SAFETY DATA SHEET

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier
REILLINE* 4035

Synonyms:
PVNO; Poly Vinyl Pyridine-N-Oxide, 35%

Chemical Abstracts Registry No:
Mixture

REACH Registration Number:
Polymer - exempt from registration. 4-Vinylpyridine monomer has been registered (01-2119970566-26-0000).

1.2. Relevant identified uses of the substance or mixture and uses advised against
Dye transfer inhibitor

1.3. Details of the supplier of the safety data sheet

Vertellus Integrated Pyridines LLC
201 North Illinois Street, Suite 1800
Indianapolis, Indiana 46204 USA
1-317-247-8141
e-mail Address: sds@vertellus.com

1.4. Emergency telephone number
Vertellus: 1-317-247-8141
CHEMTREC (USA): 1-800-424-9300 (collect calls accepted)
CHEMTREC (International): 1-703-527-3887 (collect calls accepted)
NRCC (China): +86 532 83889090

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture
Not classified as hazardous under this directive. Symbol: Not classified as hazardous under this directive.
Risk Phrases: Not applicable.
Safety Phrases: Not applicable.

2.2. Label elements

Hazard Symbols (Pictogram): Not applicable.
Signal Word: Not applicable.
Hazard Precautions: Not classified as hazardous under this directive.
Prevention Precautionary
Statements:
Note: These precautionary statements are not prescribed by directive 1272/2008 as this product is not classified as hazardous under this directive. Wash hands thoroughly after handling with soap and water. Wear protective gloves, protective clothing, eye protection and face protection. If swallowed, in eyes, on skin or inhaled call a poison center or doctor/physician if you feel unwell. If inhaled, remove victim to fresh air and keep at rest in a comfortable position for breathing. Take off contaminated clothing before reuse. Store in a well-ventilated place. Keep container tightly closed.

First Aid Precautionary Statements:
Not required.
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Storage Precautionary Statements: Not required.

Disposal Precautionary Statements: Not required.

2.3. Other hazards
Mixture Statement: Mixture - 0% of this mixture consists of ingredient(s) of unknown acute toxicity.

SECTION 3: Composition/information on ingredients

3.1. Substances or 3.2. Mixtures

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>CAS Number</th>
<th>Concentration (weight %)</th>
<th>EC Number</th>
<th>CLP Inventory/Annex VI</th>
<th>EU DSD Classification (67/548/EEC)</th>
<th>EU CLP Classification (1272/2008)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>7732-18-5</td>
<td>approx 60</td>
<td>231-791-2</td>
<td>Not listed.</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Poly-4-Vinylpyridine-N-Oxide</td>
<td>58984-27-3</td>
<td>approx 35</td>
<td>Polymer</td>
<td>Not listed.</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Isonicotinic Acid-N-Oxide</td>
<td>13602-12-5</td>
<td>&lt; 4</td>
<td>237-086-6</td>
<td>Not listed.</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Sodium Sulfate (as residue on ignition)</td>
<td>7757-82-6</td>
<td>&lt; 3.5</td>
<td>231-820-9</td>
<td>Not listed.</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
</tr>
</tbody>
</table>

NOTE: See Section 8 for exposure limit data for these ingredients. See Section 15 for trade secret information (where applicable). See Section 16 for the full text of the R-phrases above.

SECTION 4: First aid measures

4.1. Description of first aid measures

Skin Contact: Wash exposed area twice with soap and water. The exposed area should be examined by medical personnel if irritation or pain persists after the area has been washed.

Eye Contact: Immediately flush eyes with plenty of water. Get medical attention, if irritation persists.

Inhalation: If symptoms of respiratory irritation are experienced, remove source of contamination or move victim to fresh air and obtain medical advice.

Ingestion: If swallowed, contact physician or poison control center immediately. Give oxygen if respiration is shallow. GET MEDICAL ATTENTION. Do not give anything by mouth to an unconscious person.

4.2 Most important symptoms and effects, both acute and delayed

Acute: PVNO may cause very mild irritation to skin, eyes or respiratory tract in sensitive individuals. No skin sensitization was observed in tests using human volunteers. Although it has been observed that the health effects related to this compound are minimal, as with any chemical, use appropriate precautions during handling.

