

SAFETY DATA SHEET

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

1.1. Product identifier

4-Vinylpyridine

Synonyms: 4-VP; 4-Ethenylpyridine; Pyridine, 4-ethenyl-

Chemical Abstracts Registry No: 100-43-6

REACH Registration Number: 01-2119970566-26-0000

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

chemical intermediate under strictly controlled conditions
monomer

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

Only Representative for EU REACH Registration:

Vertellus Specialties UK Ltd.
Seal Sands Road, Seal Sands
Middlesbrough, TS2 1UB
England
Phone: +44 1642 546 546

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 25 85477110

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture (According to Regulation (EC) No 1272/2008, 29 CFR 1910.1200 and the Globally Harmonized System)

Serious Eye Damage Category 1
Environmental Chronic Category 2
EUH071 - Corrosive to the respiratory tract.
Acute Toxicity Inhalation Dust / Mist Category 3
Acute Toxicity Dermal Category 3
Acute Toxicity Oral Category 3
Flammable Liquids Category 3
Skin Corrosion Category 1B
Skin Sensitization Category 1

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2.2. Label elements

Hazard Symbols (Pictogram):



Signal Word:

Danger

Hazard Precautions:

H226 - Flammable liquid and vapour.
 H301+H311+H331 - Toxic if swallowed, in contact with skin or if inhaled.
 H314 - Causes severe skin burns and eye damage.
 H317 - May cause an allergic skin reaction.
 H411 - Toxic to aquatic life with long lasting effects.
 EUH071 - Corrosive to the respiratory tract.

Prevention Precautionary Statements:

P210 - Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
 P280 - Wear protective gloves/protective clothing/eye protection/face protection.
 P261 - Avoid breathing dust/fume/gas/mist/vapours/spray.
 P273 - Avoid release to the environment.
 P240 - Ground/bond container and receiving equipment.
 P241 - Use explosion-proof electrical/ventilating/lighting/telecommunication/computer/ equipment.
 P242 - Use only non-sparking tools.
 P243 - Take precautionary measures against static discharge.
 P270 - Do not eat, drink or smoke when using this product.

First Aid Precautionary Statements:

P301+P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
 P303+P361+P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
 P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
 P304+P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
 P301+P330+P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
 P333+P313 - If skin irritation or rash occurs: Get medical advice/attention.
 P363 - Wash contaminated clothing before reuse.
 P391 - Collect spillage.
 P302+P352 - IF ON SKIN: Wash with plenty of soap and water.

2.3. Other hazards

Other Hazards:

Not applicable.

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SECTION 3: Composition/information on ingredients

3.1. Substances or 3.2. Mixtures

Ingredient	CAS Number	Concentration (weight %)	EC Number	CLP Inventory/ Annex VI	EU CLP Classification (1272/2008)
4-Vinylpyridine	100-43-6	~ 100	202-852-0	Not applicable.	Acute Tox. 3; H311 Acute Tox. 3; H331 Acute Tox. 3; H301 Flam. Liq. 3; H226 Skin Corr. 1B; H314 Skin Sens. 1; H317 Aquatic Chronic 2; H411

NOTE: See Section 8 for exposure limit data for these ingredients. See Section 15 for trade secret information (where applicable).

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. Vinegar may be used to ease irritation and to neutralize any remaining material after the area has been washed.
Eye Contact:	Rinse eyes immediately with large amounts of water for at least 15 minutes, occasionally lifting the eyelids. GET MEDICAL ATTENTION. Continue to rinse until medical personnel arrive. Do not put vinegar in eyes.
Inhalation:	Remove from exposure area to fresh air immediately. If breathing has stopped, give artificial respiration. Keep affected person warm and at rest. GET MEDICAL ATTENTION.
Ingestion:	Do NOT induce vomiting, this material is corrosive. GET MEDICAL ATTENTION IMMEDIATELY due to the corrosion potential of this material.

4.2 Most important symptoms and effects, both acute and delayed

Acute:	Vapors of 4-Vinylpyridine are irritating to the respiratory tract. The material is readily absorbed from the gastrointestinal tract, the skin, and the respiratory tract. 4-VP is considered corrosive to skin and possibly a skin sensitizer. Extended exposure (e.g., from saturated clothing) may lead to irritation, skin burns and/or systemic poisoning.
Delayed Effects:	Due to the corrosive nature of this material, burns are likely to occur. Ongoing contact with contaminated clothing may cause burns to appear after an extended exposure period.

