

SAFETY DATA SHEET

Nova Molecular Technologies, Inc.



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Tetrahydrofurfuryl Alcohol**1. PRODUCT AND COMPANY IDENTIFICATION**

PRODUCT NAME: Tetrahydrofurfuryl Alcohol
GENERAL USE: Solvent, chemical intermediate.
GENERIC NAME: Tetrahydro-2-furanmethanol; tetrahydro-2-furylmethanol

DISTRIBUTOR

Nova Molecular Technologies, Inc.
 1 Parker Place, Suite 725
 Janesville, WI 53545
 Emergency Phone: 800-445-6682

24 HR. EMERGENCY TELEPHONE NUMBERS

For emergency, spill, leak, fire, exposure or accident, call: CHEMTREC: 1-800-424-9300
Outside the United States, call: 703-527-3887
(collect calls accepted)

2. HAZARDS IDENTIFICATION**GHS CLASSIFICATIONS****Health:**

Acute Toxicity (Oral), Category 4
 Eye Irritant, Category 2A
 Specific Target Organ Toxicity (Single Exposure), Category 3
 Hazard Not Otherwise Classified (Acute Toxicity (Dermal)), Category 5

GHS LABEL

Exclamation
 mark

SIGNAL WORD: WARNING**HAZARD STATEMENTS**

H302: Harmful if swallowed.
 H319: Causes serious eye irritation.
 H227: Combustible liquid.
 H336: May cause drowsiness or dizziness.

PRECAUTIONARY STATEMENT(S)**Prevention:**

P210: Keep away from heat/sparks/open flames/hot surfaces – no smoking. P261: Avoid breathing dust/fume/gas/mist/vapors/spray.
 P264: Wash thoroughly after handling.
 P270: Do not eat, drink or smoke when using this product. P271: Use only outdoors or in a well-ventilated area.
 P280: Wear protective gloves/protective clothing/eye protection/face protection.

Response:

P304+P341: IF INHALED: If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing.
 P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
 P312: Call a POISON CENTER or doctor/physician if you feel unwell.

P330: Rinse mouth.

P337+P313: If eye irritation persists: Get medical advice/attention.

P370+P378: In case of fire: Use a Class B, multipurpose dry chemical, or carbon dioxide fire extinguisher for extinction.

Storage:

P403+P233: Store in a well-ventilated place. Keep container tightly closed.

P403+P235: Store in a well-ventilated place. Keep cool.

P405: Store locked up.

Disposal:

P501: Dispose of contents/container in accordance with local/regional/national/international regulations.

EMERGENCY OVERVIEW

IMMEDIATE CONCERNS: HAZARD DESCRIPTION / WARNING INFORMATION SUMMARY - This product is a combustible liquid. Can cause eye, skin or respiratory tract irritation. May be harmful if inhaled or swallowed. Overexposure can cause central nervous system (CNS) depression and/or other target organ effects.

POTENTIAL HEALTH EFFECTS

EYES: Contact may cause eye irritation.

SKIN: Causes mild skin irritation.

INGESTION: May be harmful if ingested.

INHALATION: Excessive exposure to vapor may cause dizziness, blurred vision, nausea, vomiting or headaches.

REPRODUCTIVE TOXICITY

REPRODUCTIVE EFFECTS: Not Established.

TERATOGENIC EFFECTS: Not Established.

CARCINOGENICITY: This product is not listed as a carcinogen by NTP, IARC or OSHA. See Section 11 of this SDS for more details.

MUTAGENICITY: The results of the Ames *Salmonella typhimurium* test produced negative results for mutagenicity.

MEDICAL CONDITIONS AGGRAVATED: Pre-existing skin disorders may be aggravated by over-exposure to this product. Refer to Section 11 of this SDS.

ROUTES OF ENTRY: Inhalation, skin contact, eye contact, ingestion.

SENSITIZATION: Not Established.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Name	Wt.%	CAS
Tetrahydrofurfuryl Alcohol	>= 98	97-99-4
1,2-Pentanediol	< 2	5343-92-0

4. FIRST AID MEASURES

EYES: Immediately flush with large amounts of water, holding eyelids open, for at least 20 minutes. Repeat if necessary. Remove contact lenses, if present and easy to do. Seek medical assistance if irritation persists.