Delayed Effects: None known.

4.3. Indication of any immediate medical attention and special treatment needed

Note to Physician: Essentially non-hazardous; no adverse effects reported. Treatment should be based on the judgment of the physician in response to the reactions of the patient.

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SECTION 5: Firefighting measures

5.1. Extinguishing media

Appropriate Extinguishing Media: Water fog, foam, carbon dioxide, or dry chemical

5.2. Special hazards arising from the substance or mixture

Hazardous Products of Combustion: Toxic vapors may be released upon thermal decomposition (cyanides, nitrogen oxides, carbon monoxide).
Potential for Dust Explosion: Not applicable.
Special Flammability Hazards: Not applicable.

5.3. Advice for firefighters

Basic Fire Fighting Guidance: Wear self-contained breathing apparatus and full protective clothing (i.e., Bunker gear). Skin and eye contact should be avoided. Normal fire fighting procedures may be used.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Evacuation Procedures: Isolate the hazard area and deny entry to unnecessary and unprotected personnel.
Special Instructions: See Section 8 for personal protective equipment recommendations. Remove all contaminated clothing to prevent further absorption. Decontaminate affected personnel using the first aid procedures in Section 4. Leather shoes that have been saturated must be discarded.

6.2. Environmental precautions

Prevent releases to soils, drains, sewers and waterways.

6.3. Methods and material for containment and cleaning up

Remove all ignition sources. Ventilate the area of spill or leak. Wear protective equipment during clean-up. For small spills, use suitable absorbent material and collect for later disposal. For large spills, the area may require diking to contain the spill. Material can then be collected (e.g., suction) for later disposal. After collection of material, flush area with water. Dispose of the material in accordance with standard practice for disposal of potentially hazardous materials as required by applicable federal, state or local laws.

6.4. Reference to other sections

Refer to section 8 for information on selecting personal protective equipment. Refer to section 13 for information on spilled product, absorbent and clean up material disposal instructions.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for Unique Hazards: Not applicable.
Practices to Minimize Risk: Wear appropriate protective equipment when performing maintenance on contaminated equipment. Wash hands thoroughly before eating or smoking after handling this material. Do not eat, drink or smoke in work areas. Prevent contact with incompatible materials. Avoid spills and keep away from drains. Handle in a manner to prevent generation of aerosols, vapors or dust clouds.
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Special Handling Equipment: Not applicable.

7.2. Conditions for safe storage, including any incompatibilities

| Storage Precautions & Recommendations: | Maintain dry, ventilated conditions for storage. Protect containers against physical damage. |
| Dangerous Incompatibility Reactions: | Avoid strong acids, strong bases, excessive heat and reducing agents. |
| Incompatibilities with Materials of Construction: | None known |

7.3. Specific end use(s)

If a chemical safety assessment has been completed an exposure scenario is attached as an annex to this Safety Data Sheet. Refer to this annex for the specific exposure scenario control parameters for uses identified in subsection 1.2.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

| Occupational Exposure Limit: | Not applicable. |
| Air Monitoring Method: | Not applicable. |

8.2. Exposure controls

Also see the annex to this SDS (if applicable) for specific exposure scenario controls.

| Other Engineering Controls: | All operations should be conducted in well-ventilated conditions. Local exhaust ventilation should be provided. |
| Personal Protective Equipment: | Where overexposures are a concern, use NIOSH-approved chemical cartridge respirator or supplied-air breathing equipment as necessary. Chemical goggles, faceshield, impervious clothing and boots, if conditions necessitate. Neoprene, nitrile or PVC-coated gloves (Standard EN 374). Safety glasses or chemical goggles (Standard EN166). Chemical resistant clothing (Standard EN368). |
| Thermal Hazards: | Not applicable. |
| Environmental Exposure Controls: | The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. |

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

| Appearance, State & Odor (ambient temperature): | Clear yellow liquid with a mild odor |
| Molecular Formula: | (C7H7NO)x |
| Molecular Weight: | Polymer |
| Vapor Pressure: | No data available. |
| Evaporation Rate: | No data available. |

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Specific Gravity or Density: 1.15 g/mL
Boiling Point: 105°C @ 760 mm Hg (estimated)
Solubility in Water: freely soluble
pH: 4 to 5
Viscosity: No data available.
Flash Point and Method: > 200°F (> 93°C)
Flammability (solid, gas): Not applicable.

