EYES: Immediately flush with water for at least 15 minutes, lifting the upper and lower eyelids intermittently. See a medical doctor or ophthalmologist immediately.

SKIN: Immediately flush with plenty of water while removing contaminated clothing and/or shoes, and thoroughly wash with soap and water. Obtain immediate medical attention. Contact a medical doctor if necessary.

INGESTION: Quickly wipe material from the mouth and rinse mouth with water. Do not induce vomiting. Never give anything by mouth to an unconscious person. See a medical doctor immediately.

INHALATION: Remove to fresh air. If breathing discomfort occurs and persists, see a medical doctor. If
breathing has stopped, give artificial respiration and see a medical doctor immediately.

4.2 Most Important Symptoms and effects, both acute and delayed
Symptoms of over-exposure will typically be a result of the corrosive nature of the substance with discomfort to skin and if swallowed, local effects with discomfort to the mouth and GI tract. Inhalation of solvent vapours may lead to dizziness and impairment of normal functions.

4.3 Indication of any immediate medical attention and special treatment needed.
Notes to medical doctor:
Product is highly alkaline and is corrosive to the eyes, skin and mucous membranes. Consideration should be given to careful endoscopy as stomach or esophageal burns, perforations or strictures may occur. Careful gastric lavage with an endotracheal tube in place should be considered. Observation may be warranted. Treatment is controlled removal of exposure followed by symptomatic and supportive care.

5. Fire-Fighting Measures

5.1 Extinguishing media
DO NOT USE WATER OR CARBON DIOXIDE. Use dry chemical.

5.2 Special hazards arising from the substance or mixture

<table>
<thead>
<tr>
<th>Hazardous combustion products</th>
<th>Lithium hydroxide, carbon monoxide, carbon dioxide.</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Hazard</td>
<td>Flammable liquid. AI-200 reacts with water, generating heat.</td>
</tr>
<tr>
<td>Properties contributing to Flammability</td>
<td>Water reactivity of product, and volatility of solvents.</td>
</tr>
<tr>
<td>Flashpoint</td>
<td>Not available. The flashpoint of cyclohexane is -18.3 °C (Closed Cup)</td>
</tr>
</tbody>
</table>

5.3 Advice for fire-fighters
Wear full protective clothing and self-contained breathing apparatus (SCBA) approved for fire fighting. This is necessary to protect against the hazards of heat, products of combustion and oxygen deficiency. Do not breathe smoke, gases or vapors generated.

COMMENTS:
(See Section 10, Stability and Reactivity)

6. Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures
Before cleanup measures begin, review the entire SDS with particular attention to Section 2, Hazards Identification; and Section 8, Exposure Controls/Personal Protection. Remove all sources of ignition.
Spilled material can catch fire spontaneously on contact with air, moisture, acids or oxidizing materials.

6.2 Environmental precautions
Contain spill. Do not wash into drains. Dispose of at qualified waste disposal facility.

6.3 Methods and material for containment and cleaning up
Remove all sources of ignition. Spilled material can catch fire spontaneously on contact with air, moisture, acids or oxidizing materials. Cover spill with dry extinguishant. DO NOT USE WATER OR CARBON DIOXIDE. Contain spill with absorbant. Expose to air until solvent has dissipated. Sweep up and place in approved transport container. Dispose of waste according to local and Federal laws and regulations.

6.4 Reference to other sections
Before cleanup measures begin, review the entire SDS with particular attention to Section 2, Hazards Identification; and Section 8, Exposure Controls/Personal Protection.

6.5 Additional information
Not specified.

7. Handling and Storage

7.1 Precautions for safe handling
**KEEP AWAY FROM WATER, AIR AND OXIDIZING MATERIALS**. Wear full face protection and gloves.

**Use in a closed system under argon or nitrogen.**

### 7.2 Conditions for safe storage, including any incompatibilities

Keep away from heat, sparks and flame. Protect storage container from leaks and physical damage.