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

Note to Physician:	No specific indications. 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 spray, water fog, alcohol-resistant foam, carbon dioxide, dry chemical.
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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.
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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 (eg., 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:	If polymerization occurs, the possibility of explosive rupturing exists.
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.
Special Handling Equipment:	Not applicable.

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7.2. Conditions for safe storage, including any incompatibilities

Storage Precautions & Recommendations:	Maintain dry, ventilated conditions for storage. Protect containers against physical damage. Outside or detached storage is preferable. Inside storage should be in standard flammable liquids storage room or cabinet. Keep away from strong acids and oxidizing agents. It is recommended that the material be stored below -10°C (14°F) in a dry environment to preserve product quality. Product should be periodically inspected.
Dangerous Incompatibility Reactions:	Strong acids, oxidizers, elevated temperatures, polymerization initiators (i.e., alkali metal - graphite composites, peroxides, etc.)
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 required

Derived No Effect Levels (DNELs) – Workers:

Route	DNEL
Acute - systemic effects (dermal)	0.39 mg/kg/day
Acute - systemic effects (inhalation)	1.05 mg/m ³
Long-term - systemic effects (dermal)	0.13 mg/kg/day
Long-term - systemic effects (inhalation)	0.35 mg/m ³
Acute and long-term - local effects (dermal, inhalation)	Qualitative assessment - skin / eye / respiratory irritant

Derived No Effect Levels (DNELs) – General Population:

Route	DNEL
Acute - systemic effects (oral, dermal)	Qualitative assessment - skin / eye / respiratory irritant. No applications involving general population.
Acute - systemic effects (inhalation)	
Long-term - systemic effects (dermal)	
Long-term - systemic effects (inhalation)	
Long-term - systemic effects (oral)	
Acute and long-term - local effects (dermal, inhalation)	

Predicted No Effect Concentrations (PNECs):

Route	PNEC
PNEC aqua (freshwater)	0.0001 mg/L
PNEC aqua (marine water)	0.0001 mg/L.
PNEC aqua (intermittent releases)	0.01 mg/L
PNEC aqua (STP)	0.9 mg/L
PNEC sediment (freshwater)	0.026 mg/kg sediment
PNEC sediment (marine water)	0.0026 mg/kg sediment
PNEC soil	0.0028 mg/kg soil

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PNEC oral (wildlife exposures)	Derivation waived - no potential for bioaccumulation
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8.2. Exposure controls

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

Intermediate Status:	Where the substance has been registered as an isolated intermediate (on-site or transported), this safety data sheet is consistent with the specific conditions relied on to justify the registration in accordance with Article 17 or 18 of regulation (EC) No 1907/2006.
Other Engineering Controls:	All operations should be conducted in well-ventilated conditions. Local exhaust ventilation should be provided.
Personal Protective Equipment:	NIOSH-approved chemical cartridge respirator or supplied-air breathing equipment as necessary. Chemical goggles should be worn at all times; use face shields as conditions warrant. Neoprene, nitrile, or PVC-coated gloves. Impervious clothing and boots.
Respirator Caution:	Observe OSHA regulations for respirator use (29 CFR 1910.134). Air-purifying respirators must not be used in oxygen-deficient atmospheres.
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 to dark brown liquid with a strong, disagreeable odor		
Vapor Pressure:	1.71 mm Hg @ 25°C	Evaporation Rate:	No data available.
Specific Gravity or Density:	0.98 g/mL @ 20°C	Vapor Density (air = 1):	No data available.
Boiling Point:	171 °C @ 760 mm Hg	Freezing / Melting Point:	< -20 °C
Solubility in Water:	29.1 g/L at 20°C	Octanol / Water Coefficient:	log Kow = 1.36
pH:	No data available.	Odor Threshold:	No data available.
Viscosity:	< 3 cPa @ 20°C	Autoignition Temperature:	460°C
Flash Point and Method:	126°F (52°C) Closed Cup	Flammable Limits:	0.99% (LEL) –8.45% (UEL)
Flammability (solid, gas):	Flammable Liquid	Decomposition Temperature:	No data available.
Explosive Properties:	Not explosive.	Oxidizing Properties:	Not an oxidizer.

9.2. Other information

Not applicable.