Vapor Density (air = 1): No data available.
Freezing / Melting Point: -4°C
Octanol / Water Coefficient: No data available.
Odor Threshold: No data available.
Autoignition Temperature: No data available.
Flammable Limits: No data available.
Decomposition Temperature: No data available.
Oxidizing Properties: No data available.

SECTION 10: Stability and reactivity

10.1. Reactivity
Not classified as dangerously reactive.

10.2. Chemical stability
Stable

10.3. Possibility of hazardous reactions
Will not occur.

10.4. Conditions to avoid
Not applicable.

10.5. Incompatible materials
Avoid strong acids, strong bases, excessive heat and reducing agents.

10.6. Hazardous decomposition products
none known

SECTION 11: Toxicological information

11.1. Information on toxicological effects
Acute Oral LD₅₀: > 2000 mg/kg (rat) Poly-4-Vinylpyridine-N-Oxide
Acute Dermal LD₅₀: > 2000 mg/kg (rat) Poly-4-Vinylpyridine-N-Oxide
Acute Inhalation LC₅₀: No data available.
Skin Irritation: Mildly irritating to skin.
Eye Irritation: Non-irritating to eyes.
Skin Sensitization: Negative in Human Repeat Insult Patch test.
Mutagenicity: Both the Ames Test and the E. coli WP2 mutagenicity assay were conducted. No positive responses were observed in the mutagenicity and confirmatory assays.
Reproductive / Developmental Toxicity: Feral female rats were dosed at 1000 mg/kg IM during days 1-17 of gestation, and another group was exposed to aerosol concentrations of 51 mg/m³ for first 20 days of gestation for 1 hour. There were no effects on embryonal development, duration of pregnancy, fertility or vitality of offspring. Male feral rats and mice were dosed a 1000 mg/kg, IV and IM for 5 days/week for 2 weeks. Another group was exposed to aerosol concentrations of 58 mg/m³ for 1 hr/day, 5 days/week for 8 months. In both groups, there
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was no indication of male gonadal effects, regardless of route of administration. No changes were detected in the dominant lethal mutagenesis test, regardless of route of administration.

Carcinogenicity:
In a 28-day oral gavage study in male and female rats, no test material-related changes were found in antemortem observations, body weight, body weight gain, food consumption, or clinical pathology except for increased urinary sodium concentration and excretion in the high dose group (2500 mg/kg). Histopathologic changes were noted for males only, in the kidney and spleen. Kidney effects were tubular degeneration with hyaline droplet formation at the high dose. Hyaline droplet formation only was observed at the mid and low dose groups. Splenic effects were increased extramedullary hematopoiesis in all males. The incidence and severity was greater in treated versus control animals. Among the treated groups, no dose-response relationship was observed. There were no changes in hematologic parameters, bone marrow histopathology, or spleen weights; therefore, the effect of extramedullary hematopoiesis is considered not to be biologically meaningful. An alpha2µ -globulin study showed that alpha2µ -globulin accumulated in the male rat kidney following administration, when dosed at 2500 mg/kg/d for 3 days.

Target Organs: No data available.
Primary Route(s) of Exposure: Skin contact, Eye contact. Ingestion is not likely to be a primary route of exposure.
Most important symptoms and effects, both acute and delayed PVNO may cause very mild irritation to skin, eyes or respiratory tract in sensitive individuals. No skin sensitization was observed in tests using human volunteers. Although it has been observed that the health effects related to this compound are minimal, as with any chemical, use appropriate precautions during handling. Delayed Effects: None known.
Additive or Synergistic effects: None known.
Additional Toxicity Information: Not applicable.

SECTION 12: Ecological information

12.1. Toxicity
| LC_{50} (96h) | Brachdani rio rerio (Zebra fish) > 1000 mg/L | Poly-4-Vinylpyridine-N-Oxide |
| LC_{50} (48h) | Daphnia magna > 1000 mg/L |
| EC_{50} (72h) | Scenedesmus subspicatus = 2800 mg/L |

12.2. Persistence and degradability
Continuous activated sludge testing showed average DOC removal over 29 days was 8%. In carbon dioxide production tests with unacclimated sludge, the theoretical carbon dioxide production ranged from 6 to 11% and DOC loss 2 to 7%. These data suggest that PVNO is not ready biodegradable.

