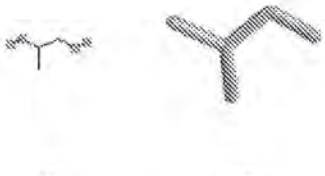
PubChem

COMPOUND SUMMARY

Propylene Glycol

Cite | Download

PubChem CID	1030
Structure	 2D 3D
Chemical Safety	Irritant Health Hazard Laboratory Chemical Safety Summary (LCSS) Datasheet
Molecular Formula	$C_3H_8O_2$ $CH_3CHOHCH_2OH$
Synonyms	propylene glycol 1,2-propanediol 57-55-6 propane-1,2-diol 1,2-Propylene glycol View More...
Molecular Weight	76.09 g/mol *Computed by PubChem 2.2 (PubChem release 2021.10.14)*
Dates	Create: 2004-09-16 Modify: 2025-04-11

Description

Propylene glycol is a synthetic liquid substance that absorbs water. Propylene glycol is also used to make polyester compounds, and as a base for deicing solutions. Propylene glycol is used by the chemical, food, and pharmaceutical industries as an antifreeze when leakage might lead to contact with food. The Food and Drug Administration (FDA) has classified propylene glycol as an additive that is "generally recognized as safe" for use in food. It is used to absorb extra water and maintain moisture in certain medicines, cosmetics, or food products. It is a solvent for food colors and flavors, and in the paint and plastics industries. Propylene glycol is also used to create artificial smoke or fog used in fire-fighting training and in theatrical productions. Other names for propylene glycol are 1,2-dihydroxypropane, 1,2-propanediol, methyl glycol, and trimethyl glycol. Propylene glycol is clear, colorless, slightly syrupy liquid at room temperature. It may exist in air in the vapor form, although propylene glycol must be heated or briskly shaken to produce a vapor. Propylene glycol is practically odorless and tasteless.

- Agency for Toxic Substances and Disease Registry (ATSDR)

Thick odorless colorless liquid. Mixes with water. (USCG, 1999)

U.S. Coast Guard. 1999. Chemical Hazard Response Information System (CHRIS) - Hazardous Chemical Data. Commandant Instruction 16465.12C. Washington, D.C.: U.S. Government Printing Office.

- CAMEO Chemicals

Propane-1,2-diol is the simplest member of the class of propane-1,2-diols, consisting of propane in which a hydrogen at position 1 and a hydrogen at position 2 are substituted by hydroxy groups. A colourless, viscous, hygroscopic, low-melting (-59°C) and high-boiling (188°C) liquid with low toxicity, it is used as a solvent, emulsifying agent, and antifreeze. It has a role as a protic solvent, an allergen, a human xenobiotic metabolite and a mouse metabolite. It is a member of propane-1,2-diols and a glycol.

- ChEBI

View More...

See also: Tobacco Leaf (part of); Propylene Glycol; WATER (component of); Glycerin; propylene glycol (component of) ... View More ...

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1 Structures

1.1 2D Structure

Chemical Structure Depiction

PubChem

1.2 3D Conformer

▸ PubChem

2 Names and Identifiers

2.1 Computed Descriptors

2.1.1 IUPAC Name

propane-1,2-diol

Computed by Lexichem TK 2.7.0 (PubChem release 2021.10.14)

▸ PubChem

2.1.2 InChI

InChI=1S/C3H8O2/c1-3(5)2-4/h3-5H,2H2,1H3

Computed by InChI 1.0.6 (PubChem release 2021.10.14)

▸ PubChem

2.1.3 InChIKey

DNIAPMSPPWPWGF-UHFFFAOYSA-N

Computed by InChI 1.0.6 (PubChem release 2021.10.14)

▸ PubChem

2.1.4 SMILES

CC(CO)O

Computed by OEChem 2.3.0 (PubChem release 2024.12.12)

▸ PubChem

2.2 Molecular Formula

$C_3H_8O_2$

Computed by PubChem 2.2 (PubChem release 2021.10.14)

▸ Australian Industrial Chemicals Introduction Scheme (AICIS); CAMEO Chemicals; EU Food Improv...

$C_3H_8O_2$

$CH_3CHOHCH_2OH$

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

2.3 Other Identifiers

2.3.1 CAS

57-55-6

▸ Australian Industrial Chemicals Introduction Scheme (AICIS); CAMEO Chemicals; CAS Common C...

25322-68-3

▸ DTP/NCI

63625-56-9

▸ European Chemicals Agency (ECHA)

2.3.2 Related CAS

58858-91-6 (hydrochloride salt)

▸ ChemIDplus

2.3.3 Deprecated CAS

1194046-20-2, 190913-75-8, 4254-16-4, 63625-56-9

- ChemIDplus; EPA Chemicals under the TSCA

1194046-20-2, 190913-75-8, 63625-56-9

- EPA DSSTox

2.3.4 European Community (EC) Number

200-338-0

- EU Food Improvement Agents; European Chemicals Agency (ECHA)

613-293-0

- European Chemicals Agency (ECHA)

2.3.5 UNII

6DC9Q167V3

- FDA Global Substance Registration System (GSRS)

2.3.6 ChEBI ID

CHEBI:16997

- ChEBI

2.3.7 ChEMBL ID

CHEMBL286398

- ChEMBL

2.3.8 DrugBank ID

DB01839

- DrugBank

2.3.9 DSSTox Substance ID

DTXSID0021206

▸ EPA DSSTox

2.3.10 FEMA Number

2940

▸ Flavor and Extract Manufacturers Association (FEMA)

2.3.11 ICSC Number

0321

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

2.3.12 JECFA Number

925

▸ Joint FAO/WHO Expert Committee on Food Additives (JECFA)

2.3.13 KEGG ID

C00583

▸ KEGG

D00078

▸ KEGG

2.3.14 Metabolomics Workbench ID

87196

- Metabolomics Workbench

2.3.15 NCI Thesaurus Code

C29388

- NCI Thesaurus (NCIt)

2.3.16 Nikkaji Number

J1.918F

- Japan Chemical Substance Dictionary (Nikkaji)

J2.210A

- Japan Chemical Substance Dictionary (Nikkaji)

2.3.17 NSC Number

69860

- DTP/NCI

35749

- DTP/NCI

35748

- DTP/NCI

View More...

2.3.18 RXCUI

34693

- NLM RxNorm Terminology

2.3.19 Wikidata

Q161495

- Wikidata

2.3.20 Wikipedia

Propylene glycol

- Wikipedia

2.4 Synonyms

2.4.1 MeSH Entry Terms

1,2 Propanediol
1,2-Propanediol
Glycol, Propylene
Monohydrate, Propylene Glycol
Propan-1,2-Diol
Propylene Glycol
Propylene Glycol Monohydrate
Propylene Glycol Sodium Salt
Propylene Glycol, (+-)-Isomer
Propylene Glycol, (R)-Isomer
Propylene Glycol, (S)-Isomer

- Medical Subject Headings (MeSH)

2.4.2 Depositor-Supplied Synonyms

propylene glycol	Monopropylene glycol	DL-1,2-Propanediol	Caswell No. 713
1,2-propanediol	Dowfrost	Ucar 35	General lube
57-55-6	Sirlene	1,2-Propylenglykol	Kollisolv pg
propane-1,2-diol	Trimethyl glycol	(RS)-1,2-Propanediol	CCRIS 5929
1,2-Propylene glycol	2,3-Propanediol	Sentry Propylene Glycol	HSDB 174
1,2-dihydroxypropane	Propylene Glycol USP	PG 12	1,2 Propanediol

2-Hydroxypropanol	Solargard P	FEMA No. 2940	All purpose lubricant
Isopropylene glycol	alpha-Propyleneglycol	(+-)-1,2-Propanediol	AI3-01898
Methylethyl glycol	Solar Winter BAN	Kilfrost ABC-S	alpha-Propylene glycol
Methylethylene glycol	dl-Propylene glycol	(+-)-Propylene glycol	1,2-Propylenglykol [German

▸ PubChem

3 Chemical and Physical Properties

3.1 Computed Properties

Property Name	Property Value	Reference
Molecular Weight	76.09 g/mol	Computed by PubChem 2.2 (PubChem release 2021.10.14)
XLogP3	-0.9	Computed by XLogP3 3.0 (PubChem release 2021.10.14)
Hydrogen Bond Donor Count	2	Computed by Cactvs 3.4.8.18 (PubChem release 2021.10.14)
Hydrogen Bond Acceptor Count	2	Computed by Cactvs 3.4.8.18 (PubChem release 2021.10.14)
Rotatable Bond Count	1	Computed by Cactvs 3.4.8.18 (PubChem release 2021.10.14)
Exact Mass	76.052429494 Da	Computed by PubChem 2.2 (PubChem release 2021.10.14)
Monoisotopic Mass	76.052429494 Da	Computed by PubChem 2.2 (PubChem release 2021.10.14)
Topological Polar Surface Area	40.5 Å²	Computed by Cactvs 3.4.8.18 (PubChem release 2021.10.14)
Heavy Atom Count	5	Computed by PubChem
Formal Charge	0	Computed by PubChem
Complexity	20.9	Computed by Cactvs 3.4.8.18 (PubChem release 2021.10.14)
Isotope Atom Count	0	Computed by PubChem

Defined Atom Stereocenter Count	0	Computed by PubChem
Undefined Atom Stereocenter Count	1	Computed by PubChem
Defined Bond Stereocenter Count	0	Computed by PubChem
Undefined Bond Stereocenter Count	0	Computed by PubChem
Covalently-Bonded Unit Count	1	Computed by PubChem
Compound Is Canonicalized	Yes	Computed by PubChem (release 2021.10.14)

▸ PubChem

3.2 Experimental Properties

3.2.1 Physical Description

Thick odorless colorless liquid. Mixes with water. (USCG, 1999)

U.S. Coast Guard. 1999. Chemical Hazard Response Information System (CHRIS) - Hazardous Chemical Data. Commandant Instruction 16465.12C. Washington, D.C.: U.S. Government Printing Office.

▸ CAMEO Chemicals

Liquid; Water or Solvent Wet Solid; Liquid, Other Solid; NKRA; Dry Powder, Liquid

▸ EPA Chemical Data Reporting (CDR)

Clear, colourless, hygroscopic, viscous liquid

▸ EU Food Improvement Agents

Clear, colorless, viscous liquid; [ChemIDplus]

▸ Haz-Map, Information on Hazardous Chemicals and Occupational Diseases

COLOURLESS ODOURLESS HYGROSCOPIC VISCOUS LIQUID.

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

Thick odorless colorless liquid.

▸ Occupational Safety and Health Administration (OSHA)

3.2.2 Color / Form

Colorless viscous liquid

Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 15th Edition. John Wiley & Sons, Inc. New York, NY 2007., p. 1050

▸ Hazardous Substances Data Bank (HSDB)

3.2.3 Odor

Practically odorless

Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 15th Edition. John Wiley & Sons, Inc. New York, NY 2007., p. 1050

▸ Hazardous Substances Data Bank (HSDB)

3.2.4 Taste

Practically tasteless

Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 15th Edition. John Wiley & Sons, Inc. New York, NY 2007., p. 1050

▸ Hazardous Substances Data Bank (HSDB)

3.2.5 Boiling Point

370.8 °F at 760 mmHg (NTP, 1992)

National Toxicology Program, Institute of Environmental Health Sciences, National Institutes of Health (NTP). 1992. National Toxicology Program Chemical Repository Database. Research Triangle Park, North Carolina.

▸ CAMEO Chemicals

187.6 °C

PhysProp

▸ DrugBank

187.6 °C

Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor & Francis, Boca Raton, FL 2007, p. 3-444

▸ Hazardous Substances Data Bank (HSDB)

188.2 °C

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

370.8 °F

▸ Occupational Safety and Health Administration (OSHA)

3.2.6 Melting Point

-76 °F (NTP, 1992)

National Toxicology Program, Institute of Environmental Health Sciences, National Institutes of Health (NTP). 1992. National Toxicology Program Chemical Repository Database. Research Triangle Park, North Carolina.

▸ CAMEO Chemicals

-60 °C

PhysProp

▸ DrugBank

-60 °C

Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor & Francis, Boca Raton, FL 2007, p. 3-444

▸ Hazardous Substances Data Bank (HSDB)

-59 °C

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

-76 °F

▸ Occupational Safety and Health Administration (OSHA)

3.2.7 Flash Point

210 °F (NTP, 1992)

National Toxicology Program, Institute of Environmental Health Sciences, National Institutes of Health (NTP). 1992. National Toxicology Program Chemical Repository Database. Research Triangle Park, North Carolina.

- CAMEO Chemicals

99 °C

- Haz-Map, Information on Hazardous Chemicals and Occupational Diseases

104 °C Pensky-Martens closed cup

Martin AE, Murphy FH; Glycols, Propylene Glycols. Kirk-Othmer Encyclopedia of Chemical Technology (1994). John Wiley & Sons, Inc. Online Posting Date: December 4, 2000

- Hazardous Substances Data Bank (HSDB)

210 °F (99 °C) (Closed cup)

Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 325-102

- Hazardous Substances Data Bank (HSDB)

225 °F (Open cup)

U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data, Volume II. Washington, D.C.: U.S. Government Printing Office, 1984-5.