SKIN: Immediately remove contaminated clothing or shoes, wipe excess from skin and flush with plenty of water for at least 15 minutes. Do not reuse clothing until thoroughly cleaned. Get medical attention.

INGESTION: If large amounts are swallowed, give water to drink. Obtain medical assistance immediately and treat as directed by a medical professional.

INHALATION: Move victim to fresh air. Give artificial respiration if victim is not breathing. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Administer oxygen if breathing is difficult. Get medical attention.

NOTES TO PHYSICIAN: Treat symptomatically. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA:

SMALL FIRE - Dry chemical, CO₂, water spray or regular foam.

LARGE FIRE - Water spray, fog or regular foam. Use water spray or fog; do not use straight streams.

FIRE FIGHTING PROCEDURES: PROTECTIVE ACTIONS TO TAKE DURING FIRE FIGHTING: If material on fire or involved in fire: Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use "alcohol" foam, dry chemical or carbon dioxide.

FIRE FIGHTING EQUIPMENT: PRECAUTIONS FOR FIRE INVOLVING TANKS OR CAR/TRAILER LOADS - Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. Isolate for 800 meters (1/2 mile) in all directions; also consider initial evacuation for 800 meters (1/2 mile) in all directions. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

HAZARDOUS DECOMPOSITION PRODUCTS: Carbon dioxide and carbon monoxide.

6. ACCIDENTAL RELEASE MEASURES

SMALL SPILL: For emergency information and procedures to follow in the case of an accidental release, call the Emergency Telephone Number(s) listed in Section 1 of this SDS. Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions. Do not touch or walk through spilled material. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. A vapor suppressing foam may be used to reduce vapors. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material.

LARGE SPILL: Dike far ahead of liquid spill for later disposal. Consider initial downwind evacuation for at least 800 meters (1/2 mile). Do not release into sewers or waterways.

GENERAL PROCEDURES: MATERIALS & METHODS (EQUIPMENT & TECHNIQUES) FOR CONTAINMENT & CLEANUP - Call Emergency Telephone Number(s) provided in Section 1 of this SDS. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. For a large spill, consider initial downwind evacuation for at least 300 meters (1000 feet). Use clean non-sparking tools to collect absorbed material. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing indicated in Section 8 of this SDS.

RELEASE NOTES: Evacuate to fresh air and ventilate area before reentering. Self-contained breathing apparatus should be utilized when responding to spills or heavy fumes. Remove sources of heat, sparks, flame, impact, friction and electricity and use non-sparking tools and equipment. Contain and recover liquid when possible. Dike spill. Collect liquid in an appropriate container or absorb with an inert material (i.e. vermiculite, dry sand, earth) and place in a chemical waste container. Use water spray to disperse vapors or to flush liquid away from fire exposure.

US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of Reportable Quantities. Comply with all federal, state and local regulations. Prevent liquid from entering waterways or low areas.

SPECIAL PROTECTIVE EQUIPMENT: EMERGENCY & NON-EMERGENCY RESPONDERS - Refer to Section 8 of this SDS for appropriate exposure controls and personal protective equipment (PPE).

7. HANDLING AND STORAGE

GENERAL PROCEDURES: Handle in accordance with good industrial hygiene and safety practices. These practices include but are not limited to avoiding unnecessary exposure and prompt removal of material from eyes, skin and clothing. Do not breathe material. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. If needed, take first aid actions as indicated in Section 4 of this SDS.

HANDLING: Use only with adequate ventilation. Wear appropriate personal protective equipment and use exposure controls as indicated in Section 8 of this SDS. Avoid contact with skin and eyes. Avoid breathing gas. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Do not reuse container. Remove contaminated clothing immediately. Wash with soap and water after working with this product.

STORAGE: Keep in airtight container away from all heat sources. Store in a segregated and approved area. Store in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Keep container in a well-ventilated area. Store away from incompatible materials. Store in the original container or an approved alternative made from compatible material. Do not store in unlabeled containers. Treat empty containers in a similar fashion as residual product may exist. Use appropriate containment to avoid environmental contamination.

STORAGE TEMPERATURE: Store containers in a room at ambient temperature.