### 7.3 Specific end use(s)

For use only as a chemical intermediate under Strictly Controlled Conditions

---

### 8. Exposure Controls / Personal Protection

#### 8.1 Control parameters

Note that DNELs and PNECs have not been derived for AI-200 as it is a strictly controlled transported intermediate

**DNEL**

**Cyclohexane**

- Long-term exposure, systemic, inhalation: 700 mg/m³
- Long-term exposure, systemic, dermal: 2016 mg/kg/day

**Hydrocarbons, C7, n-alkanes, isoalkanes, cyclic; Heptanes**

- Long-term exposure, systemic, inhalation: 2085 mg/m³
- Long-term exposure, systemic, dermal: 300 mg/kg/day

**Hydrocarbons, C6, n-alkanes, iso-alkanes, cyclics, n-hexane rich**

- Long-term exposure, systemic, inhalation: 93 mg/m³
- Long-term exposure, systemic, dermal: 13 mg/kg/day

**PNEC**

**Cyclohexane**

Freshwater: 0.207 mg/l

**Heptanes**

No details published

**Hydrocarbons, C6, n-alkanes, iso-alkanes, cyclics, n-hexane rich**

No details published

#### EXPOSURE LIMITS

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<th>EU TWA</th>
<th>STEL</th>
<th>EH40 (UK WEL) TWA</th>
<th>STEL</th>
<th>USA (ACGIH) TWA</th>
<th>STEL/Ceiling</th>
<th>USA (OSHA) PEL</th>
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<td>100 ppm</td>
<td>300 ppm</td>
<td>100 ppm</td>
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<td>60 ppm</td>
<td>50 ppm</td>
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<td>500 ppm</td>
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</table>

#### 8.2 Exposure controls

**Engineering controls:**

Use in closed system under argon or nitrogen. If personal contact can occur, use local exhaust ventilation (explosion-proof), to keep airborne concentrations below exposure limits.

**Personal protective equipment**

**Eyes and Face:** Chemical splash goggles with a face shield.

**Respiratory:** Wear a respirator approved for protection against organic vapours and mists when adequate ventilation is not available.  

US: NIOSH or MSHA approved  
Europe: CEN Class A type

**Protective Clothing:** Gloves: Nitrile (typical permeation breakthrough time >480 minutes)

These glove recommendations should not be used as the absolute basis for glove selection. Actual in-use conditions may vary glove performance from the controlled conditions of laboratory tests. Factors such as concentration and temperature, glove thickness and glove reuse, may affect performance. Other glove requirements, such as length, dexterity, cut, abrasion, puncture and snag resistance, or glove grip need to be considered in making your final selection. For flammable products, the recommended gloves provide chemical but not fire protection.
Other: Rubber clothing.


9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

- **Appearance:** Clear to slightly hazy, yellow to amber-red solution
- **Odor:** Gasoline-like
- **Odor threshold:** Not available
- **pH:** Reacts violently with water giving mixture with pH >12
- **Melting point:** Not available. The melting point of cyclohexane is 6.5°C.
- **Boiling point:** Cyclohexane: (81°C)
- **Flash point:** Not available. The flashpoint of cyclohexane is -18.3 °C (Closed Cup)
- **Evaporation rate(butyl acetate = 1):** cyclohexane: 6.1
- **Flammability:** Water reactive material in flammable liquid solvent
- **Flammable limits:** Not available for formulation. For cyclohexane: Upper: 8%; Lower: 1.3%
- **Vapor pressure:** cyclohexane: 3.26 psi @ 37.8 °C
- **Vapor density (air = 1):** (Air = 1): cyclohexane: 2.9
- **Specific gravity:** 0.7-0.8 g.ml @ 20°C (68°F)
- **Solubility in water:** Reacts violently with water
- **Partition coefficient n-octanol/ water:** Not available
- **Autoignition temperature:** Not available.
- **Decomposition temperature:** Not available
- **Viscosity:** Not available
- **Explosive properties:** Not explosive
- **Oxidizing properties:** Not an oxidizer

9.2 Other information

- **Self-reactive properties** Does not meet classification criteria.
- **Pyrophoric properties** Does not meet classification criteria.
- **Self-heating properties** Does not meet classification criteria.
- **Water reactive properties** Does not meet classification criteria.
- **Corrosive to metals** Does not meet classification criteria.
- **Molecular weight:** 229.3

10. Stability and Reactivity

10.1 Reactivity

Reactive with water and damp air

10.2 Chemical stability

Stable if kept away from air and moisture.

10.3 Possibility of hazardous reaction

Reaction with water, air, oxidizers, acids to form lithium hydroxide, lithium hydride, organic amines

10.4 Conditions to avoid

Open air. Heat, sparks or flames

10.5 Incompatible materials

Water, air, oxidizers, carbon dioxide, acids

10.6 Hazardous decomposition products

None

11. Toxicological Information

11.1 Information on toxicological effects

The mixture has not been tested, but properties can be predicted based on the properties of the two components

(a) acute toxicity

Al-200: Corrosive

Cyclohexane: Acute Oral LD₅₀: 12705 mg/kg (rat)
Cyclohexane: Acute Inhalation LC₅₀: 70000 mg/m³/2H (mouse)

(b) skin corrosion/irritation

Classified as corrosive on the basis of the basis of Al-200.