- Hazardous Substances Data Bank (HSDB)

101 °C c.c.

- ILO-WHO International Chemical Safety Cards (ICSCs)

210 °F

- Occupational Safety and Health Administration (OSHA)

3.2.8 Solubility

greater than or equal to 100 mg/mL at 70 °F (NTP, 1992)

National Toxicology Program, Institute of Environmental Health Sciences, National Institutes of Health (NTP). 1992. National Toxicology Program Chemical Repository Database. Research Triangle Park, North Carolina.

▸ CAMEO Chemicals

1000000 mg/L (at 20 °C)

YALKOWSKY,SH & DANNENFELSER,RM (1992)

▸ DrugBank

Soluble in water, ethanol and acetone

▸ EU Food Improvement Agents

Soluble in benzene

Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor & Francis, Boca Raton, FL 2007, p. 3-444

▸ Hazardous Substances Data Bank (HSDB)

Miscible with acetone and chloroform; soluble in ether. Will dissolve many essential oils, but is immiscible with fixed oils.

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 2006., p. 1350

▸ Hazardous Substances Data Bank (HSDB)

In water, 1X10+6 mg/L at 20 °C /miscible/

Yalkowsky SH, Dannenfelser RM; The AQUASOL dATAbASE of Aqueous Solubility. Ver 5. Tucson, AZ: Univ AZ, College of Pharmacy (1992)

▸ Hazardous Substances Data Bank (HSDB)

Solubility in water: miscible

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

3.2.9 Density

1.04 at 68 °F (USCG, 1999) - Denser than water; will sink

U.S. Coast Guard. 1999. Chemical Hazard Response Information System (CHRIS) - Hazardous Chemical Data. Commandant Instruction 16465.12C. Washington, D.C.: U.S. Government Printing Office.

▸ CAMEO Chemicals

1.0361 g/cu cm at 20 °C

Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor & Francis, Boca Raton, FL 2007, p. 3-444

▸ Hazardous Substances Data Bank (HSDB)

Relative density (water = 1): 1.04

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

1.04

▸ Occupational Safety and Health Administration (OSHA)

3.2.10 Vapor Density

2.62 (NTP, 1992) - Heavier than air; will sink (Relative to Air)

National Toxicology Program, Institute of Environmental Health Sciences, National Institutes of Health (NTP). 1992. National Toxicology Program Chemical Repository Database. Research Triangle Park, North Carolina.

▸ CAMEO Chemicals

Relative vapor density (air = 1): 2.6

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

2.62

▸ Occupational Safety and Health Administration (OSHA)

3.2.11 Vapor Pressure

0.08 mmHg at 68 °F ; 0.13 mmHg at 77 °F (NTP, 1992)

National Toxicology Program, Institute of Environmental Health Sciences, National Institutes of Health (NTP). 1992. National Toxicology Program Chemical Repository Database. Research Triangle Park, North Carolina.

▸ CAMEO Chemicals

0.13 [mmHg]

▸ Haz-Map, Information on Hazardous Chemicals and Occupational Diseases

0.13 mm Hg at 25 °C /Extrapolated/

Daubert, T.E., R.P. Danner. Physical and Thermodynamic Properties of Pure Chemicals Data Compilation. Washington, D.C.: Taylor and Francis, 1989.

▸ Hazardous Substances Data Bank (HSDB)

Vapor pressure, Pa at 20 °C: 10.6

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

0.08 mmHg

▸ Occupational Safety and Health Administration (OSHA)

3.2.12 LogP

-0.92

HANSCH,C ET AL. (1995)

▸ DrugBank

log Kow = -0.92

Hansch, C., Leo, A., D. Hoekman. Exploring QSAR - Hydrophobic, Electronic, and Steric Constants. Washington, DC: American Chemical Society., 1995., p. 7

▸ Hazardous Substances Data Bank (HSDB)

-0.92

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

3.2.13 Stability / Shelf Life

At cool temperatures, propylene glycol is stable in a well-closed container, but at high temperatures, in the open, it tends to oxidize, giving rise to products such as propionaldehyde, lactic acid, pyruvic acid, and acetic acid. Propylene glycol is chemically stable when mixed with ethanol (95%), glycerin, or water; aqueous solutions may be sterilized by autoclaving.

Rowe, R.C., Sheskey, P.J., Quinn, M.E.; (Eds.), Handbook of Pharmaceutical Excipients 6th edition Pharmaceutical Press, London, England 2009, p. 592

▸ Hazardous Substances Data Bank (HSDB)

3.2.14 Autoignition Temperature

700 °F (USCG, 1999)

U.S. Coast Guard. 1999. Chemical Hazard Response Information System (CHRIS) - Hazardous Chemical Data. Commandant Instruction 16465.12C. Washington, D.C.: U.S. Government Printing Office.

▸ CAMEO Chemicals

700 °F (371 °C)

Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 325-102

▸ Hazardous Substances Data Bank (HSDB)

420 °C

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

3.2.15 Decomposition

When heated to decomposition it emits acrid smoke and irritating fumes.

Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3061

▸ Hazardous Substances Data Bank (HSDB)

3.2.16 Viscosity

0.581 cP at 20 °C

Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 15th Edition. John Wiley & Sons, Inc. New York, NY 2007., p. 1050

▸ Hazardous Substances Data Bank (HSDB)

3.2.17 Heat of Combustion

431.0 kg cal/mole

Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 15th Edition. John Wiley & Sons, Inc. New York, NY 2007., p. 1050

▸ Hazardous Substances Data Bank (HSDB)

3.2.18 Heat of Vaporization

168.6 cal/g at BP

Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 15th Edition. John Wiley & Sons, Inc. New York, NY 2007., p. 1050

▸ Hazardous Substances Data Bank (HSDB)

3.2.19 Surface Tension

40.1 dynes/cm at 25 °C

Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 15th Edition. John Wiley & Sons, Inc. New York, NY 2007., p. 1050

▸ Hazardous Substances Data Bank (HSDB)

3.2.20 Refractive Index

[n]D/20: 1,431-1,433

▸ EU Food Improvement Agents

Index of refraction: 1.4324 at 20 °C/D

Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor & Francis, Boca Raton, FL 2007, p. 3-444

▸ Hazardous Substances Data Bank (HSDB)

3.2.21 Dissociation Constants

pKa

14.9

SERJEANT,EP & DEMPSEY,B (1979)

▸ DrugBank

pKa = 14.8 at 25 °C

Riddick, J.A., W.B. Bunger, Sakano T.K. Techniques of Chemistry 4th ed., Volume II. Organic Solvents. New York, NY: John Wiley and Sons., 1985., p. 266

▸ Hazardous Substances Data Bank (HSDB)

▸ IUPAC Digitized pKa Dataset

3.2.22 Relative Evaporation Rate

0.01, relative to butyl acetate

Riddick, J.A., W.B. Bunger, Sakano T.K. Techniques of Chemistry 4th ed., Volume II. Organic Solvents. New York, NY: John Wiley and Sons., 1985., p. 266

▸ Hazardous Substances Data Bank (HSDB)

3.2.23 Kovats Retention Index

Standard non-polar	722 , 719 , 753 , 745 , 710 , 716 , 711 , 710 , 710 , 745
Semi-standard non-polar	705 , 758 , 764 , 732 , 740
Standard polar	1600 , 1591 , 1603 , 1605 , 1603 , 1599 , 1599 , 1612 , 1599 , 1603 , 1602 , 1583 , 1589 , 1597 , 1616.9 , 1612 , 1585 , 1611 , 1594

▸ NIST Mass Spectrometry Data Center

3.2.24 Other Experimental Properties

Specific heat: 0.590 cal/g at 20 °C; hygroscopic

Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 15th Edition. John Wiley & Sons, Inc. New York, NY 2007., p. 1050

Hazardous Substances Data Bank (HSDB)

Heat of vaporization = 15.4 kcal/mol at 25 °C; heat of formation = -116.1 kcal/mol at 25 °C (liquid); heat capacity = 45.1 kcal/mol at 20 °C; viscosity = 56.0 cP at 20 °C; surface tension = 36.51 dyne/cm at 25 °C

Riddick, J.A., W.B. Bunger, Sakano T.K. Techniques of Chemistry 4th ed., Volume II. Organic Solvents. New York, NY: John Wiley and Sons., 1985., p. 266

Hazardous Substances Data Bank (HSDB)

BP: 88-90 °C at 12 mm Hg; 187-189 °C at 760 mm Hg. Specific optical rotation: -15 deg at 20 °C /l-form/

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 2006., p. 1350

Hazardous Substances Data Bank (HSDB)

BP: 95-96 °C at 14 mm Hg; Specific optical rotation: +15 (neat) deg at 20 °C; Density: 1.04 at 25 °C/4/ degC /d-form/

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 2006., p. 1350

Hazardous Substances Data Bank (HSDB)

Hydroxyl radical reaction rate constant = 1.2X10-11 cu cm/molec-sec at 25 °C

Atkinson R; J Phys Chem Ref Data Monograph 1 (1989)

Hazardous Substances Data Bank (HSDB)

3.3 Chemical Classes

3.3.1 Drugs

Pharmaceuticals

S10 | SWISSPHARMA | Pharmaceutical List with Consumption Data | DOI:10.5281/zenodo.2623484

NORMAN Suspect List Exchange

3.3.1.1 Animal Drugs

Pharmaceuticals -> UK Veterinary Medicines Directorate List

S104 | UKVETMED | UK Veterinary Medicines Directorate's List | DOI:10.5281/zenodo.7802119

NORMAN Suspect List Exchange

3.3.2 Cosmetics

Cosmetic ingredients (Propylene Glycol) -> CIR (Cosmetic Ingredient Review)

Cosmetic Ingredient Review (CIR)

Viscosity controlling; Humectant; Skin conditioning; Solvent

S13 | EUCOSMETICS | Combined Inventory of Ingredients Employed in Cosmetic Products (2000) and Revised Inventory (2006) | DOI:10.5281/zenodo.2624118

NORMAN Suspect List Exchange

3.3.3 Food Additives

ANTICAKING AGENT OR FREE-FLOW AGENT, ANTIMICROBIAL AGENT, ANTIOXIDANT, DRYING AGENT, EMULSIFIER OR EMULSIFIER SALT, FLAVOR ENHANCER, FLAVORING AGENT OR ADJUVANT, FORMULATION AID, HUMECTANT, SOLVENT OR VEHICLE -> FDA Substance added to food

FDA Substances Added to Food

3.3.4 Fragrances

Fragrance Ingredient (Propylene glycol) -> IFRA transparency List

International Fragrance Association (IFRA)

3.3.5 Polymers

Other Classes -> Alcohols and Polyols, Other

Haz-Map, Information on Hazardous Chemicals and Occupational Diseases

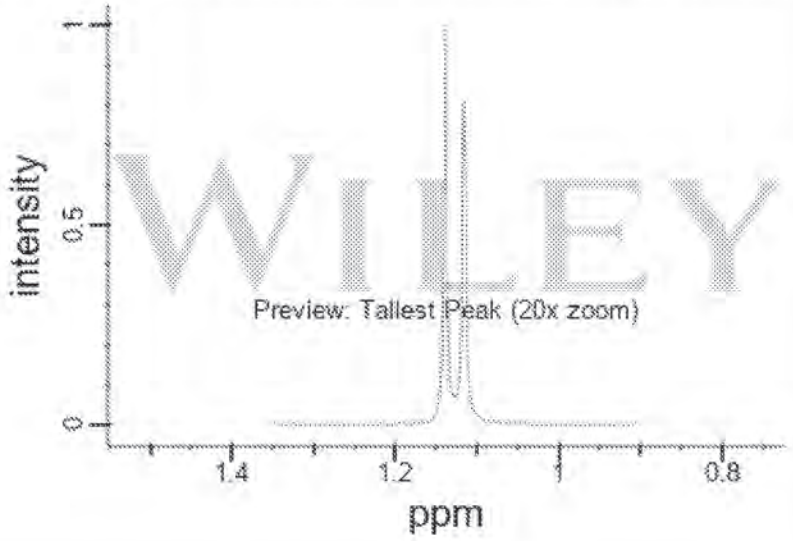
4 Spectral Information

4.1 1D NMR Spectra

1D NMR Spectra	NMR: 45 (Varian Associates NMR Spectra Catalogue)

Hazardous Substances Data Bank (HSDB)

4.1.1 1H NMR Spectra

Instrument Name	BRUKER AC-300
Source of Sample	Tokyo Kasei Kogyo Company, Ltd., Tokyo, Japan
Copyright	Copyright © 1991-2025 John Wiley & Sons, Inc. All Rights Reserved.
Thumbnail	