SECTION 10: Stability and reactivity

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<u>10.1. Reactivity</u>	Not classified as dangerously reactive.
<u>10.2. Chemical stability</u>	Hazardous polymerization may occur.
<u>10.3. Possibility of hazardous reactions</u>	Self-accelerated decomposition/polymerization temperature (SADT/SAPT) testing has been performed on 4-vinylpyridine. All packaging options (< 210 kg) for 4-vinylpyridine were tested, and all had a SADT/SAPT higher than 55°C. 4-Vinylpyridine in bulk (20,000 liter tank) has a SADT/SAPT greater than 45°C.
<u>10.4. Conditions to avoid</u>	Allowing the material to heat uncontrollably or to absorb water and/or impurities can promote autopolymerization into vinylpyridine polymer. It is recommended that the material be stored below -10°C (14°F) in a dry environment to preserve product quality.
<u>10.5. Incompatible materials</u>	Strong acids, oxidizers, elevated temperatures, polymerization initiators (i.e., alkali metal - graphite composites, peroxides, etc.)
<u>10.6. Hazardous decomposition products</u>	Toxic vapors may be released upon thermal decomposition (cyanides, nitrogen oxides, carbon monoxide).

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute Oral LD₅₀:	LD50 (rat) 100 - 200 mg/kg LD50 (rabbit) = 200 - 400 mg/kg	Trochimowicz 1982
Acute Dermal LD₅₀:	LD50 (guinea pig) < 500 mg/kg	Trochimowicz 1982
Acute Inhalation LC₅₀:	LC50 (4h) (rat) = 1000 - 2000 ppm	Trochimowicz 1982
Skin Irritation:	Corrosive to skin.	
Eye Irritation:	Corrosive to eyes.	
Skin Sensitization:	Positive for sensitizing effects in guinea pig maximization test	
Mutagenicity:	In vitro genotoxicity testing results suggest that 4-Vinylpyridine is not mutagenic. No conclusion can be drawn on clastogenicity results due to lack of control of cytotoxicity. The vinylpyridines do not act as tumorigens in vivo. The negative (inactive) in vitro mutagenicity results are consistent with negative (non-carcinogen) bioassay results. The weight of evidence is that 4-vinylpyridine is not mutagenic.	
Reproductive / Developmental Toxicity:	4-Vinylpyridine has been studied in a validated QSAR and found to be inactive for reproductive toxicity (not a reproductive toxicant). When a structural analogue (2-Vinylpyridine) was studied in a 90-day repeated dose toxicity study, there was no evidence of toxicity to reproductive organs at doses causing systemic toxicity. [Vlaovic 1984]	
Carcinogenicity:	4-Vinylpyridine was investigated in a mouse lung adenoma model (20-week exposure via intraperitoneal route) and found not to induce lung tumors. [Brunnemann 1992]	
Target Organs:	Several repeated dose oral toxicity studies on 2-Vinylpyridine (a close analogue of 4-Vinylpyridine) in rats are available which suggest a systemic NOAEL between 20 and 50 mg/kg bw/day. There is no evidence of specific target organ toxicity; rather only signs of generalized toxicity such as changes in food consumption, altered body weight gain, and changes in relative organ weights. Concerning local effects, 2VP displayed corrosive effects at the portal of entry, the non-glandular stomach. The LOAEL for this effect was 20 mg/kg bw/day in the 90-day study. [Vlaovic 1984]	
Aspiration Hazard:	Not applicable	
Primary Route(s) of Exposure:	Skin contact and absorption, eye contact, and inhalation. Ingestion is not likely to be a primary route of exposure.	

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Most important symptoms and effects, both acute and delayed

Vapors of 4-Vinylpyridine are irritating to the respiratory tract. The material is readily absorbed from the gastrointestinal tract, the skin, and the respiratory tract. 4-VP is considered corrosive to skin and possibly a skin sensitizer. Extended exposure (e.g., from saturated clothing) may lead to irritation, skin burns and/or systemic poisoning. Delayed Effects: Due to the corrosive nature of this material, burns are likely to occur. Ongoing contact with contaminated clothing may cause burns to appear after an extended exposure period.

Additive or Synergistic effects:

None known.