(c) serious eye damage/irritation

Classified as corrosive on the basis of Al-200.

(d) respiratory/skin sensitisation

Classified as a skin sensitizer based on Al-200.

(e) germ cell mutagenicity

Classed as a mutagen, category 2, based on Al-200.

(f) carcinogenicity

None on the components considered to be carcinogenic

(g) reproductive toxicity

n-Hexane and Al-200 are suspected of damaging fertility or the unborn
child.

(h) STOT-single exposure Cyclohexane and hexanes may cause drowsiness.
(i) STOT-repeated exposure Hexanes may cause damage to the nervous system through inhalation
(j) aspiration hazard Cyclohexane and hexanes may be fatal if swallowed and enters airways

The components cyclohexane and hexanes have been extensively tested for REACH registration. AI-200 has been less extensively tested in view of the corrosivity and reactivity and in view of limited uses as intermediate.

**Acute Effects From Overexposure:**
No data available for the formulation. This product contains an alkyl lithium compound which is extremely reactive and corrosive to the skin, eyes (may cause blindness), nose, throat and stomach. Inhalation of vapors may cause dizziness, nausea, anesthesia, numbness, burning sensation and motor weakness in fingers and toes, incoordination, and headache. Low viscosity material—if swallowed may enter the lungs and cause lung damage.

n-hexane: May cause peripheral nervous system disorder and/or damage. Blurred vision is associated with hexane polyneuropathy.

**Chronic Effects From Overexposure:**
No data available for product.
Hexane: Overexposure to n-hexane may cause progressive and potentially irreversible damage to the peripheral nervous system, particularly in the arms and legs. The neurotoxic effects of n-hexane vapour can be enhanced in rats by both methyl ethyl ketone (MEK) and lead acetate. The available information does not suggest that n-hexane is mutagenic. Negative results were obtained in most tests using live animals and relevant routes of exposure. n-Hexane has caused severe testicular damage in male rats at concentrations which have produced significant other toxicity.

Prolonged contact with cyclohexane, hexane or heptane may cause defatting of the skin and skin irritation.

**Carcinogenicity Listings**

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### 12. Ecological Information

#### 12.1 Toxicity:
The mixture has not been tested, but properties can be predicted based on the properties of the components. The mixture is predicted to be toxic to aquatic organisms based on cyclohexane

**Cyclohexane:**
- Fish 96h LC50 4.53 mg/l
- Daphnia 48h EC50 0.9 mg/l
- Algae 96h IC50 40 mg/l

**n-Hexane:**
- Fish 96h LC50 8.2 mg/l
- Daphnia 48h EC50 4.5 mg/l
- Algae 96h IC50 3.1 mg/l

#### 12.2 Persistence and degradability
AI-200: AI-200 reacts with water to form organic amines and lithium hydroxide.

Cyclohexane is expected to evaporate rapidly if released to land or water. The volatilization half-life from a body of water has been estimated to be as low as 2.8 hours. In the atmosphere, cyclohexane will degrade with a half-life of 52 hours. When absorbed into soil, cyclohexane is not expected to readily biodegrade. However, microorganisms from an oil-exposed environment have been shown to biodegrade cyclohexane.
n-Hexane: Hexane readily volatilizes, biodegrades in soil, water and wastewater treatment plants, adsorsbs to organic matter in aquatic systems, has low mobility in soil. Log BCF = 2.24 to 2.89.

12.3 **Bioaccumulative potential**
n-Hexane: Log BCF = 2.24 to 2.89  
Cyclohexane and heptane are not expected to bioaccumulate

12.4 **Mobility in soil**
Solvents not expected to be mobile.

12.5 **Results of PBT and vPvB assessment**
Not available

12.6 **Other adverse effects**
Due to the nature of the material and the specialist applications, this product is not considered to be a risk to the environment.

### 13. Disposal Considerations

13.1 **Waste treatment methods**
**Disposal method:**
Do not discharge to waste water systems. 
Spent solvent may be sent for recovery or used as fuel if permitted under local regulations
Dispose of waste according to local and national laws and regulations.