STORAGE PRESSURE: Containers should be stored in a room at ambient pressure.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE GUIDELINES

OSHA HAZARDOUS COMPONENTS (29 CFR1910.1200)					
		EXPOSURE LIMITS			
		OSHA PEL		ACGIH TLV	
Chemical Name		ppm	mg/m ³	ppm	mg/m ³
Tetrahydrofurfuryl Alcohol	TWA	N/E	N/E	N/E	N/E
	STEL	N/E	N/E	N/E	N/E
1,2-Pentanediol	TWA	N/E	N/E	N/E	N/E
	STEL	N/E	N/E	N/E	N/E

ENGINEERING CONTROLS: Provide adequate general and local exhaust ventilation to meet exposure limit requirements.

Provide readily accessible eye wash stations and emergency showers. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Employees should be provided with and required to use splash-proof safety goggles and splash shields where there is any possibility of product coming in contact with eyes. Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of contact lenses. Ensure that an eye wash station is operable and nearby.

SKIN: Neoprene coated gloves such as Ansell Scorpio™ or equivalent and additional protection including impervious boots, apron or coveralls, as needed in areas of unusual exposure.

RESPIRATORY: Depending on airborne concentration, use a NIOSH approved respirator with organic vapor cartridges.

Use a positive pressure, air-supplying respirator if there is potential for uncontrolled release, exposure levels are not known or other circumstances where air-purifying respirators may not provide adequate protection.

WORK HYGIENIC PRACTICES: Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Promptly remove contaminated clothing and launder before reuse. Shower after work using plenty of soap and water.

9. PHYSICAL AND CHEMICAL PROPERTIES

ODOR: Mild, characteristic odor.

APPEARANCE: Clear, water white to pale yellow, mobile liquid.

pH: Not Available.

FLASH POINT: 74°C (165°F) Tag Closed Cup (TCC)

FLAMMABLE LIMITS: 1.5% to 9.7%

Notes: Flammable Limits given as percentage volume in air at normal atmospheric temperature and pressure.

AUTOIGNITION TEMPERATURE: 282°C (540°F)

VAPOR PRESSURE: 0.2 mmHg at 20°C (68°F)

VAPOR DENSITY: 3.5 at 1 atm (Air = 1)

BOILING POINT: 178°C (352°F)

FREEZING POINT: 80°C (-112°F)

SOLUBILITY IN WATER: Complete.

SPECIFIC GRAVITY: 1.05

(VOC): 100 %

10. STABILITY AND REACTIVITY**STABLE:** Yes**HAZARDOUS POLYMERIZATION:** No**STABILITY:** This product is anticipated to be stable under normal ambient storage and handling conditions of temperature and pressure. Avoid heat and open flame.**POLYMERIZATION:** This product is not anticipated to cause hazardous reactions or polymerizations under normal ambient storage and handling conditions of temperature and pressure.**CONDITIONS TO AVOID:** Avoid contact with heat, sparks, open flames and elevated temperatures.**HAZARDOUS DECOMPOSITION PRODUCTS:** This product may produce carbon monoxide and carbon dioxide during decomposition.**INCOMPATIBLE MATERIALS:** Oxidizers and strong acids.**11. TOXICOLOGICAL INFORMATION****ACUTE**

Chemical Name	ORAL LD ₅₀ (rat)	DERMAL LD ₅₀ (rabbit)	INHALATION LC ₅₀ (rat)
Tetrahydrofurfuryl Alcohol	1600 mg/kg	5 g/kg (Guinea Pig)	N/E
1,2-Pentanediol	N/E	N/E	N/E

