I. Identification of the Substance/Preparation and Company

<table>
<thead>
<tr>
<th>Product Information:</th>
<th>Acetaldehyde</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Information:</td>
<td>-</td>
</tr>
<tr>
<td>Suggested Use and Restrictions:</td>
<td>Productions of the following chemical substances: acetic acid, acetic anhydride, n-butanol, 2-ethylhexanol, peracetic acid, aldolase, pentaerythritol, pyridine, trichloroacetaldehyde, 1,3-butene-diol, Trimethylolpropane, synthetic seasonings.</td>
</tr>
<tr>
<td>Information on Producer/Supplier Name, Addresses, Phone:</td>
<td>Linyuan Factory, LCY Chemical Corp. / No.11, Shihhua 3rd Rd., Linyuan District, Kaohsiung City</td>
</tr>
<tr>
<td>Emergency Phone / Fax:</td>
<td>(07) 6419966-137 / (07) 6410537</td>
</tr>
</tbody>
</table>

II. Hazard Identification:

<table>
<thead>
<tr>
<th>Hazard Category:</th>
<th>Class 1 flammable liquid, class 4 acute toxicity substance (ingestion), class 2 severe injury/eye irritation substance, class 2 reproductive cell mutagenicity substance, class 2 carcinogen, class 2 specific target organ systematic toxicity – Repeated exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labeled Content</td>
<td><img src="image" alt="Symbols" /></td>
</tr>
<tr>
<td>Symbols:</td>
<td>flame, exclamation point , health hazard</td>
</tr>
<tr>
<td>Warning:</td>
<td>danger</td>
</tr>
</tbody>
</table>
| Hazard Warning Information:            | Highly flammable liquid and vapor  
Hazard if ingested  
Eye irritation  
Suspicion of genetic defects  
Potential hazards to liver and kidney under long-term exposure |
| Hazard Prevention Measures:            | Keep the container tightly sealed.  
Place the container in a well-ventilated area.  
If comes in contact with the eyes, wash with large quantity of water immediately followed by medical consultation.  
If feeling uneasy, seek medical consultation (present this label to the medical staff). |
| Other Hazards:                         | -                                                                                                                                                                                                 |
III. Composition / Information on Ingredients

<table>
<thead>
<tr>
<th>Single:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>English Name:</strong> Acetaldehyde</td>
</tr>
<tr>
<td><strong>Synonyms:</strong> Acetic Aldehyde, Ethanal, Acetyl Aldehyde, Ethyl Aldehyde, Ethylaldehyde</td>
</tr>
<tr>
<td><strong>Chemical Abstracts Number (CAS No.):</strong> 75-07-0</td>
</tr>
<tr>
<td><strong>Percentage for Chemical Ingredient (%):</strong> 100</td>
</tr>
</tbody>
</table>

IV. First Aid Measures:

**Emergency and First Aid Procedures:**

**Inhalation:**
1. Take measures to ensure one’s own safety before administering first-aid. (such as wearing appropriate protective equipment and employing first-aid measures by cooperative support teams).
2. Remove the pollution source or the patient to a place with fresh air.
3. In case of difficulty in breathing, supply oxygen by trained staff under a physician’s directions.
4. Seek medical attention immediately.

**Skin Contact:**
1. Use gentle, running warm water to wash the injured area for 5 minutes immediately or wash till the chemical is removed.
2. Remove soiled clothes, shoes, and leather accessories (such as watchstraps, belts) during washing.
3. If irritation persists, repeat washing.
4. Seek medical attention immediately.

**Eye Contact:**
1. Open the eyelids immediately and wash the tainted eye with running warm water for 5 minutes or wash till the pollutant is removed.
2. Seek medical attention immediately.

**Ingestion:**
1. If the patient is losing consciousness, is unconscious or is having convulsion, do not feed anything through the mouth.
2. If the patient is conscious, allow him/her to rinse the mouth completely with water.
3. Do not induce vomiting.
4. Give 240~300 ml of water to the patient.
5. If the patient vomits spontaneously, allow the patient to rinse the mouth and provide water repeatedly.
6. If breathing has stopped, apply artificial respiration by trained professionals immediately. If the heart has stopped, apply cardiopulmonary resuscitation.
7. Take the patient to the emergency medical institution.
Major Disease and Harm Effects: Under high concentration, unconsciousness due to the inhibition of central nervous system, or even death due to respiratory paralysis.

