Material Safety Data Sheet
Material Name: Zaclon Galvanizing Fluxes (K;F;C;CS)

*** Section 1 - Chemical Product and Company Identification ***
Manufacturer Information
Zaclon LLC
2981 Independence Road
Cleveland, OH  44115
Phone: 216-271-1569 or 800-356-7327
Fax: 216-271-1792
Emergency # 800-424-9300 CHEMTREC

*** Section 2 - Hazards Identification ***
Emergency Overview
The product is corrosive to the eyes and corrosive or irritating to skin.
Potential Health Effects: Eyes
Causes eye burns.
Potential Health Effects: Skin
Causes skin irritation or burns.
Potential Health Effects: Ingestion
Not a likely route of exposure during normal product use. May be fatal from significant ingestion.
Potential Health Effects: Inhalation
Causes irritation of lungs and upper respiratory passages.
HMIS Ratings: Health: 3 Fire: 0 HMIS Reactivity 1
Hazard Scale:  0 = Minimal  1 = Slight  2 = Moderate  3 = Serious  4 = Severe   * = Chronic hazard

*** Section 3 - Composition / Information on Ingredients ***

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Component</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>12125-02-9</td>
<td>Ammonium chloride</td>
<td>40-75</td>
</tr>
<tr>
<td>7646-85-7</td>
<td>Zinc chloride</td>
<td>25-60</td>
</tr>
</tbody>
</table>

*** Section 4 - First Aid Measures ***
First Aid: Eyes
In case of contact, immediately flush eyes with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician.

First Aid: Skin
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician. Wash contaminated clothing before reuse and discard shoes.

First Aid: Ingestion
If swallowed, do not induce vomiting. Give large quantities of water. Call a physician immediately. Never give anything by mouth to an unconscious person.

First Aid: Inhalation
If inhaled, remove to fresh air immediately. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Call a physician.

First Aid: Notes to Physician
Emesis should be initiated unless there is evidence of burns of the oral mucosa. Gastric lavage may be advisable. In some cases of excess body loads of zinc, treatment with calcium disodium acetate may be effective.

*** Section 5 - Fire Fighting Measures ***
General Fire Hazards
See Section 9 for Flammability Properties.
Will not burn.

Hazardous Combustion Products
May release ammonium chloride fumes, zinc oxide fumes, zinc chloride fumes, and ammonia and hydrogen chloride gases in a fire.

Extinguishing Media
As appropriate for combustibles in area.
Fire Fighting Equipment/Instructions

Firefighters should wear full protective gear.

NFPA Ratings: Health: 3 Fire: 0 Reactivity: 1
Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

** Section 6 - Accidental Release Measures **

Containment Procedures
None

Clean-Up Procedures
Sweep up spillage and place in a plastic lined container for disposal. Flush spill area to chemical sewer with plenty of water. Comply with Federal, State, and local regulations or reporting releases.

Evacuation Procedures
Isolate area. Keep unnecessary personnel away.

Special Procedures
None

** Section 7 - Handling and Storage **

Handling Procedures
Do not get in eyes, on skin, on clothing. Avoid breathing dusts, mists, or fumes. Wash thoroughly after handling.

Storage Procedures
Store in a tightly closed container in a dry place. Do not store with cyanides or sulfides.

** Section 8 - Exposure Controls / Personal Protection **

A: Component Exposure Limits

<table>
<thead>
<tr>
<th>Compound</th>
<th>ACGIH</th>
<th>OSHA</th>
<th>NIOSH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonium chloride</td>
<td>10 mg/m³ TWA (fume)</td>
<td>20 mg/m³ STEL (fume)</td>
<td>20 mg/m³ STEL (fume)</td>
</tr>
<tr>
<td>Zinc chloride</td>
<td>1 mg/m³ TWA (fume)</td>
<td>2 mg/m³ STEL (fume)</td>
<td>2 mg/m³ STEL (fume)</td>
</tr>
</tbody>
</table>

Engineering Controls
Provide adequate local exhaust ventilation to maintain worker exposure below exposure limits.

PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment: Eyes/Face
Use chemical splash goggles.

Personal Protective Equipment: Skin
Use neoprene or PVC rubber gloves, apron, boots; long sleeve shirt and pants. If considerable contact is likely, wear impervious neoprene or PVC rubber clothing or acid suit.

Personal Protective Equipment: Respiratory
If airborne concentrations are above the applicable exposure limits, use NIOSH approved respiratory protection.

Personal Protective Equipment: General
Eye wash fountain and emergency showers are recommended.

** Section 9 - Physical & Chemical Properties **
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Material Name: Zaclon Galvanizing Fluxes (K;F;C;CS)

Appearance: White to off-white granular or fine particle

Odor: None

Physical State: Solid

Vapor Pressure: Nil

Boiling Point: Decomposes

Solubility (H2O): ND

Evaporation Rate: 0

Octanol/H2O Coeff.: ND

Flash Point Method: NA

Lower Flammability Limit (LFL): NA

Auto Ignition: NA

pH: ND

Vapor Density: NA

Melting Point: ~343°C (~650°F)

Specific Gravity: 67 lb/cuft3

VOC: ND

Flash Point: NA

Upper Flammability Limit (UFL): NA

Burning Rate: NA

*** Section 10 - Chemical Stability & Reactivity Information ***

Chemical Stability
This is a stable material.