SECTION 12: Ecological information

12.1. Toxicity

LC50(96h) *Oryzias latipes* (Medaka) = 1.04 mg/L Japan MITI 2007
LC50 (48h) *Oryzias latipes* (Medaka) = 1.57 mg/L
EC50 (48h) *Daphnia magna* = 1.17 mg/L
EC50 (72h) *Pseudokirchneriella subcapitata* (algae) = 4.55 mg/L
NOEC (72-hr) *Pseudokirchneriella subcapitata* (algae) = 0.86 mg/L

12.2. Persistence and degradability

The substance 4-Vinylpyridine has not been demonstrated to be readily biodegradable, indicating the potential for persistence. [Japan MITI 1981] Biodegradability testing indicates that 4-Vinylpyridine is not readily biodegradable. A model prediction [BIOWIN, US EPA] based on chemical structure also indicates that 4-Vinylpyridine is not readily biodegradable, while indicating some primary degradability.

12.3. Bioaccumulative potential

The bioconcentration factor (BCF) for 4-Vinylpyridine was determined in a fish bioconcentration study. The measured BCF values ranged from 58 to 96 at a nominal concentration of 20 ug/L, from 48 to 96 at a nominal concentration of 2 ug/L. Each of the BCF values is under 100, the criterion for consideration of bioaccumulation in aquatic species. Therefore, the bioaccumulation of 4-Vinylpyridine is not of concern.

12.4. Mobility in soil

This material is expected to have high mobility in soil. It absorbs weakly to most soil types.

12.5. Results of PBT and vPvB assessment

This substance is not a PBT or vPvB.
Substance is not bioaccumulative.

12.6. Other adverse effects

No data available.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

US EPA Waste Number: D001
Waste Classification: (per US regulations) Ignitable.
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

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

14.1. UN number	UN3073	14.2. UN proper shipping name	Vinylpyridines, stabilized
14.3. Transport hazard class(es)	6.1(3,8)	14.4. Packing group	PG II
14.5. Environmental hazards	Hazardous to the environment / Marine pollutant		
14.6. Special precautions for user	Tunnel restriction code (ADR) : D/E		
NA Emergency Guidebook Numbers:	131P	IMDG EMS:	S-C; F-E
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	EINECS:	202-852-0
Canada(DSL/NDSL):	DSL	Japan:	(5)-717
Korea:	KE-35388	Australia:	Listed
China:	Listed	Philippines:	Listed
Taiwan:	Listed	New Zealand:	Listed
German Water Hazard Classification:	WGK 3 ((self-assessment))		
SARA 313:	Not applicable.		
Reportable Quantities:	Not applicable.		
State Regulations:	Not applicable.		

HMIS IV:

HEALTH	3
FLAMMABILITY	2
PHYSICAL HAZARD	1

NFPA:



15.2. Chemical safety assessment

A chemical safety assessment has been prepared for this product.

SECTION 16: Other information

Key Data Sources:

- **[Brunnemann 1992]** Brunnemann, K. D., A. Rivenson, S. C. Cheng, V. Saa and D. Hoffmann (1992). A study of tobacco carcinogenesis XLVII. Bioassays of vinylpyridines for genotoxicity and for tumorigenicity in A/J mice. *Cancer Letters* **65**: 107-113. Testing laboratory: American Health Foundation.
- **[Japan MITI 1981]** Japan Ministry of International Trade and Industry (1981). Degradation Test Report. Testing laboratory: Chemical Bio-testing Center, Chemicals Inspection and Testing Institute, Japan. Report date: 1981-03-04.
- **[Japan MITI 2007a]** Japan Ministry of the Environment (2007a). 4-Vinylpyridine Acute Toxicity Test on Japanese Killifish (*Oryzias latipes*). Report no.: A070389.