First-Aid Personal Protection: Must wear Class C protective gear and perform emergency rescue in safe area.

Prompt to Doctor: If inhaled, consider supplying oxygen. If ingested, gastric lavage and active carbon should be administered.

V. Fire Fighting Measure:

Suitable Extinguishing Media: chemical powder, carbon dioxide, and alcoholic foam

Special Exposure Hazards:

1. Highly volatile and highly flammable liquid.
2. The concentration range of the explosion is widened when mixed in the air.
3. The vapor is rapidly oxidized and the peroxide compound formed in the air will explode spontaneously.
4. Vapor is heavier than the air. It can accumulate at the bottom or in the tank and may travel to far places and flashback from ignition sources.
5. When burning in the fire, toxic carbon monoxide will be released.

Special Extinguishing Procedure:

1. The fire should be effectively extinguished; the container at the fire field can be cooled; the unignited vapor can be dissipated while the fire fighters are protected.
2. If no immediate danger, the container can be moved out from the fire field.

Special Protection Equipment: The fire fighters must wear air respirators, protective gloves, and fire fighting coats.

VI. Accidental Release Measures:

Personal Protection:

1. Before the polluted area is cleaned up completely, access to the area should be restricted. 2. Make sure the cleaning work is performed by trained personnel. 3. The personnel should wear appropriate personal protective equipment.

Environmental Protection:

1. The air in the area should be well ventilated. 2. All flammable sources should be extinguished or eliminated. 3. Report the accident to the safety, health, and environmental protection authorities of the government.

Methods for Cleaning Up:

1. Do not come in contact with the released chemical. 2. Avoid the released chemical from entering the sewers, drains, or sealed spaces. 3. Stop or reduce the leakage under safe conditions if possible. 4. Use sand, earth, or other absorbents that do not react with the released chemical to block the leakage. 5. Small Quantity: Use an absorbent that does not react with the released chemical to absorb. The polluted absorbent becomes as harmful as the released chemical and should be placed in the appropriate container that is capped and labeled. Use water to
VII. Handling and Storage:

Handling:
1. Use appropriate personal protective equipment to prevent all possible contact. Do not perform operation in an open container or system.
2. All pipes and containers should be grounded.
3. Keep away from sparks, flames, and other ignition sources. A “Smoking Prohibited” sign should be present in the work area.
4. The emergency response equipment should be made available at any time.
5. Avoid the pure substance to be mixed with the pollutants.
6. The container should be labeled and tightly sealed when not in use. The empty container may still contain harmful residues.
7. In the well-ventilated designated area, operate in the smallest quantity possible to avoid the release of vapor.
8. The small containers should be stored in the cool, dry, well-ventilated, and independent non-flammable building without direct sunlight.
9. Keep away from incompatible substances such as oxide, strong acids, and strong bases.
10. Keep away from heat and ignition sources. Use grounded, anti-corrosive, and spark-free ventilation system and electric equipment to avoid them from becoming the ignition sources.
11. Use airtight containers and keep them sealed well and labeled clearly to prevent damages.
12. When refrigerated in small quantities, use qualified explosion-proof refrigerating equipment.

Storage:
1. Install alarm and detection system and limit the storage quantity.
2. The storage area should be separated from the work area with high employee density. Access should be restricted and the storage facility should be inspected regularly for any rupture or leakage.
3. The storage area should have the fire-extinguishing equipment readily available.
4. The storage tank for large quantities must be made of steel and placed in an open area. The automatic temperature-controlled irrigation system should be available to maintain the temperature below 20°C.
5. During release, nitrogen or other inert gas should be used as the pressure source.
6. Observe the regulations related to the storage and handling of flammables.

VIII. Exposure Control / Personal Protection:

Engineering Control:
1. Because of the potentially high risk of the substance, strict control such as secure sealing or isolation treatment may be required.
2. A ventilation system that does not create sparks and is grounded should be used separately.
3. The ventilation exits should be directly connected to the outside area.
4. Provide sufficient fresh air to replenish the air exhausted by the exhaust system.