12.3. Bioaccumulative potential
No data available

12.4. Mobility in soil
No data available

12.5. Results of PBT and vPvB assessment
No data available.

12.6. Other adverse effects
No data available.

SECTION 13: Disposal considerations

13.1. Waste treatment methods
| US EPA Waste Number: | Not applicable |
| Waste Classification: (per US regulations) | Non-Hazardous |
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Waste Disposal: NOTE: Generator is responsible for proper waste characterization. State hazardous waste regulations may differ substantially from federal regulations. Dispose of this material responsibly, and in accordance with standard practice for disposal of potentially hazardous materials as required by applicable international, national, regional, state or local laws, and environmental protection duty of care principles. Do NOT dump into any sewers, on the ground, or into any body of water. For disposal within the EC, the appropriate classification code according to the European Community List of Wastes should be used. Note that disposal regulations may also apply to empty containers and equipment rinsates.

SECTION 14: Transport information

The following information applies to all shipping modes (DOT/IATA/ICAO/IMDG/ADR/RID/ADN), unless otherwise indicated:

14.1. UN number Not applicable
14.2. UN proper shipping name Chemicals, n.o.s. (Poly Vinyl Pyridine-N-Oxide)
14.3. Transport hazard class(es) Not applicable
14.4. Packing group Not applicable
14.5. Environmental hazards Not applicable
14.6. Special precautions for user Not applicable
NA Emergency Guidebook Numbers: Not applicable
IMDG EMS: Not applicable
14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code Not applicable.

SECTION 15: Regulatory information

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

Chemical Inventory Lists: Status:
USA TSCA: Listed
Canada(DSL/NDSL): DSL
Korea: 2003-3-2289
China: Listed
Taiwan: Listed
EINECS: Polymer (monomer listed)
Japan: Listed
Australia: Listed
Philippines: Not listed.
New Zealand: Listed
WHMIS Classification: Not Classified as Hazardous
German Water Hazard Classification: ID Number 286, hazard class 1 - hazard to waters (self classification)
SARA 313: Not applicable.
Reportable Quantities: Not applicable.
State Regulations: Not applicable.
Other Regulatory Listings: Not applicable.
HMIS:
  HEALTH 1
  FLAMMABILITY 0
  REACTIVITY 0
NFPA:
1 0 0

15.2. Chemical safety assessment

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A chemical safety assessment has been performed for the monomers making up this polymer. However, given that the monomers are not present in this polymer product, the risk assessment and precautions for the monomers are not applicable to this polymeric substance. Contact REACH@Vertellus.com with any questions.
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SECTION 16: Other information

Full text of R phrases in Section 3: Not applicable.
Classification Method: On basis of test data
Training Advice: Not applicable.

Legend of Abbreviations:

- ACGIH = American Conference on Governmental Industrial Hygienists.
- CAS = Chemical Abstracts Service.
- DSL/NDSL = Domestic Substances List/Non-Domestic Substances List.
- EC = European Community.
- EINECS = European Inventory of Existing Commercial Chemical Substances.
- ELINCS = European List of Notified Chemical Substances.
- EU = European Union.
- GHS = Globally Harmonized System.
- LC = Lethal Concentration.
- LD = Lethal Dose.
- NIOSH = National Institute of Occupational Safety and Health.
- NTP = National Toxicology Program.
- OSHA = Occupational Safety and Health Administration.
- PEL = Permissible Exposure Limit.
- RQ = Reportable Quantity.
- TLV = Threshold Limit Value.

Important Note: Please note that the information contained herein is furnished without warranty of any kind. Users should consider these data only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use and disposal of these materials and the safety and health of employees and customers. Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable to their circumstances. The information contained herein may change without prior notice. THIS SAFETY DATA SHEET SUPERSEDES ALL PREVIOUS EDITIONS.

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Issued by: Regulatory Management Department
Revision Details: Revised format

Original Date of Issue: 21 February 1997
Email: SDS@Vertellus.com

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