SpectraBase

4.1.2 13C NMR Spectra

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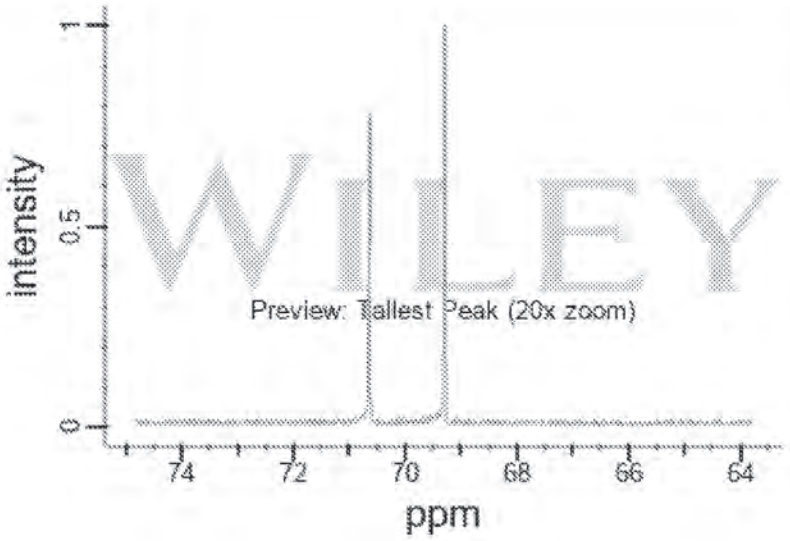
Thumbnail



WILEY

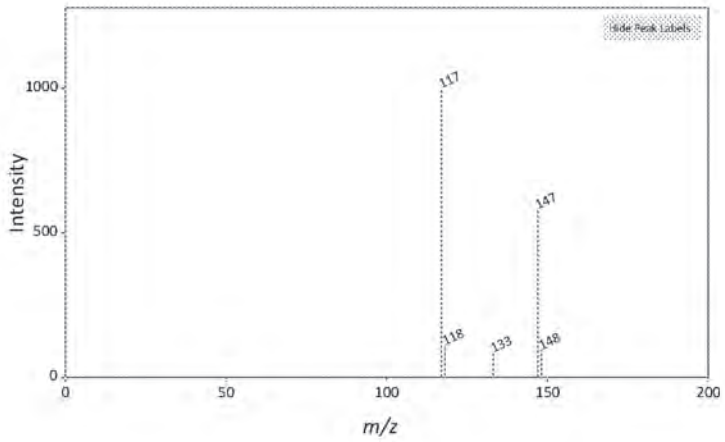
SpectraBase

4.2 Mass Spectrometry

4.2.1 GC-MS

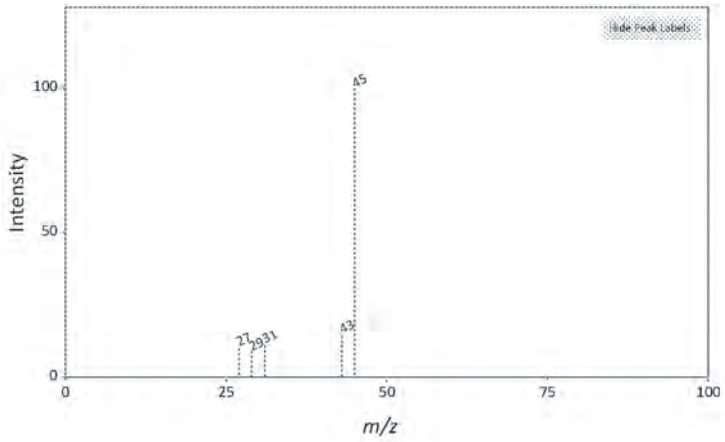
1 of 8 View All

Accession ID	MSBNK-Osaka_Univ-OUF00428
Authors	Tsujimoto Y, Tsugawa H, Bamba T, Fukusaki E, engineering department, Osaka Univ.
Instrument	Pegasus III TOF-MS system, Leco; GC 6890, Agilent Technologies
Instrument Type	GC-EI-TOF
MS Level	MS
Ionization Mode	POSITIVE
Column Name	CP-SIL 8 CB LOW BLEED/MS
Retention Time	245.966 sec

Top 5 Peaks	117 999 147 581 118 109 148 94 133 84
SPLASH	splash10-014j-0900000000-d90655d5a614c4ddf998
Thumbnail	
License	CC BY-SA

▸ MassBank Europe

2 of 8	View All
MoNA ID	JP001841
MS Category	Experimental
MS Type	GC-MS
MS Level	MS1
Instrument	HITACHI RMU-7M
Instrument Type	EI-B
Ionization Mode	positive
Top 5 Peaks	45 99.99 43 14.83 31 11.49

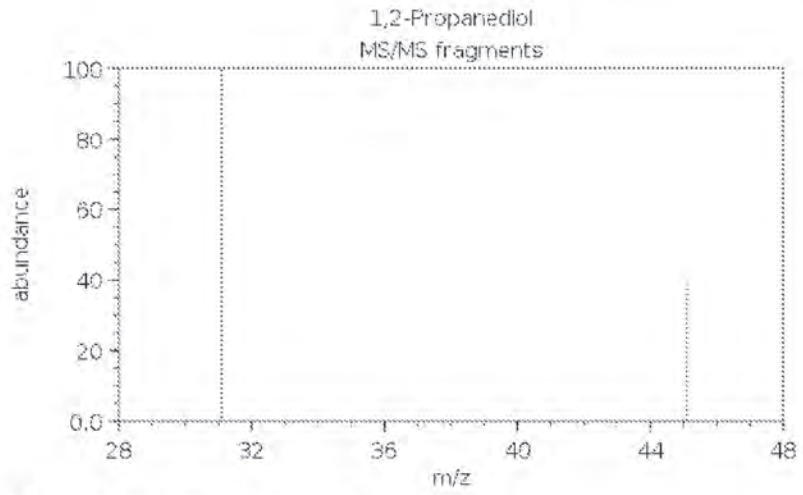
	27 10.45 29 8.84
SPLASH	splash10-0002-9000000000-a18bede40461dace657b
Thumbnail	
License	CC BY-NC-SA

MassBank of North America (MoNA)

4.2.2 MS-MS

NIST Number	1051599
Instrument Type	IT/ion trap
Collision Energy	0
Spectrum Type	MS2
Precursor Type	[M-H]-
Precursor m/z	75.0452
Total Peaks	2
m/z Top Peak	31.1
m/z 2nd Highest	45.1
m/z 3rd Highest	0

Thumbnail



© 2014 by the U.S. Secretary of Commerce.

▸ NIST Mass Spectrometry Data Center

4.2.3 Other MS

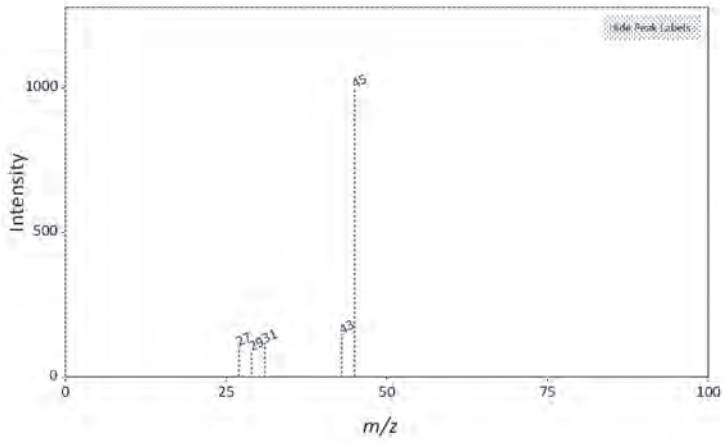
1 of 3	View All
Other MS	MASS: 95 (Atlas of Mass Spectral Data, John Wiley & Sons, New York)

▸ Hazardous Substances Data Bank (HSDB)

2 of 3	View All
Accession ID	MSBNK-Fac_Eng_Univ_Tokyo-JP001841
Authors	TAJIMA S, GUNMA COLLEGE OF TECHNOLOGY
Instrument	HITACHI RMU-7M
Instrument Type	EI-B
MS Level	MS
Ionization Mode	POSITIVE
Ionization	ENERGY 70 eV
Top 5 Peaks	45 999 43 148 31 115 27 105

	29 88
SPLASH	splash10-0002-9000000000-a18bede40461dace657b

Thumbnail



License	CC BY-NC-SA

▸ MassBank Europe

4.3 UV Spectra

UV: 5-12 (Organic Electronic Spectral Data, Phillips et al, John Wiley & Sons, New York)

Lide, D.R., G.W.A. Milne (eds.). Handbook of Data on Organic Compounds. Volume I. 3rd ed. CRC Press, Inc. Boca Raton ,FL. 1994., p. V5: 4324

▸ Hazardous Substances Data Bank (HSDB)

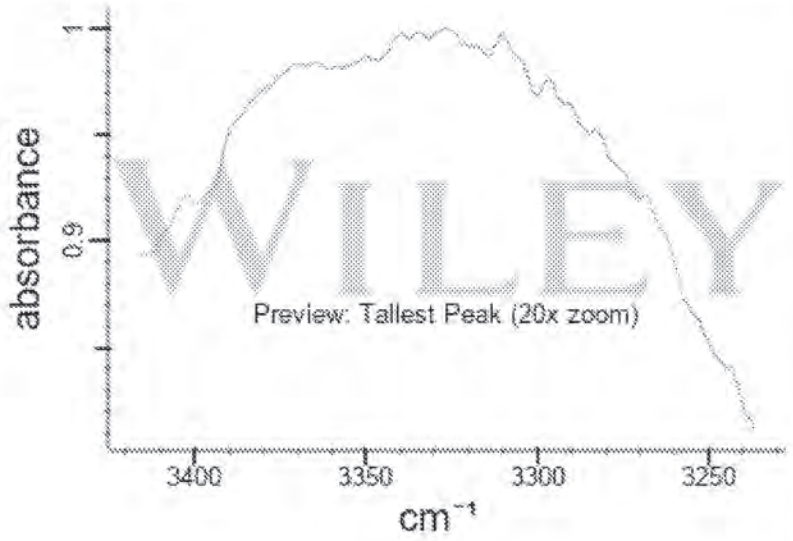
4.4 IR Spectra

IR Spectra	IR: 5974 (Coblentz Society Spectral Collection)

▸ Hazardous Substances Data Bank (HSDB)

4.4.1 FTIR Spectra

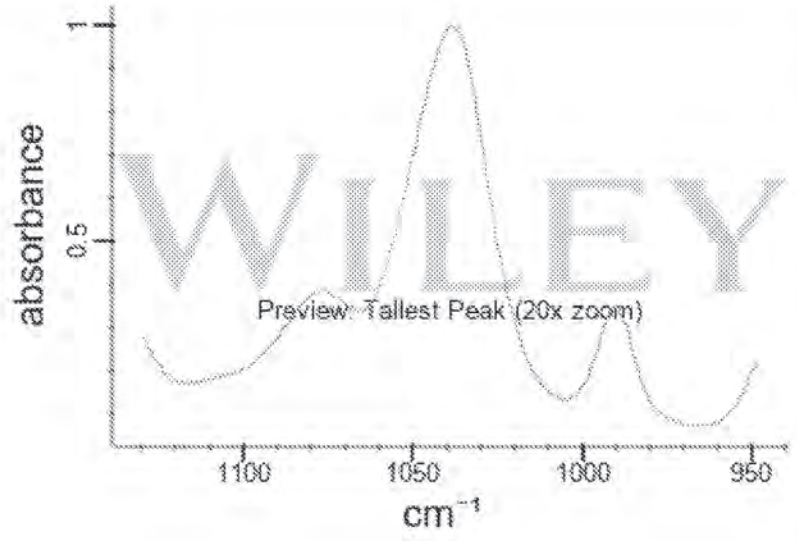
Technique	CAPILLARY CELL: NEAT

Source of Sample	The Matheson Company, Inc., East Rutherford, New Jersey
Copyright	Copyright © 1980, 1981-2025 John Wiley & Sons, Inc. All Rights Reserved.
Thumbnail	

▸ SpectraBase

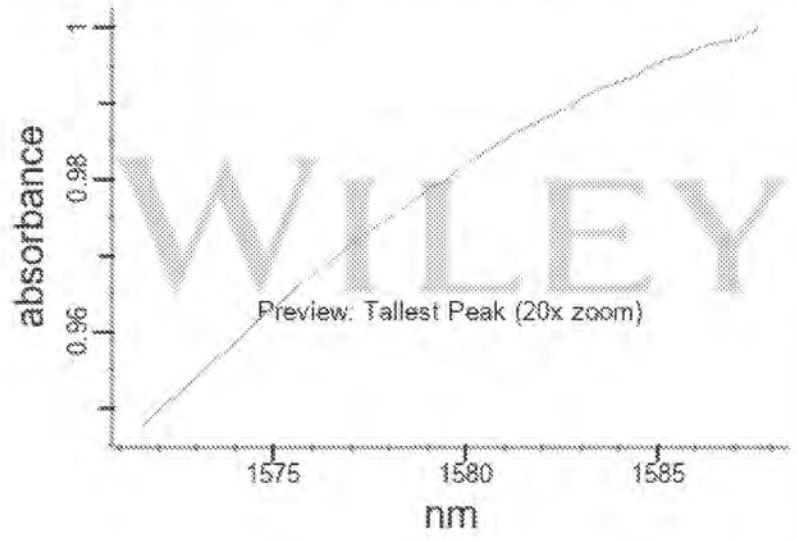
4.4.2 ATR-IR Spectra

Instrument Name	Bruker Tensor 27 FT-IR
Technique	ATR-Neat (DuraSamplIR II)
Source of Spectrum	Bio-Rad Laboratories, Inc.
Source of Sample	Alfa Aesar, Thermo Fisher Scientific
Catalog Number	A18406
Lot Number	10188904
Copyright	Copyright © 2016-2025 John Wiley & Sons, Inc. All Rights Reserved.