<table>
<thead>
<tr>
<th>Control Factor</th>
<th>TWA</th>
<th>STEL</th>
<th>CEILING</th>
<th>BEIs</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 ppm</td>
<td>125 ppm</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Personal Protection Equipment:

Respiratory Protection:
1. Any Detectable Concentration: positive-pressure full self-contained respiratory apparatus, positive-pressure full air-supply respiratory apparatus with positive-pressure self-contained respiratory apparatus.

Hand Protection:
1. Impermeable gloves made of butyl rubber, Responder, or Tychem 10000 preferred.

Eye Protection:
1. Chemical goggles
2. Facial shields

Skin & Body Protection:
1. The above-mentioned one-piece protective clothing, work boots, emergency shower, and eye wash station.

Hygiene Procedures:
1. Polluted clothes should be removed as soon as the work is completed. The clothes should be worn or discarded only after being washed. The washing staff should be informed of the harmful effects of the pollution.
2. Eating, drinking, and smoking are strictly prohibited in the work area.
3. Wash hands thoroughly after handling the substance.
4. Keep the work area clean.

IX. Physical and Chemical Properties / Characteristics:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>colorless liquid</td>
</tr>
<tr>
<td>Odor</td>
<td>fruity and irritating</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>0.0028-1000 ppm</td>
</tr>
<tr>
<td>pH Value</td>
<td>-</td>
</tr>
<tr>
<td>Melting Point</td>
<td>-123.5°C</td>
</tr>
<tr>
<td>Boiling Point</td>
<td>20°C</td>
</tr>
<tr>
<td>Flammability</td>
<td>-</td>
</tr>
<tr>
<td>Flash Point</td>
<td>-39°C</td>
</tr>
<tr>
<td>Decomposition Temperature</td>
<td>-</td>
</tr>
<tr>
<td>Test Method</td>
<td>Close cup</td>
</tr>
<tr>
<td>Spontaneous Temperature</td>
<td>-</td>
</tr>
<tr>
<td>Exposure Limits</td>
<td>4%~57%</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>130 °C</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>1.52</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>0.783</td>
</tr>
<tr>
<td>Solubility</td>
<td>completely soluble in water</td>
</tr>
<tr>
<td>Log Kow</td>
<td>0.45</td>
</tr>
<tr>
<td>Percent volatile</td>
<td>high evaporation rate</td>
</tr>
</tbody>
</table>

X. Stability and Reactivity:

Stability: stable under normal conditions

Special Conditions of Hazardous Reaction:
1. Acids (such as acetic acid, concentrated sulfuric acid), bases (such as sodium hydroxide), and metals (such as copper, silver, mercury, and their alloys): a small quantity may cause polymerization rapidly and lead to violent explosion and fire.
2. Oxygen (including oxygen in the air): reacts immediately to form spontaneously explosive peroxide.
3. Oxidized substance: severe fire and explosion hazard.
4. Certain rusted metals: may ignite the vapor when comes in contact.

Conditions to Avoid: heat, pressure, vibration

Incompatibility: acids, bases, metals, oxygen, oxidized substances, some rusted metals.

Hazardous Decomposition Products: methane, carbon monoxide, and acetic acid after thermal decomposition