Chemical Stability: Conditions to Avoid
None

Incompatibility
Incompatible with cyanides and sulfides (may release toxic gases).

Hazardous Decomposition
At high temperatures, (~343°C; ~650°F) as in intended use, ammonium chloride fumes, zinc oxide fumes, zinc chloride fumes, and ammonia and hydrogen chloride gases may be released.

Possibility of Hazardous Reactions
Will not occur.

*** Section 11 - Toxicological Information ***

Acute Dose Effects
A: General Product Information
The product is corrosive to the eyes and corrosive or irritating to skin. Toxic effects described in animals from short exposures include corrosion of mucosal surfaces, liver effects, and kidney effects. Toxic effects in animals occurring only with inhalation exposures are lower respiratory infection with pulmonary edema. Tests in bacterial or mammalian cell cultures demonstrate mutagenic activity. Tests in some animals indicate that the compound may have embryotoxic activity.

Human health effects of overexposure by inhalation, ingestion, or skin or eye contact may initially include: eye irritation with discomfort, tearing, or blurring of vision; skin irritation with discomfort or rash; or irritation of the upper respiratory passages. Higher exposures may lead to these effects: skin and eye burns or ulceration; temporary lung irritation effects with cough, discomfort, difficulty breathing, or shortness of breath; possibly modest initial symptoms, followed in hours by severe shortness of breath, requiring prompt medical attention; fatality from gross overexposure by fume inhalation or by significant ingestion. There are inconclusive or unverified reports of human sensitization. Individuals with preexisting diseases of the lungs may have increased susceptibility to the toxicity of excessive exposures.

When the Zaclon® products are heated to high temperatures as those encountered in the galvanizing process, irritating zinc chloride fumes and gaseous hydrogen chloride may be released. Severe exposures may cause pulmonary edema. Heating may also release zinc oxide fumes which may cause metal fume fever.

B: Component Analysis - LD50/LC50
Ammonium chloride (12125-02-9)
Oral LD50 Rat 1410 mg/kg

Zinc chloride (7646-85-7)
Oral LD50 Rat 350 mg/kg
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Carcinogenicity

Component Carcinogenicity
None of this product’s components are listed by ACGIH, IARC, OSHA, NIOSH, or NTP.

*** Section 12 - Ecological Information ***

Ecotoxicity

A: General Product Information
No information available for the product.

B: Component Analysis - Ecotoxicity - Aquatic Toxicity
Ammonium chloride (12125-02-9)
Test & Species | Conditions
--- | ---
24 Hr LC50 Lepomis macrochirus | 725 mg/L
96 Hr LC50 Cyprinus carpio | 209 mg/L [static]
24 Hr LC50 Daphnia magna | 202 mg/L

*** Section 13 - Disposal Considerations ***

US EPA Waste Number & Descriptions

Component Waste Numbers
No EPA Waste Numbers are applicable for this product’s components.

Disposal Instructions
All wastes must be handled in accordance with local, state and federal regulations. See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment recommendations.

*** Section 14 - Transportation Information ***

US DOT Information
Shipping Name: Zinc Chloride, anhydrous, mixture
UN/NA #: 2331 Hazard Class: 8 Packing Group: III

*** Section 15 - Regulatory Information ***

US Federal Regulations

Component Analysis
This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4).

Ammonium chloride (12125-02-9)
CERCLA: 5000 lb final RQ; 2270 kg final RQ

Zinc chloride (7646-85-7)
CERCLA: 1000 lb final RQ; 454 kg final RQ

State Regulations

Component Analysis - State
The following components appear on one or more of the following state hazardous substances lists:

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS</th>
<th>CA</th>
<th>MA</th>
<th>MN</th>
<th>NJ</th>
<th>PA</th>
<th>RI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonium chloride</td>
<td>12125-02-9</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Zinc chloride</td>
<td>7646-85-7</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
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Component Analysis - WHMIS IDL

The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS #</th>
<th>Minimum Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonium chloride</td>
<td>12125-02-9</td>
<td>1 %</td>
</tr>
<tr>
<td>Zinc chloride</td>
<td>7646-85-7</td>
<td>1 %</td>
</tr>
</tbody>
</table>

Additional Regulatory Information

Component Analysis - Inventory

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS #</th>
<th>TSCA</th>
<th>CAN</th>
<th>EEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonium chloride</td>
<td>12125-02-9</td>
<td>Yes</td>
<td>DSL</td>
<td>EINECS</td>
</tr>
<tr>
<td>Zinc chloride</td>
<td>7646-85-7</td>
<td>Yes</td>
<td>DSL</td>
<td>EINECS</td>
</tr>
</tbody>
</table>

*** Section 16 - Other Information ***

Other Information

The information herein is presented in good faith and believed to be accurate as of the effective date given. However, no warranty, expressed or implied, is given. It is the buyer's responsibility to ensure that its activities comply with Federal, State or provincial, and local laws.

Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act; ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; NJTSR = New Jersey Trade Secret Registry.