Thumbnail	

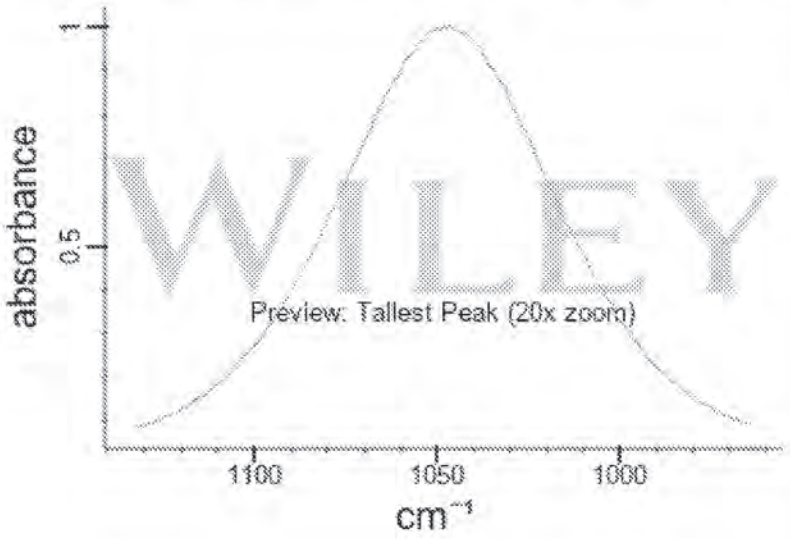
SpectraBase

4.4.3 Near IR Spectra

Instrument Name	BRUKER IFS 88
Technique	NIR
Source of Spectrum	Prof. Buback, University of Goettingen, Germany
Copyright	Copyright © 1989, 1990-2025 Wiley-VCH GmbH. All Rights Reserved.
Thumbnail	

SpectraBase

4.4.4 Vapor Phase IR Spectra

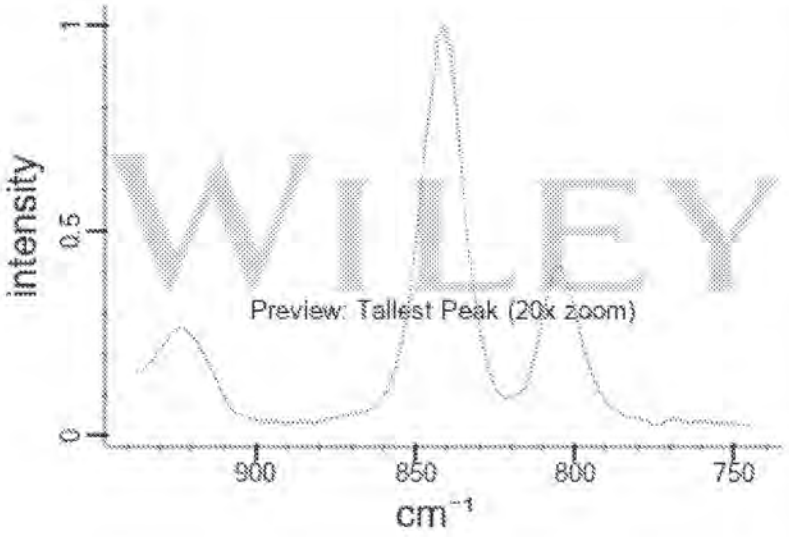
Instrument Name	Bruker IFS 85
Technique	Gas-GC
Copyright	Copyright © 1989, 1990-2025 Wiley-VCH GmbH. All Rights Reserved.
Thumbnail	

SpectraBase

4.5 Raman Spectra

Instrument Name	Bruker MultiRAM Stand Alone FT-Raman Spectrometer
Source of Spectrum	Zenodo
Copyright	Copyright © 2023-2025 John Wiley & Sons, Inc. All Rights Reserved.

Thumbnail



WILEY

▸ SpectraBase

4.6 Other Spectra

SADTLER REFERENCE NUMBER: 267 (IR, PRISM); 92 (IR, GRATING)

Weast, R.C. (ed.). Handbook of Chemistry and Physics. 60th ed. Boca Raton, Florida: CRC Press Inc., 1979., p. C-450

▸ Hazardous Substances Data Bank (HSDB)

5 Related Records

5.1 Related Compounds with Annotation

Follow these links to do a live 2D search or do a live 3D search for this compound, sorted by annotation score. This section is deprecated (see here for details), but these live search links provide equivalent functionality to the table that was previously shown here.

▸ PubChem

5.2 Related Compounds

Same Connectivity Count	20
Same Stereo Count	16

Same Isotope Count	3
Same Parent, Connectivity Count	173
Same Parent, Stereo Count	159
Same Parent, Isotope Count	156
Same Parent, Exact Count	144
Mixtures, Components, and Neutralized Forms Count	3322
Similar Compounds (2D)	View in PubChem Search
Similar Conformers (3D)	View in PubChem Search

PubChem

5.3 Substances

5.3.1 PubChem Reference Collection SID

481108016

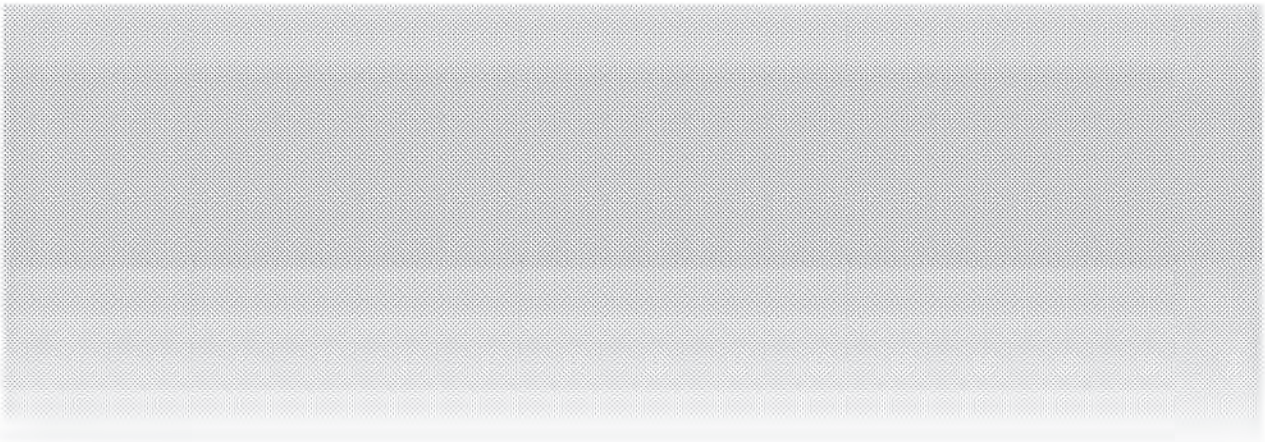
PubChem

5.3.2 Related Substances

All Count	6422
Same Count	663
Mixture Count	5759

PubChem

5.3.3 Substances by Category



PubChem

5.4 Other Relationships

Tobacco Leaf (part of)
Propylene Glycol; WATER (component of)
Glycerin; propylene glycol (component of)
ANUBISMED (FDA NDC: 83021-750) (component of)
AnubisMed (FDA NDC: 83021-551) (component of)
Anubis Barcelona Regul Oil (FDA NDC: 83021-624) (component of)
AnubisMed (FDA NDC: 83021-401) (component of)
Chlorhexidine gluconate; propylene glycol (component of)
AnubisMed (FDA NDC: 83021-774) (component of)
Anubis Barcelona Regul Oil (FDA NDC: 83021-300) (component of)
Anubis Barcelona Regul Oil (FDA NI
Chloroxylenol; edetic acid; propylen
Cetylpyridinium chloride; propylene
Naphazoline hydrochloride; povido
Aloe vera leaf; glycerin; propylene g
Anubis Barcelona Protective Line (Fl
Citric acid monohydrate; human im
alpha-HEXYLCINNAMALDEHYDE; A
GLYCOL MONOETHYL ETHER; FD&C
LIMONENE, (+)-; LINALOOL, (+/-)-;
OIL; PROPYLENE GLYCOL; TROLAMI

PubChem

5.5 Entrez Crosslinks

PubMed Count	331
Protein Structures Count	1
Taxonomy Count	4
OMIM Count	1
Gene Count	40

- PubChem

5.6 Associated Chemicals

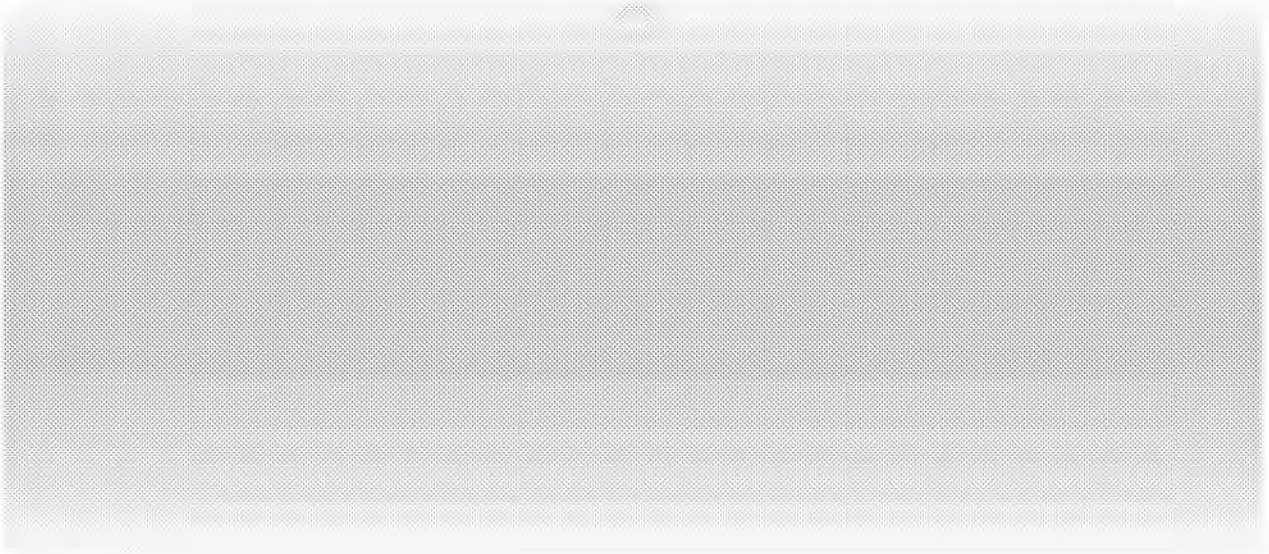
(+)-Propylene glycol; 4254-15-3

- Hazardous Substances Data Bank (HSDB)

(-)-Propylene glycol; 4254-14-2

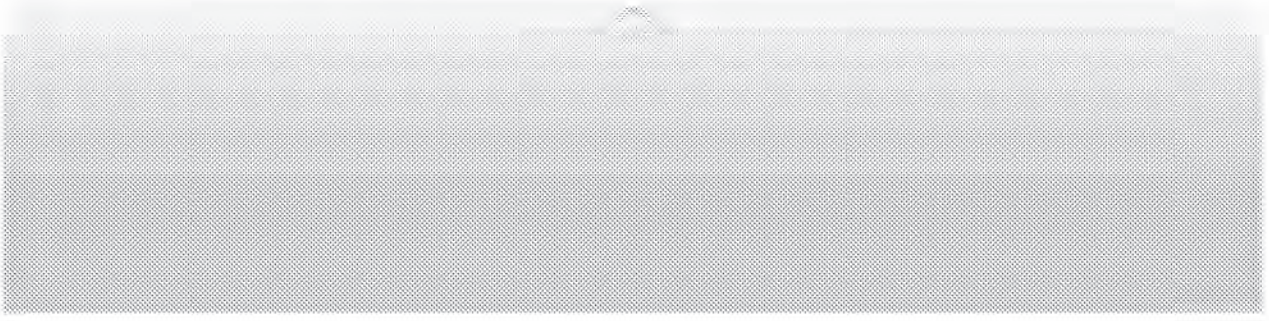
- Hazardous Substances Data Bank (HSDB)