### 14. Transport Information

14.1 **UN Number**
UN2924

14.2 **UN proper shipping name (IMDG, ICAO, ADR, DOT)**
Flammable liquids, corrosive, N.O.S.
(alkylaminooalkyllithium, hydrocarbon, solution)

14.3 **Transport hazard class(es) (IMDG, ICAO, ADR, DOT)**
3, Flammable liquid, (8, Corrosive)

14.4 **Packing group (IMDG, ICAO, ADR, DOT)**
I

14.5 **Environmental hazards**
Marine pollutant due to presence of cyclohexane, heptanes and hexanes.

14.6 **Special precautions for user**
None

14.7 **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**
None

### 15. Regulatory Information

15.1 **Safety, health and environmental regulations/legislation specific for the substance or mixture**

**EUROPEAN UNION:**

German Wassergefährdungsklasse (water hazard class)

<table>
<thead>
<tr>
<th>Substance</th>
<th>Hazard Class</th>
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</thead>
<tbody>
<tr>
<td>AI-200</td>
<td>not listed</td>
</tr>
<tr>
<td>cyclohexane</td>
<td>2</td>
</tr>
<tr>
<td>n-hexane</td>
<td>2</td>
</tr>
</tbody>
</table>

**UNITED STATES:**

**Section 311 Hazard Category (40 CFR 370):**
Immediate (acute) health hazard, delayed (chronic) health hazard, fire hazard, reactive

**Section 313 Reportable Ingredients (40 CFR 372):**
This product contains cyclohexane and hexane which are substances subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act of 1986.
This information must be included in all MSDS's that are copied and distributed for this material.

**Section 302 Extremely Hazardous Substances (40 CFR 355):**
Not listed

**CERCLA Hazardous Substance (40 CFR 302.4):**
Cyclohexane and n-hexane are listed. The reportable quantities are respectively 1000 lbs and 5000 lbs.
**TSCA Sec 12b Export Notification:** This product is not subject to TSCA 12 (b) Export Notification Requirements.

**NFPA Rating:**

Health: 3  Flammability: 3  Reactivity: 2  Special: W

**INTERNATIONAL INVENTORY STATUS:**

<table>
<thead>
<tr>
<th>Inventory/Country</th>
<th>Product Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>EINECS (EU)</td>
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<tr>
<td>TSCA (US)</td>
<td>Not listed. For use under Low Volume Exemption Modification LM-14-0020 and Low volume Exemption L-14-0196 only.</td>
</tr>
<tr>
<td>ECL (Korea)</td>
<td>Not listed</td>
</tr>
<tr>
<td>DSL (Canada)</td>
<td>Not listed</td>
</tr>
</tbody>
</table>

**15.2 Chemical Safety Assessment**

A Chemical Safety Assessment has not been carried out for AI-200.

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**16. Other Information**

**European Union:**

**R Phrases:**

- Highly flammable. R11
- Irritating to skin. R38
- Causes burns R34
- Toxic if swallowed R25
- Harmful: may cause lung damage if swallowed R65
- Possible risk of irreversible effects R68
- Harmful: danger of serious damage to health by prolonged exposure through inhalation R48/20
- May cause sensitisation by skin contact R43
- Vapours may cause drowsiness and dizziness R67
- Possible risk of impaired fertility R62
- Possible risk of harm to the unborn child R63
- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment R50/53
- Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment R51/53
- Highly flammable liquid and vapour. H225
- Causes severe skin burns and eye damage. H314
- Toxic if swallowed H301
- May cause an allergic skin reaction H317
- May be fatal if swallowed and enters airways. H304
- Suspected of causing genetic defects H341
- Suspected of damaging fertility or the unborn child H361d
- May cause drowsiness or dizziness. H336
- May cause damage to organs through prolonged or repeated exposure. H373
- Very toxic to aquatic life with long lasting effects. H410

**List of Abbreviations used in this SDS:**

- PBT Persistent, Bioaccumulative and Toxic
- vPvB very Persistent, very Bioaccumulative
- PEC Predicted environmental concentration
- PNEC Predicted no effect concentration
- DNEL Derived no effect level

**Specific uses identified for Exposure Scenarios**

Not available
**REVISION SUMMARY:** Revision # 1. Section 3 and 9 revised. Changed CAS# for AI200 and added molecular weight.

This SDS has been prepared to meet U. S. OSHA Hazard Communication Standard requirements.

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