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- **[Japan MITI 2007b]** Japan Ministry of the Environment (2007b). 4-Vinylpyridine Acute Immobilization Test on *Daphnia magna* Straus (*Daphnia magna*). Report no.: A070390.
- **[Japan MITI 2007c]** Japan Ministry of the Environment (2007c). 4-Vinylpyridine Growth Inhibition Test on Algae (*Pseudokirchneriella subcapitata*). Report no.: A070391.
- **[Kimber 1991]** Kimber I and C Weisenberger (1991). Anamnestic responses to contact allergens: application in the murine local lymph node assay. *J. Applied Toxicology*, **11**(2), 129-33.
- **[Kimber 1989]** Kimber I, J Hilton, and C Weisenberger (1989). The murine local lymph node assay for identification of contact allergens: a preliminary evaluation of in situ measurement of lymphocyte proliferation. *Contact Dermatitis* **21**:215-20.
- **[Trochimowicz 1982]** Trochimowicz, Henry J. (1982). *Heterocyclic and Miscellaneous Nitrogen Compounds. Patty's Industrial Hygiene and Toxicology*, 3rd Ed. New York, NY: John Wiley & Sons, pp. 3360-3362.
- **[Turk 1986]** Turk JL, D Parkers, PV Long, JE Bull (1986). Induction of immunologic tolerance: Desensitization to occupational allergens. *J. Allergy Clin Immunol* **78**(5):1082-1085.
- **[Vlaovic 1984]** Vlaovic MS (1984). Subchronic Oral Toxicology of 2-Vinylpyridine. Testing laboratory: Health and Environmental Laboratories. Report no.: 180295A. Study number: TX-84-19. Report date: 1984-08-21, unpublished report..

Classification Method: On basis of test data
Weight of evidence

Legend of Abbreviations:

ACGIH = American Conference on Governmental Industrial Hygienists.

CAS = Chemical Abstracts Service.

CFR = Code of Federal Regulations.

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.

NFPA = National Fire Protection Association.

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.

SARA = Superfund Amendments and Reauthorization Act of 1986.

TLV = Threshold Limit Value.

WHMIS = Workplace Hazardous Materials Information System.

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	Email:	SDS@Vertellus.com
Revision Details:	Changes in sections 7.2, 10.2, 10.3, 10.4, 14.5 and 14.6.		

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Annex 4-Vinylpyridine - Summary of Uses

ES Number	Name	SU	ERC	PROC	PC
1	Production of Polymers	3/8	6c	1,2,3,8a,8b	32

4-Vinylpyridine Exposure Scenario

Note: Guidance below is in addition to that indicated in sections 1-16 of the SDS

ES 1

Title: Production of Polymers

Exposure scenario covering the following

Main Sector of Use Group

- **SU3: Industrial uses: Uses of substances as such or in preparations-at industrial sites**
 - SU8: Manufacture of bulk, large scale chemicals

Process Categories

- PROC 1: Production of Polymers (Use in closed process, no likelihood of exposure)
- PROC 2: Production of Polymers (Use in closed, continuous process with occasional controlled exposure)
- PROC 3: Production of Polymers (Use in closed batch process (synthesis or formulation))
- PROC 8a: Cleaning / maintenance
- PROC 8b: Transfer of substance or preparation (charging/discharging) from / to vessels / large containers at dedicated facilities

Environmental Release Categories

- ERC 6c: Industrial use of monomers for manufacture of thermo-plastics

1. Control of Worker Exposure

Product characteristic

- The material exists only in the liquid form.

Amounts used

- Not relevant for human health risk assessment.

Frequency and duration of use/exposure

Worker exposure per shift:

PROC	ES 1
1	< 8 hours
2	< 8 hours
3	< 8 hours
8b	< 8 hours
8a	< 4hours

Other given operational conditions affecting workers exposure

- The work is performed indoors

Technical conditions and measures at process level (source) to prevent release:

- See Section 7 of SDS

Technical conditions and measures to control dispersion from source towards the worker:

- See Section 7 and 8 of SDS

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- Ventilation:

PROC	General Ventilation	Local Ventilation
1	General (1-3 air changes per hour)	No
2	Enhanced (5-10 air changes per hour)	Yes 90% Efficiency
3	Enhanced (5-10 air changes per hour)	Yes 90% Efficiency
8a	Enhanced (5-10 air changes per hour)	Yes 90% Efficiency
8b	Enhanced (5-10 air changes per hor	Yes 90% Efficiency

Organisational measures to prevent /limit releases, dispersion and exposure:

- See SDS

Conditions and measures related to personal protection, hygiene and health evaluation:

- See sections 7, 8 and 10 of SDS
- Respirators with 90% efficiency assumed for PROCs 3, 8a, 8b
- Gloves with specific activity training, 95% efficiency assumed for all

2. Control of Environmental Exposure

Product characteristics

- The substance is a liquid.