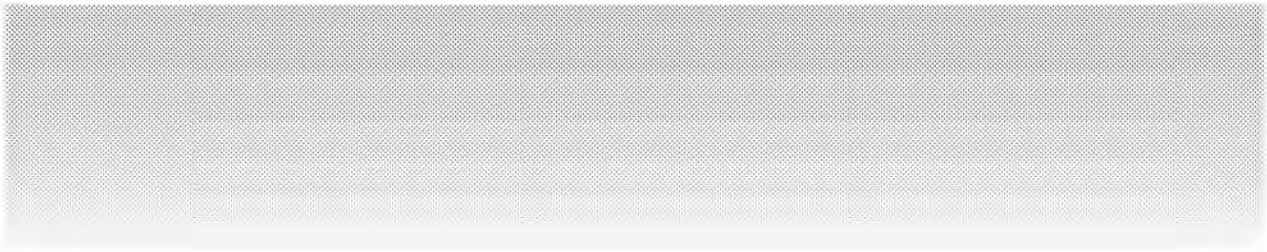
5.7 NCBI LinkOut



- NCBI

6 Chemical Vendors

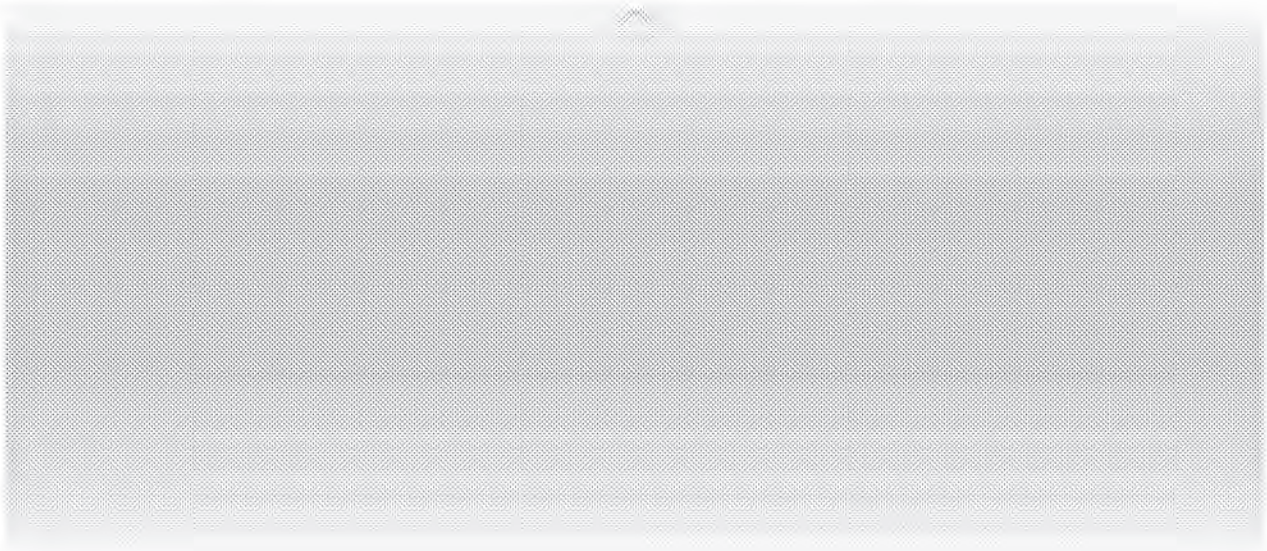




PubChem

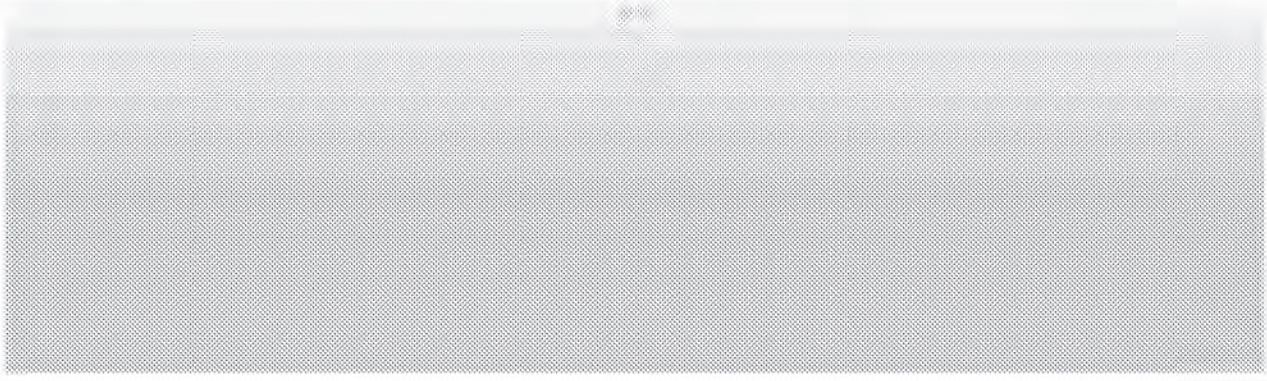
7 Drug and Medication Information

7.1 Drug Indication



Open Targets

7.2 FDA National Drug Code Directory



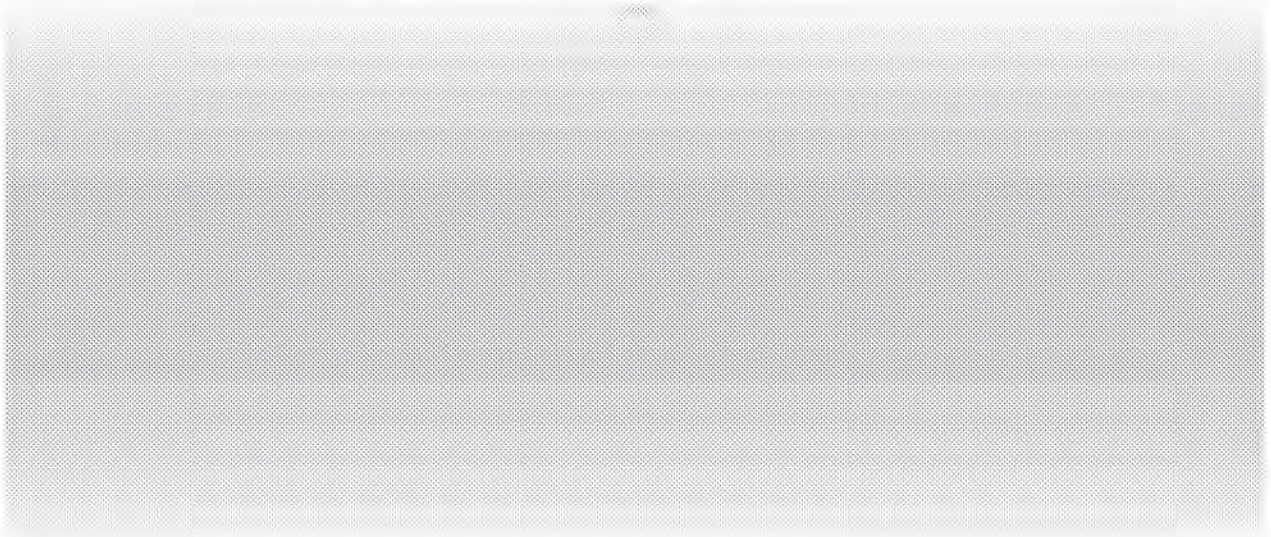
▸ National Drug Code (NDC) Directory

7.3 Drug Labels

Drug and label

▸ DailyMed

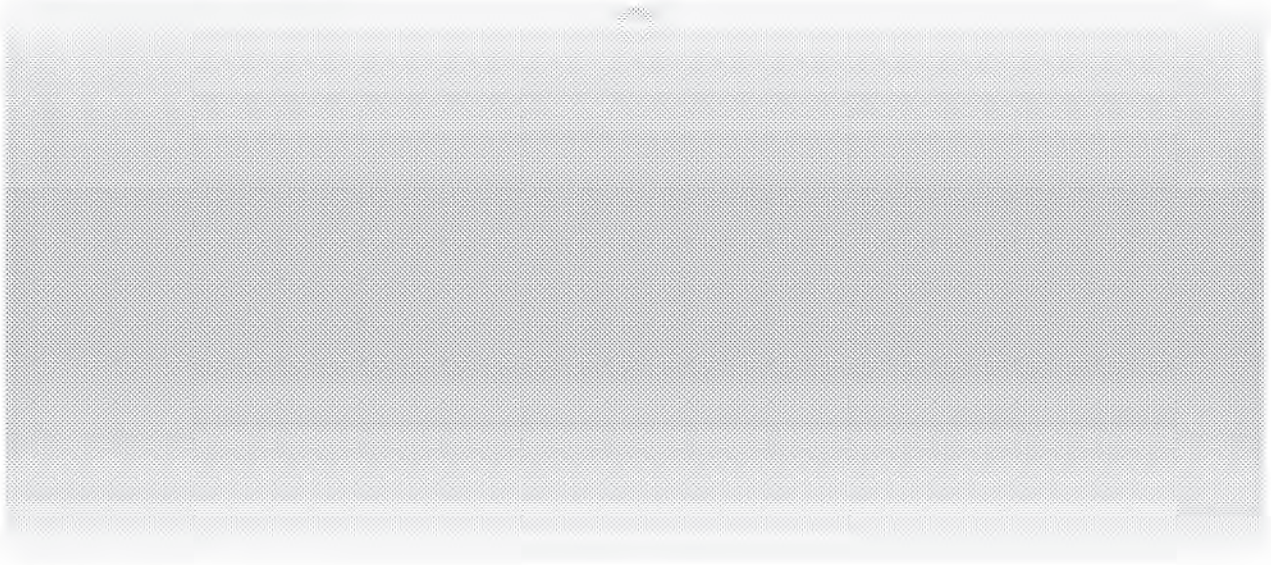
Active ingredient and drug



DailyMed

7.4 Clinical Trials

7.4.1 ClinicalTrials.gov



ClinicalTrials.gov

7.4.2 EU Clinical Trials Register

▸ EU Clinical Trials Register

7.4.3 NIPH Clinical Trials Search of Japan

▸ NIPH Clinical Trials Search of Japan

7.5 Therapeutic Uses

Propylene glycol is used as a vehicle for IV administration of drugs such as lorazepam, etomidate, phenytoin, diazepam, digoxin, hydralazine, esmolol, chlordiazepoxide, multivitamins, nitroglycerin, pentobarbital sodium, phenobarbital sodium, and trimethoprim-sulfamethoxazole.

DHHS/NTP-CERHR; NTP-CERHR Monograph on the Potential Human Reproductive and Developmental Effects of Propylene Glycol (March 2004) NIH Pub No. 04-4482 p.II-30 . Available from, as of January 11, 2010: https://cerhr.niehs.nih.gov/evals/egpg/propylene/PG_Monograph.pdf

▸ Hazardous Substances Data Bank (HSDB)

As an antiseptic it is similar to ethanol, and against molds it is similar to glycerin and only slightly less effective than ethanol.

Rowe, R.C., Sheskey, P.J., Quinn, M.E.; (Eds.), Handbook of Pharmaceutical Excipients 6th edition Pharmaceutical Press, London, England 2009, p. 592

▸ Hazardous Substances Data Bank (HSDB)

Hydroscopic agents (eg, propylene glycol...) are added /to respiratory inhalants/ to reduce viscosity of bronchial secretions.

American Medical Association, AMA Department of Drugs, AMA Drug Evaluations. 3rd ed. Littleton, Massachusetts: PSG Publishing Co., Inc., 1977., p. 656

Hazardous Substances Data Bank (HSDB)

Ointment containing approx 70% propylene glycol has been used as osmotic agent with good results in treatment of edema of cornea.

Grant, W. M. Toxicology of the Eye. 2nd ed. Springfield, Illinois: Charles C. Thomas, 1974., p. 862

Hazardous Substances Data Bank (HSDB)

For more Therapeutic Uses (Complete) data for Propylene glycol (9 total), please visit the HSDB record page.

Hazardous Substances Data Bank (HSDB)

7.6 Drug Warnings

Hyperosmolality has been induced by propylene glycol (PG) in a number of clinical settings ..., particularly in intensive care unit patients during the administration of nitroglycerin solutions that contain PG ...

Cosmetic Ingredient Review Expert Panel; J Am Coll Toxicol 13 (6): 437-91 (1994)

Hazardous Substances Data Bank (HSDB)

Formulations containing 35% propylene glycol can cause hemolysis in humans.

Rowe, R.C., Sheskey, P.J., Quinn, M.E.; (Eds.), Handbook of Pharmaceutical Excipients 6th edition Pharmaceutical Press, London, England 2009, p. 593

Hazardous Substances Data Bank (HSDB)

Hemolysis, CNS depression, hyperosmolality, and lactic acidosis have been reported after IV administration of propylene glycol.

DHHS/NTP-CERHR; NTP-CERHR Monograph on the Potential Human Reproductive and Developmental Effects of Propylene Glycol (March 2004) NIH Pub No. 04-4482 p.II-30. Available from, as of January 11, 2010: https://cerhr.niehs.nih.gov/evals/eggp/propylene/PG_Monograph.pdf

Hazardous Substances Data Bank (HSDB)

Propylene glycol is a commonly used solvent for oral, intravenous, and topical pharmaceutical preparations. Although it is considered safe, large intravenous doses given over a short period

of time can be toxic. Underlying renal insufficiency and hepatic dysfunction raise risk for toxicity. Toxic effects include hyperosmolality, increased anion gap metabolic acidosis (due to lactic acidosis), acute kidney injury, and sepsis-like syndrome. Treatment of toxicity includes hemodialysis to effectively remove propylene glycol. Prevention is best achieved by limiting the dose of propylene glycol infused.