NOTES: This product is moderately irritating to eyes and mucous membranes and mildly irritating to skin. It is harmful when ingested.**EYE EFFECTS:** May cause eye irritation.**SKIN EFFECTS:** May cause mild skin irritation.**SUBCHRONIC:** Subchronic exposures (oral, dermal and inhalation) at relatively high levels have demonstrated system toxicity, reproductive toxicity and CNS depression in either rats, rabbits or dogs. An oral developmental screening study in rats expressed a lower mean fetal body weight at 100 mg/kg day.**CARCINOGENICITY:** This product is not listed as a carcinogen by NTP, IARC, and OSHA.**SENSITIZATION:** Not Established.**NEUROTOXICITY:** Not Established.**GENETIC EFFECTS:** Not Established.**REPRODUCTIVE EFFECTS:** Not Established.**TERATOGENIC EFFECTS:** Not Established.**MUTAGENICITY:** The results of the Ames *Salmonella typhimurium* test produced negative results for mutagenicity.**12. ECOLOGICAL INFORMATION****ENVIRONMENTAL DATA:** Tetrahydrofurfuryl alcohol's production and use as a specialty organic solvent, as a cleaner and paint stripper, and in the dyeing and finishing of textiles and leathers may result in its release to the environment through various waste streams. If released to air, a vapor pressure of 0.80 mmHg at 25°C (77°F) indicates tetrahydrofurfuryl alcohol will exist solely as a vapor in the ambient atmosphere. Vapor-phase tetrahydrofurfuryl alcohol will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 13.4 hours. If released to soil, tetrahydrofurfuryl alcohol is expected to have very high mobility based upon an estimated Koc of 1. Volatilization from moist soil surfaces is not expected to be an important fate process based upon an estimated Henry's Law constant of 4.1 x 10⁻⁹ atm-cu m/mole. Tetrahydrofurfuryl alcohol may volatilize slowly from dry soil surfaces based upon its vapor pressure. If released into water, tetrahydrofurfuryl alcohol is not expected to adsorb to suspended solids and sediment based upon the estimated Koc. Tetrahydrofurfuryl alcohol is readily biodegradable using an adapted activated sludge inoculum in which 96.1% of initial tetrahydrofurfuryl alcohol degraded in 120 hours. Volatilization from water surfaces is not expected to be an important fate

process based upon this compound's estimated Henry's Law constant. An estimated BCF of 3 suggests the potential for

bioconcentration in aquatic organisms is low. Hydrolysis is not expected to occur due to the lack of hydrolyzable functional group. Occupational exposure to tetrahydrofurfuryl alcohol may occur through dermal contact and inhalation of this compound at workplaces where tetrahydrofurfuryl alcohol is produced or used.

BIOACCUMULATION/ACCUMULATION: Tetrahydrofurfuryl alcohol was considered readily biodegradable from the results of a screening test using an adapted activated sludge inoculum in which 96.1% of initial tetrahydrofurfuryl alcohol (based upon COD) was degraded in 120 hours of incubation. Using a respirometric dilution method and sewage inocula, tetrahydrofurfuryl alcohol had a theoretical BOD of 82.9% over a 5-day incubation period.

GENERAL COMMENTS: Any other adverse environmental effects, such as environmental fate (exposure), ozone depletion potential, photochemical ozone creation potential, endocrine disrupting potential, and global warming potential are indicated in this section if data exists. Otherwise, this data has not been established.

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Use material for its intended purpose or recycle if possible. This material, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA under RCRA (40 CFR 261) or other State and local regulations. Measurement of certain physical properties and analysis for regulated components may be necessary to make a correct determination. If this material is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.

EMPTY CONTAINER: Contents should be completely used and containers emptied prior to discard. Large empty containers, such as drums, should be returned to the distributor or a drum reconditioner. To assure proper disposal of small empty containers, consult state and local regulations and disposal authorities.

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)

PROPER SHIPPING NAME: Combustible liquid, n.o.s. (Tetrahydrofurfuryl alcohol)

UN/NA NUMBER: 1993

PACKING GROUP: III

NAERG: 128

MARINE POLLUTANT: Not Listed.

NOTE: Combustible liquids in non-bulk packaging are not regulated by DOT.

15. REGULATORY INFORMATION

UNITED STATES

SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)

311/312 HAZARD CATEGORIES: Fire Hazard. Immediate (Acute) Health Hazard.

FIRE: Yes **PRESSURE GENERATING:** No **REACTIVITY:** No **ACUTE:** Yes **CHRONIC:** No

TSCA (TOXIC SUBSTANCE CONTROL ACT)

Chemical Name	CAS
Tetrahydrofurfuryl Alcohol	97-99-4

STATES WITH SPECIAL REQUIREMENTS

Chemical Name	Requirements
Tetrahydrofurfuryl Alcohol	Massachusetts Hazardous Substance Pennsylvania Hazardous Substance

FIFRA (FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT): Residues of tetrahydrofurfuryl alcohol are exempted from the requirement of a tolerance when used as a solvent or cosolvent in accordance with good agricultural practices as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops or to raw agricultural commodities after harvest.