Frequency and duration of use

- Continuous and Intermittent release possible

Environment factors not influenced by risk management

- Default values of 18,000 m³/d for receiving waters are assumed

Other given operational conditions affecting environmental exposure

- Operations are assumed to be indoors
- Production is in closed systems

Technical conditions and measures at process level (source) to prevent release

- See sections 7 and 8 of the SDS

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

Water

- Initial release rate of 3%
- On site waste water treatment with efficiency of 97%
- Discharge to STP: Treatment efficiency assumed 3%
- STP Discharge rate: 2000 m³ / day
- Compliance with local water discharge regulations

Air

- Release rate of 0.2%

Soil

- No release to soil was assumed in the EUSES assessment.

Organizational measures to prevent/limit release from site

- See Sections 6 and 7 of the SDS

Conditions and measures related to municipal sewage treatment plant disposal

- The default STP value of 2000 m³/d was used.

Conditions and measures related to external treatment of waste for disposal

- See section 13 of the SDS
- Onsite WWTP sludge sent offsite for disposal (EU waste code 07 02 11)
- Empty raw material packaging containers (EU waste code: 15 01 10)
- Residual in shipping containers assumed to be <0.1%

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- Observe all regional, state and local environmental regulations

Conditions and measures related to external recovery of waste

- There is no recovery at an external waste treatment site

3. Exposure estimation and reference to its source

The human health risk assessment and the environmental risk assessment were performed using Chesar with ECETOC TRA 3.0.. Tables below summarize the calculated exposures and resulting Risk Characterization Ratios (RCR) at < 1.0. Note the worker exposures in ECETOC TRA are calculated by multiplying the full shift calculations by the following factors:

- > 4 hours: 1
- 1 - 4 hours: 0.6
- 15 minutes to 1 hour: 0.2
- < 15 minutes: 0.1

4. Guidance to DU - Operational conditions and Risk Management Measures

The activities discussed above result in an acceptable exposure if individually performed by an industrial/professional worker, and considering the operational conditions and the risk management measures (RMM) as defined.

The downstream user may re-calculate the RCR values based on variations in the local operational conditions and application of RMM to confirm that operations are within the control limits.

Predicted Exposure Concentrations / Risk Characterization – Environmental

Compartment	Local PEC; ERC 6a	Risk Characterization Ratio RCR
Water: Fresh; mg/L	4.364E-4	0.436
Water: Fresh Sediment; mg/kg	0.011	0.429
Water: Marine; mg/L	4.364E-5	0.436
Water; Marine Sediment; mg/kg	0.001	0.429
Water: STP mg/L	0.004	0.005
Soil: mg/kg	0.002	0.776

Predicted Exposure Concentrations – Worker

Route of exposure: ES 1	PROC 1	PROC 2	PROC 3	PROC 8a	PROC 8b
Inhalation: Acute Systemic: mg/m ³	0.175	0.525	0.158	0.526	0.131
Inhalation: Long Term Local; mg/m ³	Qual	Qual	Qual	Qual	Qual
Inhalation: Long Term Systemic: mg/m ³	0.044	0.131	0.039	0.079	0.033
Dermal: Acute Systemic: mg/kg bw/day	0.034	0.014	0.007	0.069	0.069
Dermal: Long Term Local: mg/cm ²	Qual	Qual	Qual	Qual	Qual
Dermal: Long Term Systemic: mg/kg/bw/day	0.034	0.014	0.007	0.069	0.069

Qual: Qualitative assessment completed to demonstrate control, considering alternate modes and the use of defined Operational Conditions and Risk Management Measures.

SAFETY DATA SHEET

Risk Characterization Ratio – Worker

Route of exposure: ES 1	PROC 1	PROC 2	PROC 3	PROC 8a	PROC 8b
Inhalation: Acute Systemic:	0.167	0.501	0.15	0.501	0.125
Inhalation: Long Term Local;	Qual	Qual	Qual	Qual	Qual
Inhalation: Long Term Systemic:	0.125	0.376	0.113	0.225	0.094
Dermal: Acute Systemic:	0.262	0.105	0.053	0.527	0.527
Dermal: Long Term Local:	Qual	Qual	Qual	Qual	Qual
Dermal: Long Term System:	0.262	0.105	0.053	0.527	0.527
Combined: Long Term Systemic	0.387	0.481	0.166	0.753	0.621
Combined: acute systmic	0.429	0.606	0.203	0.501	0.652

Qual: Qualitative assessment completed to demonstrate control, considering alternate modes and the use of defined Operational Conditions and Risk Management Measures.