Zar T et al; Seminars in Dialysis 20 (3): 217-9 (2007). Available from, as of February 23, 2010: https://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=17555487

▸ Hazardous Substances Data Bank (HSDB)

For more Drug Warnings (Complete) data for Propylene glycol (41 total), please visit the HSDB record page.

▸ Hazardous Substances Data Bank (HSDB)

7.7 Reported Fatal Dose

1 = practically nontoxic: probable oral lethal dose (human) is above 15 g/kg; for 70 kg person (150 lb), more than 1 qt (2.2 lb).

Gosselin, R.E., H.C. Hodge, R.P. Smith, and M.N. Gleason. Clinical Toxicology of Commercial Products. 4th ed. Baltimore: Williams and Wilkins, 1976., p. II-120

▸ Hazardous Substances Data Bank (HSDB)

8 Food Additives and Ingredients

8.1 Food Additive Classes

JECFA Functional Classes

Food Additives -> CARRIER_SOLVENT; GLAZING_AGENT; HUMECTANT;

▸ Joint FAO/WHO Expert Committee on Food Additives (JECFA)

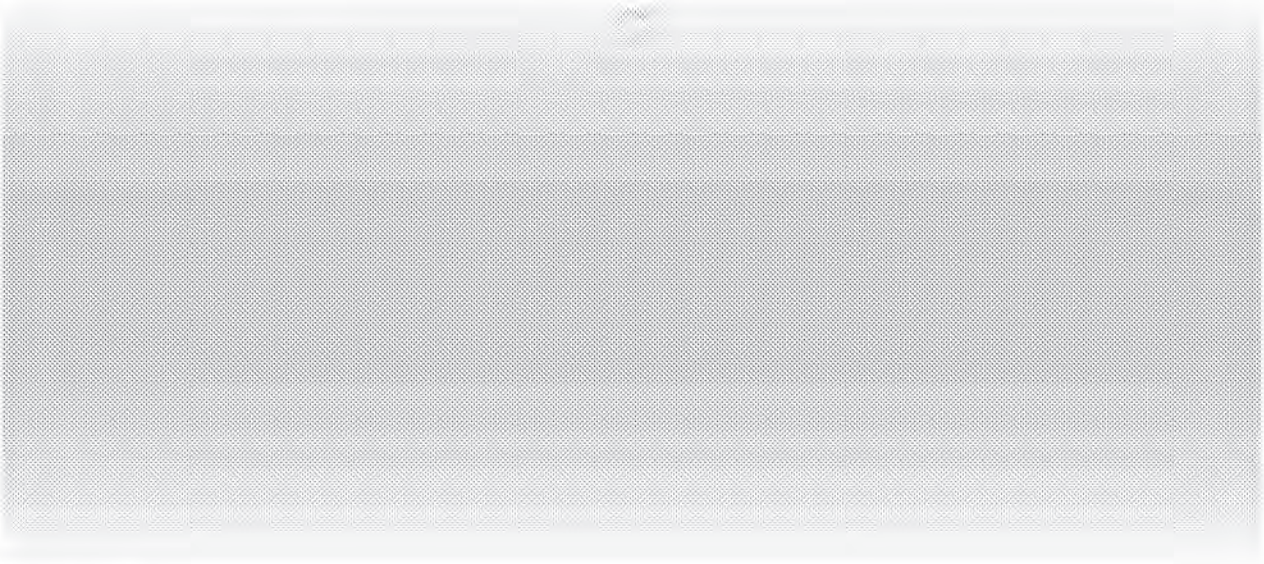
8.2 FDA Substances Added to Food

Substance	PROPYLENE GLYCOL
Used for (Technical Effect)	ANTICAKING AGENT OR FREE-FLOW AGENT, ANTIMICROBIAL AGENT, ANTIOXIDANT, DRYING AGENT, EMULSIFIER OR EMULSIFIER

	SALT, FLAVOR ENHANCER, FLAVORING AGENT OR ADJUVANT, FORMULATION AID, HUMECTANT, SOLVENT OR VEHICLE
Document Number (21 eCFR)	73.30 175.300 175.320 176.180 176.210 177.1390 177.1680 177.2420 177.2600 177.2800 178.3300 184.1666 169.175
FEMA Number	2940
GRAS Number	3

▸ FDA Substances Added to Food

8.3 Associated Foods



▸ FooDB

8.4 Evaluations of the Joint FAO / WHO Expert Committee on Food Additives - JECFA

Chemical Name	1,2-DIHYDROXYPROPANE
Evaluation Year	2002
ADI	0-25 mg/kg bw (1973)
Comments	Evaluation not finalized, pending definition of "flavouring agent"
Report	TRS 913-JECFA 59/112
Tox Monograph	FAS 48-JECFA 57/333 (2001)

▸ Joint FAO/WHO Expert Committee on Food Additives (JECFA)

9 Agrochemical Information

9.1 Agrochemical Category

Insecticide

▸ EPA Pesticide Ecotoxicity Database

10 Pharmacology and Biochemistry

10.1 MeSH Pharmacological Classification

Pharmaceutical Vehicles

A carrier or inert medium used as a solvent (or diluent) in which the medicinally active agent is formulated and or administered. (Dictionary of Pharmacy, 1986) (See all compounds classified as Pharmaceutical Vehicles.)

▸ Medical Subject Headings (MeSH)

Solvents

Liquids that dissolve other substances (solutes), generally solids, without any change in chemical composition, as, water containing sugar. (Grant and Hackh's Chemical Dictionary, 5th ed) (See all compounds classified as Solvents.)

▸ Medical Subject Headings (MeSH)

10.2 Absorption, Distribution and Excretion

Absorption of orally administered propylene glycol from the gastrointestinal tract, and its removal from the body, follow first order kinetics. Clearance from blood is rapid in humans, with a mean half-life of approx. 2 hr. Its metabolism is inhibited by pyrazole, indicating a role for alcohol dehydrogenase in this process. Once absorbed it is readily converted into lactic and pyruvic acids, which then enter the general metabolic pool.

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.20 (2001). Available from, as of December 31, 2009: https://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

▸ Hazardous Substances Data Bank (HSDB)

Propylene glycol is readily absorbed from the GI tract and distributed throughout total body water. Propylene glycol accumulation is reported to differ significantly among people maintained on a repetitive oral dosing schedule, due to intersubject variability in clearance.

Klaassen, C.D. (ed). Casarett and Doull's Toxicology. The Basic Science of Poisons. 6th ed. New York, NY: McGraw-Hill, 2001., p. 897

▸ Hazardous Substances Data Bank (HSDB)

The uptake of propylene glycol mist by humans was studied using 10% solution in labeled deionized water nebulized into a mist tent. Less than 5% of the mist entered the body, and of this 90% lodged in the nasopharynx and rapidly disappeared into the stomach. Very little was found in the lungs.

Cavender FL, Sowinski EJ; Patty's Toxicology CD-ROM (2005). NY, NY: John Wiley & Sons; Glycols. Online Posting Date: April 16, 2001

▸ Hazardous Substances Data Bank (HSDB)

Intravenous administration of propylene glycol in amounts of 3-15 g/sq m is followed by plasma concentration of 60 to 425 ug/mL, respectively, with ... a volume of distribution of 0.51 to 0.88 L/kg, and a clearance rate of about 300 mL/min/1.73 sq m. Cerebrospinal fluid concentrations are as high as 85% of the serum concentrations.

Ellenhorn, M.J., S. Schonwald, G. Ordog, J. Wasserberger. Ellenhorn's Medical Toxicology: Diagnosis and Treatment of Human Poisoning. 2nd ed. Baltimore, MD: Williams and Wilkins, 1997., p. 1156

▸ Hazardous Substances Data Bank (HSDB)

For more Absorption, Distribution and Excretion (Complete) data for Propylene glycol (20 total), please visit the HSDB record page.

▸ Hazardous Substances Data Bank (HSDB)

10.3 Metabolism / Metabolites

Propylene glycol undergoes metabolic oxidation to pyruvic acid, acetic acid, lactic acid, and propionaldehyde.

IPCS; Poisons Information Monograph 443: Propylene glycol (May 1994). Available from, as of January 4, 2009: https://www.inchem.org/documents/pims/chemical/pim443.htm

▸ Hazardous Substances Data Bank (HSDB)

In what is considered to be the main pathway of propylene glycol metabolism in mammals, propylene glycol is oxidized by alcohol dehydrogenase to lactaldehyde, then to lactate by aldehyde dehydrogenase. The lactate is further metabolized to pyruvate, carbon dioxide, and water. Lactate also contributes to glucose formation through gluconeogenic pathways. Lactate, via phosphoenol pyruvate, can be detoxified into glucose and stored as glycogen ... Excess production of lactic acid resulting from very large exposures to propylene glycol can produce a metabolic anion gap [anion gap = (Na+) - (Cl - + total CO2)] and metabolic acidosis. Serum levels of >180 mg/L [2.37mM] can result in toxicity.

DHHS/NTP-CERHR; NTP-CERHR Monograph on the Potential Human Reproductive and Developmental Effects of Propylene Glycol (March 2004) NIH Pub No. 04-4482 p.II-15 . Available from, as of January 11, 2010: https://cerhr.niehs.nih.gov/evals/eggp/propylene/PG_Monograph.pdf

▸ Hazardous Substances Data Bank (HSDB)

Synthesis of propylene glycol results in a 1:1 ratio of D and L stereoisomer forms. There is some, although incomplete, information in the literature about stereospecificity of the enzymes in the propylene glycol metabolic pathways ... In the main metabolic pathway, D and L forms of lactaldehyde and lactate are formed. In the horse and rabbit, ADH will oxidize the L form of propylene glycol and lactaldehyde more efficiently than the D form. L-lactic acidosis has been observed in both humans and animals following exposure to propylene glycol). The conversion of lactaldehyde to methylglyoxal by ADH and then to D-lactate by glyoxalase and reduced glutathione is thought to be an alternate route of metabolism ... D-lactate is cleared more slowly than L-lactate and is considered a poor substrate for gluconeogenesis. Methylglyoxal synthetase can convert the substrate, dihydroxyacetone phosphate, to methylglyoxal. However, in conditions where ketone levels are high, such as diabetes or starvation, methylglyoxal synthetase activity is increased, producing more methylglyoxal and D-lactate. Excessive production of D-lactate may result in its accumulation, especially in the

brain, which has a low level of catabolizing enzymes. Therefore, in cases of ketosis, excess levels of D-lactate may be exacerbated by propylene glycol. In a third possible metabolic pathway, propylene glycol can be phosphorylated, converted to acetol phosphate, lactaldehyde phosphate, lactyl phosphate, and lactic acid ... Metabolism of D and L forms of propylene glycol in this pathway is species-specific. The rabbit converts the L form of phosphorylated propylene glycol to lactic acid, whereas the rat and mouse can convert both forms. /D and L isomers/

DHHS/NTP-CERHR; NTP-CERHR Monograph on the Potential Human Reproductive and Developmental Effects of Propylene Glycol (March 2004) NIH Pub No. 04-4482 pp.II-17-18 . Available from, as of January 11, 2010: https://cerhr.niehs.nih.gov/evals/eggp/propylene/PG_Monograph.pdf

▸ Hazardous Substances Data Bank (HSDB)

Studies in humans and rodents suggest that the placenta has extremely limited capacity to metabolize propylene glycol. Class III ADH /was isolated/ from full term human placenta and found /to have/ low activity for ethanol and a Km value for octanol that was 100-times higher than the Class I ADH enzyme found in human liver ... ALDH from full-term human placentas had a lower activity and Vmax, and a higher Km value than ALDH isoenzymes from liver. In rats, placenta was found to have no ADH activity and ALDH activity in placenta was found to be 4-7% of liver activity

DHHS/NTP-CERHR; NTP-CERHR Monograph on the Potential Human Reproductive and Developmental Effects of Propylene Glycol (March 2004) NIH Pub No. 04-4482 p.II-23 . Available from, as of January 11, 2010: https://cerhr.niehs.nih.gov/evals/eggp/propylene/PG_Monograph.pdf

▸ Hazardous Substances Data Bank (HSDB)

For more Metabolism/Metabolites (Complete) data for Propylene glycol (12 total), please visit the HSDB record page.

▸ Hazardous Substances Data Bank (HSDB)

10.4 Biological Half-Life

Whole body: 1.4-30.5 hours (longer in infants and shorter in adults); [TDR, p. 1056]

TDR - Ryan RP, Terry CE, Leffingwell SS (eds). Toxicology Desk Reference: The Toxic Exposure and Medical Monitoring Index. 5th Ed. Washington DC: Taylor & Francis, 1999., p. 1056

▸ Haz-Map, Information on Hazardous Chemicals and Occupational Diseases

Intravenous administration of propylene glycol in amounts of 3-15 g/sq m is followed by plasma concentration of 60 to 425 ug/mL, respectively, with a half-life of 1.8 to 3.3 hours ...