### XI. Toxicological Information

| Exposure route: skin contact, inhalation, ingestion, eye contact |
| Symptoms: irritation, drowsiness, headache, fatigue, dizziness, blurred vision, numbness, nausea, mental confusion, inhibition of the central nervous system, unconsciousness, dermatitis |
| Acute Toxicity: |
| **Skin:** |
| 1. No irritation after short-term exposure to the vapor  
2. Red then white skin followed by decortication when in contact with the liquid. |
| **Inhalation:** |
2. At high concentration: inhibition of the central nervous system leading to coma, dizziness, unconsciousness, or death due to respiratory paralysis. At high concentration, lung edema, coughing, difficulty in breathing lasting for a few hours to a few days. |
| **Ingestion:** |
| 1. Very low ingestion toxicity. Severe toxicity only when ingested in large quantity.  
2. When ingested, nausea, vomiting, diarrhea, or even inhibition of the central nervous system resulting in unconsciousness, paralysis, and respiratory failure.  
3. When exposed severely, kidney, liver, and heart damage resulting in death may occur. |
| **Eye:** |
| 1. One report indicated that the vapor at 30ppm could cause eye irritation. At 50ppm, most of the workers experienced eye irritation. At 200ppm, all workers experienced eye irritation.  
2. When the liquid spills in the eye, burning sensation, tearing, and blurred vision will occur.  |
| LD50 (Test animal, absorption route): 661 mg/kg (rat, ingestion)  
LC50 (Test animal, absorption route): 15600 mg/m3/4H (rat, inhalation) |

**Chronic:**

1. Chronic poisoning will result in the symptoms similar to those of chronic alcohol poisoning including weight loss, anemia, mental confusion, and reduced attention.  
2. Repeated contact will result in red skin and dermatitis.  
3. Animal studies indicated that inhalation of acetaldehyde was carcinogenic.  
4. Acetaldehyde is the major metabolite of ethanol. Potential alcohol reaction may cause alcohol complications.
to embryos. 5. Animal studies indicated that acetaldehyde was the first pass metabolite of ethanol and was able to enhance the effects of ethanol. Nicotine, caffeine, and dopamine will enhance the toxic effects of acetaldehyde. Di-sulfo benzoic acid used to treat alcoholic intoxication can inhibit the metabolism of acetaldehyde. 6. Does not accumulate in the body and can be oxidized or eliminated via multiple metabolic pathways.

4800 mg/kg (female rats pregnant for 1-20 days, ingestion) caused embryonic intoxication and abnormal growth.

Group 2B by IARC: potential carcinogen

XII. Ecological Information:

Eco-toxicity: LC50 (Fish): 30.8mg/l/96H
   EC50 (aquatic invertebrates): -
   Bio-concentration Factor (BCF): -

Durability and Degradability:
1. Acetaldehyde can be easily biodegraded by the biological wastewater treatment.
2. When released on the soil, will evaporate rapidly.
3. When released in water, will dissipate quickly.
   Half-life (air): -
   Half-life (water surface): -
   Half-life (underground water): -
   Half-life (soil): -

Biological Accumulation: 1. No accumulation. Acetaldehyde will be oxidized immediately in the body.

Fluidity in the Soil: When released on the soil, will evaporate rapidly.

Other Adverse Effects: -

XIII. Disposal Information:

Disposal Information:
1. Related regulations of the government
2. The disposed items should be stored in the safe facility prior to the treatment. They should not be released or disposed in water.
3. Specific incineration method can be used. The incineration process should occur in the safe place and monitored.

XIV. Transport Information:

The United Nations Number (Un-No): 1089
### Regulation Information:

**Applicable Regulations:**

1. Enforcement Rules of the Labor Safety and Health Act
2. Regulations of Hazard Communication on Dangerous and Harmful Material
3. Standards of Tolerable Hazardous Substance Concentration in the Air of Labor Working Environment
4. Traffic Safety Regulations
5. Standards for the Storage, Clearance, and Disposal of Industrial Waste
6. Toxic Chemical Substances Management Act
7. Public Hazardous Materials and Flammable Pressurized Gases Establishment Standards and Safety Control Regulations

### Other Information:

**Reference**

1. CHEMINFO Database, CCINFO CD, 2005-1
2. RTECS Database, TOMES PLUS CD, Vol.63, 2005
3. HSDB Database, TOMES PLUS CD, Vol.63, 2005
4. Hazardous Chemicals Database, Environmental Protection Agency
5. ChemWatch Database, 2004-4

**Name:** Linyuan Factory, LCY Chemical Corp.

**Address/Tel:** No.11, Shihhua 3rd Rd., Linyuan District, Kaohsiung City / (07) 6419966-137

**Job title:** Industrial Safety Engineer  
**Name (signature and seal):** Cash Chuang

**Date:** March 1, 2011

**Note:** This MSDS version is intended for reference only.