FDA (FOOD AND DRUG ADMINISTRATION): Tetrahydrofurfuryl alcohol is a food additive permitted for direct addition to

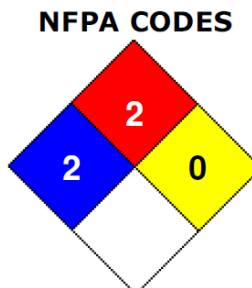
food for human consumption as a synthetic flavoring substance and adjuvant in accordance with the following conditions:

- they are used in the minimum quantity required to produce their intended effect and otherwise in accordance with all the principles of good manufacturing practice and
- they consist of one or more of the following, used alone or in combination with flavoring substances and adjuvants generally recognized as safe in food, prior-sanctioned for such use or regulated by an appropriate section in this part.

16. OTHER INFORMATION

PREPARED BY: Total Safety d/b/a EHS Services

HMIS RATING	
HEALTH	<input type="checkbox"/> 2
FLAMMABILITY	2
PHYSICAL HAZARD	0
PERSONAL PROTECTION	C



HMIS RATINGS NOTES: Please refer to Section 8 of this SDS for recommended personal protective equipment.

DATA SOURCES:

REFERENCES

- ACGIH. 2013 Guide to Occupational Exposure Values. Cincinnati, OH. Signature Publications, 2013.
- Forsberg, K.; Mansdorf, S.Z. Quick Selection Guide to Chemical Protective Clothing. Fifth Edition. Hoboken, NJ. John Wiley & Sons, 2007.
- Lide, D.R. CRC Handbook of Chemistry and Physics. 88th Edition. Boca Raton, FL. CRC Press, 2008.
- UNECE. Globally Harmonized System of Classification and Labeling of Chemicals (GHS). Third Revised Edition. New York and Geneva. United Nations, 2009.
- US DOT; Pipeline and Hazardous Materials Safety Administration. 2008 Emergency Response Guidebook. Neenah, WI. J.J. Keller & Associates, Inc. 2008.
- US EPA. Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-To-Know Act (EPCRA) and Section 112(r) of the Clean Air Act. [Available] Online: <http://www.epa.gov/ceppo/pubs/title3.pdf>. Retrieved 02/02/2011.

ADDITIONAL SDS INFORMATION:

KEY /LEGEND

- ACGIH - American Conference of Governmental Industrial Hygienists
- ADR - Agreement on Dangerous Goods by Road
- CAA - Clean Air Act
- CAS - Chemical Abstracts Service Registry Number
- CDG - Carriage of Dangerous Goods By Road and Rail Manual
- CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
- CFR - Code of Federal Regulations
- EINECS - European Inventory of Existing Chemical Substances Registry Number
- ERG - Emergency Response Guidebook
- EPCRA - Emergency Planning and Community Right-to-Know Act
- GHS - Globally Harmonized System of Classification and Labeling of Chemicals
- IARC - International Agency for Research on Cancer
- IATA - International Air Transport Association
- ICAO - International Civil Aviation Organization
- IMDG - International Maritime Dangerous Goods Code
- IMO - International Maritime Organization
- N/E - Not Established
- NTP - National Toxicology Program
- OSHA - Occupational Safety and Health Administration
- PEL - Permissible Exposure Limit
- PPE - Personal Protective Equipment
- RCRA - Resource Conservation and Recovery Act
- RID - Regulations Concerning the International Transport of Dangerous Goods by Rail

SARA - Superfund Amendments and Reauthorization Act of 1986

SDS - Safety Data Sheet

TCC - Tag Closed Cup

TDG - Transportation of Dangerous Goods

TLV - Threshold Limit Value

TSCA - Toxic Substance Control Act

UN/NA - United Nations / North American Number

UNECE - United Nations Economic Commission for Europe

US DOT - United States Department of Transportation

US EPA - United States Environmental Protection Agency

Vol. - Volume

WHMIS - Workplace Hazardous Materials Information System

GENERAL STATEMENTS: Other information not included anywhere else in this SDS is included in this section if, in fact, such data exists.

MANUFACTURER DISCLAIMER: This information relates to the specific material designated and may not be valid for such material used in combination with any other materials or in any process. Such information is to the best of our knowledge and belief, accurate and reliable as of the date compiled. However, no representation, warranty or guarantee is made as to its accuracy, reliability or completeness. **NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, IS MADE CONCERNING THE INFORMATION HEREIN PROVIDED.** It is the user's responsibility to satisfy himself as to the suitability and completeness of such information for his own particular use. We do not accept liability for any loss or damage that may occur from the use of this information nor do we offer warranty against patent infringement.