Ellenhorn, M.J., S. Schonwald, G. Ordog, J. Wasserberger. Ellenhorn's Medical Toxicology: Diagnosis and Treatment of Human Poisoning. 2nd ed. Baltimore, MD: Williams and Wilkins, 1997., p. 1156

▸ Hazardous Substances Data Bank (HSDB)

/Infant, premature/ Oral: Mean half-life in premature infants was 19.3 hours (range 108-30.5).

IPCS; Poisons Information Monograph 443: Propylene glycol (May 1994). Available from, as of January 4, 2009: https://www.inchem.org/documents/pims/chemical/pim443.htm

▸ Hazardous Substances Data Bank (HSDB)

/Infant/ Dermal: 16.9 hours in an 8-month-old infant.

IPCS; Poisons Information Monograph 443: Propylene glycol (May 1994). Available from, as of January 4, 2009: https://www.inchem.org/documents/pims/chemical/pim443.htm

▸ Hazardous Substances Data Bank (HSDB)

Parenteral: 2.4 - 5.2 hr, 1.4 - 3.3 hr (mean 2.3 +/- 0.7 hr).

IPCS; Poisons Information Monograph 443: Propylene glycol (May 1994). Available from, as of January 4, 2009: https://www.inchem.org/documents/pims/chemical/pim443.htm

▸ Hazardous Substances Data Bank (HSDB)

For more Biological Half-Life (Complete) data for Propylene glycol (7 total), please visit the HSDB record page.

▸ Hazardous Substances Data Bank (HSDB)

10.5 Biochemical Reactions

- Rhea - Annotated Reactions Database

- PubChem

11 Use and Manufacturing

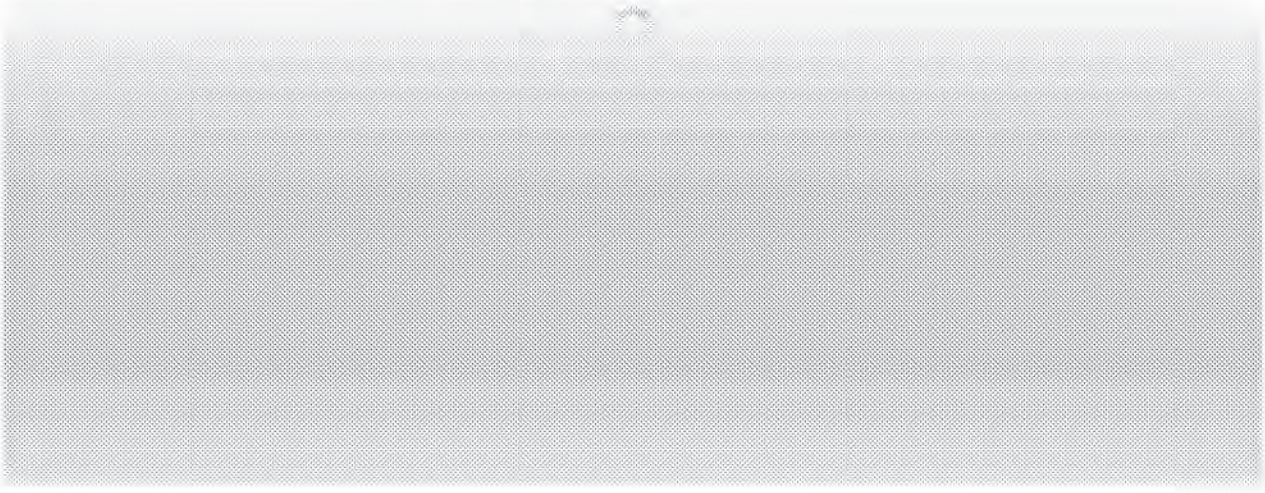
11.1 Uses

Cosmetic Ingredient Review Link

CIR ingredient: Propylene Glycol

- Cosmetic Ingredient Review (CIR)

EPA CPDat Chemical and Product Categories



The Chemical and Products Database, a resource for exposure-relevant data on chemicals in consumer products, Scientific Data, volume 5, Article number: 180125 (2018), DOI:10.1038/sdata.2018.125

- EPA Chemical and Products Database (CPDat)

Sources/Uses

Used in antifreeze and deicing solutions for cars, boats, and aircraft; also used as a solvent for paints and plastics and to create harmless, artificial smoke for training and theatrical purposes; [ATSDR ToxFAQs]

- Haz-Map, Information on Hazardous Chemicals and Occupational Diseases

Industrial Processes with risk of exposure

Painting (Solvents) [Category: Paint]

Photographic Processing [Category: Other]

- Haz-Map, Information on Hazardous Chemicals and Occupational Diseases

For propylene glycol (USEPA/OPP Pesticide Code: 068603) ACTIVE products with label matches. /SRP: Registered for use in the U.S. but approved pesticide uses may change periodically and so federal, state and local authorities must be consulted for currently approved uses./

U.S. Environmental Protection Agency/Office of Pesticide Program's Chemical Ingredients Database on Propylene Glycol (57-55-6). Available from, as of February 13, 2010: https://npirspublic.ceris.purdue.edu/ppis/

- Hazardous Substances Data Bank (HSDB)

Bacteriostat, Fungistat

USEPA/Office of Pesticide Programs; Reregistration Eligibility Decision Document - Propylene Glycol and Dipropylene Glycol p.4 EPA 739-R-06-002 (September 2006). Available from, as of February 15, 2010: https://www.epa.gov/pesticides/reregistration/status.htm

- Hazardous Substances Data Bank (HSDB)

Propylene glycol has become widely used as a solvent, extractant, and preservative in a variety of parenteral and nonparenteral pharmaceutical formulations. It is a better general solvent than glycerin and dissolves a wide variety of materials, such as corticosteroids, phenols, sulfa drugs, barbiturates, vitamins (A and D), most alkaloids, and many local anesthetics ... Propylene glycol is commonly used as a plasticizer in aqueous film-coating formulations. Propylene glycol is also used in cosmetics and in the food industry as a carrier for emulsifiers and as a

vehicle for flavors in preference to ethanol, since its lack of volatility provides a more uniform flavor.

Rowe, R.C., Sheskey, P.J., Quinn, M.E.; (Eds.), Handbook of Pharmaceutical Excipients 6th edition Pharmaceutical Press, London, England 2009, p. 592

▸ Hazardous Substances Data Bank (HSDB)

Propylene glycol is used as a skin-conditioning agent-humectant, solvent, viscosity-decreasing agent, and humectant in cosmetic formulations.

Anderson FA; J Am Col Toxicol 13 (6): 437-91 (1994)

▸ Hazardous Substances Data Bank (HSDB)

For more Uses (Complete) data for Propylene glycol (29 total), please visit the HSDB record page.

▸ Hazardous Substances Data Bank (HSDB)

Use (kg; approx.) in Germany (2009): >250

Consumption (g per capita; approx.) in Germany (2009): 0.00305

Calculated removal (%): 92.1

DOI:10.1021/acs.est.5b03332

▸ NORMAN Suspect List Exchange

Propylene glycol is used as a solvent for intravenous, oral, and topical pharmaceutical preparations It is generally considered safe. Intravenous lorazepam contains the largest amount of propylene glycol of commonly used drugs. The World Health Organization (WHO) recommends a maximum consumption of 25 mg/kg/day (1.8 g/day for a 75 kg male) of propylene glycol when used as a food additive, but this limit does not address its use as a drug solvent.

▸ Toxin and Toxin Target Database (T3DB)

11.1.1 Use Classification

EPA Safer Chemical Functional Use Classes -> Enzymes and Enzyme Stabilizers;Solvents

▸ EPA Safer Choice

Safer Chemical Classes -> Green half-circle - The chemical is expected to be of low concern

- EPA Safer Choice

Food additives

- EU Food Improvement Agents

Fragrance Ingredients

- International Fragrance Association (IFRA)

Food Additives -> CARRIER_SOLVENT; GLAZING_AGENT; HUMECTANT; -> JECFA Functional Classes

- Joint FAO/WHO Expert Committee on Food Additives (JECFA)

Cosmetics -> Viscosity controlling; Humectant; Skin conditioning; Solvent

S13 | EUCOSMETICS | Combined Inventory of Ingredients Employed in Cosmetic Products (2000) and Revised Inventory (2006) | DOI:10.5281/zenodo.2624118

- NORMAN Suspect List Exchange

SOLVENTS

- USGS Columbia Environmental Research Center

11.1.2 Industry Uses

Lubricating agent	Dye
Softener and conditioner	Other
Agricultural chemicals (non-pesticidal)	Pigments
Paint additives and coating additives not described by other categories	Processing aids, specific to petrol
Surfactant (surface active agent)	Finishing agents
Cleaning agent	Humectant
Anti-freeze agent	Processing aids not otherwise spe
Plasticizer	Diluent
Surface active agents	Hardener
Soil amendments (fertilizers)	Intermediates

https://www.epa.gov/chemical-data-reporting

- EPA Chemical Data Reporting (CDR)

11.1.3 Consumer Uses

Monomers	Paint additives and coating additives not described by other categ
Surface active agents	Humectant
Anti-freeze agent	Finishing agents
Plasticizer	Filler
Odor agents	Preservative
Fragrance	Diluent
Freeze-thaw additive	Dye
Brightener	Pigments
Surfactant (surface active agent)	Other
Agricultural chemicals (non-pesticidal)	Not Known or Reasonably Ascertainable

https://www.epa.gov/chemical-data-reporting

▸ EPA Chemical Data Reporting (CDR)

11.1.4 Household Products

Household & Commercial/Institutional Products

Information on 2231 consumer products that contain Propylene glycol in the following categories is provided:

- Auto Products
- Commercial / Institutional
- Hobby/Craft
- Home Maintenance
- Inside the Home
- Landscaping/Yard
- Personal Care
- Pesticides
- Pet Care

▸ Consumer Product Information Database (CPID)

11.2 Methods of Manufacturing

Preparation of levorotary propylene glycol from hydroxyacetone by yeast reduction.

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 2006., p. 1350

Hazardous Substances Data Bank (HSDB)

Propylene glycol is produced by the non-catalytic liquid-phase hydration of propylene oxide at 100-200 °C

CHEMICAL PRODUCTS SYNOPSIS: Propylene Glycol, 1984

Hazardous Substances Data Bank (HSDB)

Manufactured by treating propylene with chlorinated water to form the chlorohydrin, which is converted to the glycol by treatment with sodium carbonate solution. It is also prepared by heating glycerol with sodium hydroxide.

Burdock, G.A. (ed.). Fenaroli's Handbook of Flavor Ingredients. 6th ed.Boca Raton, FL 2010, p. 1749

Hazardous Substances Data Bank (HSDB)

The only industrial process for manufacturing propylene glycol is direct hydrolysis of propylene oxide with water. Dipropylene glycol and tripropylene glycol are formed by sequential addition of propylene oxide to propylene glycol. Consequently, all three products are produced simultaneously and separated by distillation.

Sullivan CJ; Ullmann's Encyclopedia of Industrial Chemistry 7th ed. (2008). New York, NY: John Wiley & Sons; Propanediols. Online Posting Date: June 15, 2000.

Hazardous Substances Data Bank (HSDB)

For more Methods of Manufacturing (Complete) data for Propylene glycol (6 total), please visit the HSDB record page.

Hazardous Substances Data Bank (HSDB)

11.3 Impurities

... Impurities of propylene glycol include chlorides (1 ppm max), iron (1.0 ppm max), water (0.2 wt% max), and dipropylene glycol (<0.2%).

DHHS/NTP-CERHR; NTP-CERHR Monograph on the Potential Human Reproductive and Developmental Effects of Propylene Glycol (March 2004) NIH Pub No. 04-4482 p. . Available from, as of January 11, 2010: https://cerhr.niehs.nih.gov/evals/egpg/propylene/PG_Monograph.pdf

Hazardous Substances Data Bank (HSDB)

11.4 Formulations / Preparations

GRADE: refined, technical, USP, FCC, feed

Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 15th Edition. John Wiley & Sons, Inc. New York, NY 2007., p. 1050

▸ Hazardous Substances Data Bank (HSDB)

Both the industrial-grade and USP grade have at least 99.5% purity. /From table/

Ullmann's Encyclopedia of Industrial Chemistry. 6th ed.Vol 1: Federal Republic of Germany: Wiley-VCH Verlag GmbH & Co. 2003 to Present, p. V30: 203 (2003)

▸ Hazardous Substances Data Bank (HSDB)

11.5 Consumption Patterns

52% for polyester resins; 11% exported(1973); 8.5% for cellophane; 7.5% as a tobacco humectant; 7% for synthesis of polymeric plasticizers; 4% as a component of brake and other functional fluids; 10% for misc applications (1973)

▸ Hazardous Substances Data Bank (HSDB)

Unsaturated polyester resins, 47%; Foods, pharmaceuticals, cosmetics, 11%; Pet foods, 10%; Tobacco, 6%; Plasticizers, 3%; Cellophane, 3%; Functional fluids, 8%; Coatings, 6%; Miscellaneous and other, 6% (1983)

CHEMICAL PRODUCTS SYNOPSIS: Propylene Glycol, 1984

▸ Hazardous Substances Data Bank (HSDB)

CHEMICAL PROFILE: Propylene Glycol. US End-use Pattern for Propylene Glycol in 1986.

Table: End-use pattern for propylene glycol in 1986

End-use	Percent
Unsaturated polyester resins	46
Exports	18
Pharmaceuticals and food	8
Semi-moist pet food	7
Humectant for tobacco	5

Polymeric plasticizers	5
Paint and coatings	4
Functional fluids	3
Cellophane	2
Miscellaneous	2

Anonymous; Chemical Marketing Reporter 231 (6): 50 (1987); 9 February 1987

▸ Hazardous Substances Data Bank (HSDB)

CHEMICAL PROFILE: Propylene Glycol. US End-use Pattern for Propylene Glycol in 1989.

Table: End-use pattern for propylene glycol in 1989

End-use	**Percent**
Unsaturated polyester resins	41
Exports	29
Food, pharmaceuticals and cosmetics	11
Semi-moist pet food	7
Humectant for tobacco	4
Functional fluids	4
Miscellaneous	4

Anonymous; Chemical Marketing Reporter 237 (1): 46 (1990); 1 January 1990

▸ Hazardous Substances Data Bank (HSDB)

For more Consumption Patterns (Complete) data for Propylene glycol (21 total), please visit the HSDB record page.

▸ Hazardous Substances Data Bank (HSDB)

11.6 U.S. Production

Aggregated Product Volume

2019: 1,000,000,000 - <5,000,000,000 lb

2018: 1,000,000,000 - <5,000,000,000 lb

2017: 1,000,000,000 - <5,000,000,000 lb

2016: 1,000,000,000 - <5,000,000,000 lb

https://www.epa.gov/chemical-data-reporting

▸ EPA Chemical Data Reporting (CDR)

(1972) 2.60 X 10+11 g

▸ Hazardous Substances Data Bank (HSDB)

(1975) 1.77 X 10+11 g

▸ Hazardous Substances Data Bank (HSDB)

(1984) 2.10 X 10+10+11 g

USITC Syn Org Chem-U.S. Prod/Sales 1984 p.257

▸ Hazardous Substances Data Bank (HSDB)

(1989) Western Europe produced 708 million pounds (325 kilotons) and consumed 660 million pounds (300 kilotons).

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.9 (2001). Available from, as of December 31, 2009: https://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

▸ Hazardous Substances Data Bank (HSDB)

For more U.S. Production (Complete) data for Propylene glycol (23 total), please visit the HSDB record page.

▸ Hazardous Substances Data Bank (HSDB)

11.7 U.S. Imports

(1984) 2.56 X 10+11 g

Bureau Of The Census. U.S. Imports For Consumption And General Imports 1984 p.1-360

▸ Hazardous Substances Data Bank (HSDB)

CHEMICAL PROFILE: Propylene glycol. US Imports: 1994: 12 million pounds.

Anonymous; Chemical Marketing Reporter 249 (7): 37 (1996); 12 February 1996

▸ Hazardous Substances Data Bank (HSDB)

CHEMICAL PROFILE: Propylene glycol. US Imports: 1996: 31 million pounds; averaged 10 million pounds per year for the five year period 1992-1996.

Anonymous; Chemical Market Reporter 254 (3): 37 (1998); 20 July 1998

▸ Hazardous Substances Data Bank (HSDB)

CHEMICAL PROFILE: Propylene glycol. US Imports: 1999: 43 million pounds; 2000: 32 million pounds.

Kirschner M; Chemical Market Reporter 260 (11): 30 (2001); 24 September 2001

▸ Hazardous Substances Data Bank (HSDB)

For more U.S. Imports (Complete) data for Propylene glycol (6 total), please visit the HSDB record page.

▸ Hazardous Substances Data Bank (HSDB)

11.8 U.S. Exports

(1972) 4.90 X 10+10 g

▸ Hazardous Substances Data Bank (HSDB)

(1976) 2.91 X 10+10 g

▸ Hazardous Substances Data Bank (HSDB)

(1984) 2.18 X 10+11 g

Bureau Of The Census. U.S. Exports, Schedule E, 1984 p.2-76

▸ Hazardous Substances Data Bank (HSDB)

(1986-1989) avg 75,000 tons/yr

Martin AE, Murphy FH; Glycols, Propylene Glycols. Kirk-Othmer Encyclopedia of Chemical Technology (1994). John Wiley & Sons, Inc. Online Posting Date: December 4, 2000

▸ Hazardous Substances Data Bank (HSDB)

For more U.S. Exports (Complete) data for Propylene glycol (10 total), please visit the HSDB record page.

▸ Hazardous Substances Data Bank (HSDB)

11.9 General Manufacturing Information

Industry Processing Sectors

Fabricated Metal Product Manufacturing	All other Petroleum and Coal Products Manufacturing
Rubber Product Manufacturing	Printing and Related Support Activities
Printing Ink Manufacturing	Furniture and Related Product Manufacturing
Plastics Product Manufacturing	Construction
Wood Product Manufacturing	Oil and Gas Drilling, Extraction, and Support activities
Computer and Electronic Product Manufacturing	All Other Chemical Product and Preparation Manufactu
Paper Manufacturing	Not Known or Reasonably Ascertainable
Utilities	Plastics Material and Resin Manufacturing
Synthetic Dye and Pigment Manufacturing	Petrochemical Manufacturing
Pharmaceutical and Medicine Manufacturing	Soap, Cleaning Compound, and Toilet Preparation Manu

EPA Chemical Data Reporting (CDR)

EPA TSCA Commercial Activity Status

1,2-Propanediol: ACTIVE

EPA Chemicals under the TSCA

Dipropylene glycol represents 10% and tripropylene glycol represents 1% of propylene glycol produced

CHEMICAL PRODUCTS SYNOPSIS: Propylene Glycol, 1984

Hazardous Substances Data Bank (HSDB)

At least two commercial grades exist - a high-purity industrial grade, and a higher-purity grade called "super-pure" or USP grade.

Ullmann's Encyclopedia of Industrial Chemistry. 6th ed.Vol 1: Federal Republic of Germany: Wiley-VCH Verlag GmbH & Co. 2003 to Present, p. V30: 202 (2003)

Hazardous Substances Data Bank (HSDB)

1,2-Propanediol is available in the List of authorized monomers and other starting substances which shall be used for the manufacture of plastic materials and articles intended to come into contact with foodstuffs /from the EU (1990)/.

Sheftel, V.O.; Indirect Food Additives and Polymers. Migration and Toxicology. Lewis Publishers, Boca Raton, FL. 2000., p. 275

Hazardous Substances Data Bank (HSDB)

12 Identification

12.1 Analytic Laboratory Methods

Method: OSHA PV2051; Prodecure: gas chromatography using a flame ionization detector; Analyte: propylene glycol; Matrix: air; Detection Limit: 0.011 ppm (0.035 mg/cu m).

U.S. Department of Labor/Occupational Safety and Health Administration's Index of Sampling and Analytical Methods. Propylene Glycol (57-55-6). Available from, as of February 15, 2010: https://www.osha.gov/dts/sltc/methods/toc.html

Hazardous Substances Data Bank (HSDB)

Method: AOAC 971.02, Glycerol, Propylene Glycol, and Triethylene Glycol, Gas Chromatographic Method; Analyte: propylene glycol; Matrix: cased cigarette cut filler and ground tobacco; Detection Level: not provided.

Horwitz W, ed.; Official Methods of Analysis of AOAC International 17th ed. (2000). CD-ROM, AOAC International, Gaithersburg, MD

Hazardous Substances Data Bank (HSDB)

Method: AOAC 947.09, Propylene Glycol in Vanilla Extract, Titrimetric Method; Analyte: propylene glycol; Matrix: vanilla extract; Detection Level: not provided.

Horwitz W, ed.; Official Methods of Analysis of AOAC International 17th ed. (2000). CD-ROM, AOAC International, Gaithersburg, MD

Hazardous Substances Data Bank (HSDB)

Method: AOAC 970.61, Propylene Glycol in Cosmetics, Gas Chromatographic Method; Analyte: propylene glycol; Matrix: applicable to all types of cosmetics; Detection Level: not provided.

Horwitz W, ed.; Official Methods of Analysis of AOAC International 17th ed. (2000). CD-ROM, AOAC International, Gaithersburg, MD

Hazardous Substances Data Bank (HSDB)

For more Analytic Laboratory Methods (Complete) data for Propylene glycol (6 total), please visit the HSDB record page.

Hazardous Substances Data Bank (HSDB)

12.2 NIOSH Analytical Methods

GLYCOLS 5523

▸ NIOSH Manual of Analytical Methods

13 Safety and Hazards

13.1 Hazards Identification

13.1.1 GHS Classification

1 of 2 View All

Note	*This chemical does not meet GHS hazard criteria for 98% (6762 of 6899) of all reports. Pictograms displayed are for 2% (137 of 6899) of reports that indicate hazard statements.*
GHS Hazard Statements	Not Classified Reported as not meeting GHS hazard criteria by 6762 of 6899 companies (only 2% companies provided GHS information). For more detailed information, please visit ECHA C&L website.
ECHA C&L Notifications Summary	*Aggregated GHS information provided per 6899 reports by companies from 22 notifications to the ECHA C&L Inventory.* *Reported as not meeting GHS hazard criteria per 6762 of 6899 reports by companies.* *There are 17 notifications provided by 137 of 6899 reports by companies with hazard statement code(s).* *Information may vary between notifications depending on impurities, additives, and other factors. The percentage value in parenthesis indicates the notified classification ratio from companies that provide hazard codes. Only hazard codes with percentage values above 10% are shown. For more detailed information, please visit ECHA C&L website.*

▸ European Chemicals Agency (ECHA)

13.1.2 Hazard Classes and Categories

Not Classified

▸ European Chemicals Agency (ECHA)

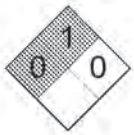
Specific target organ toxicity - Single exposure - Category 1 (central nervous system, haemal system), Category 3 (narcotic effects)

Specific target organ toxicity - Repeated exposure - Category 1 (central nervous system, respiratory organs)

▸ NITE-CMC

13.1.3 NFPA Hazard Classification

1 of 2 View All

NFPA 704 Diamond	 0-1-0
NFPA Health Rating	0 - Materials that, under emergency conditions, would offer no hazard beyond that of ordinary combustible materials.
NFPA Fire Rating	1 - Materials that must be preheated before ignition can occur. Materials require considerable preheating, under all ambient temperature conditions, before ignition and combustion can occur.
NFPA Instability Rating	0 - Materials that in themselves are normally stable, even under fire conditions.

▸ Hazardous Substances Data Bank (HSDB)

13.1.4 EPA Safer Chemical

Chemical: 1,2-Propanediol

Green half-circle - The chemical is expected to be of low concern based on experimental and modeled data. Additional data would strengthen EPA's confidence in the chemical's safer status.

▸ EPA Safer Choice

13.1.5 Health Hazards

Liquid may irritate eyes. (USCG, 1999)

U.S. Coast Guard. 1999. Chemical Hazard Response Information System (CHRIS) - Hazardous Chemical Data. Commandant Instruction 16465.12C. Washington, D.C.: U.S. Government Printing Office.

▸ CAMEO Chemicals

13.1.6 Fire Hazards

This chemical is combustible. (NTP, 1992)

National Toxicology Program, Institute of Environmental Health Sciences, National Institutes of Health (NTP). 1992. National Toxicology Program Chemical Repository Database. Research Triangle Park, North Carolina.

▸ CAMEO Chemicals

Combustible.

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

13.1.7 Hazards Summary

Propylene glycol is a synthetic liquid substance that absorbs water. Propylene glycol is also used to make polyester compounds, and as a base for deicing solutions. Propylene glycol is used by the chemical, food, and pharmaceutical industries as an antifreeze when leakage might lead to contact with food. The Food and Drug Administration (FDA) has classified propylene glycol as an additive that is "generally recognized as safe" for use in food. It is used to absorb extra water and maintain moisture in certain medicines, cosmetics, or food products. It is a solvent for food colors and flavors, and in the paint and plastics industries. Propylene glycol is also used to create artificial smoke or fog used in fire-fighting training and in theatrical productions. Other names for propylene glycol are 1,2-dihydroxypropane, 1,2-propanediol, methyl glycol, and trimethyl glycol. Propylene glycol is clear, colorless, slightly syrupy liquid at room temperature. It may exist in air in the vapor form, although propylene glycol must be heated or briskly shaken to produce a vapor. Propylene glycol is practically odorless and tasteless.

▸ Agency for Toxic Substances and Disease Registry (ATSDR)

Propylene glycol is designated by the FDA as GRAS (generally recognized as safe) for use as a food additive. It is commonly used in cosmetics and topical medications. Patch testing with propylene glycol is difficult because of irritant effects. It may cause allergic contact dermatitis in a small percentage of cases. It may also cause non-immunologic contact urticaria. [Marks, p.

156-7] Allergic contact dermatitis in a photographic developer using Flexicolor; [Kanerva, p. 1830] An eye irritant; [ICSC] Oral LD50 = 21,000 mg/kg in dogs; Causes CNS depression and coma in high-dose, animal-feeding studies; [AIHA] See Ethylene glycol.

Marks - Marks JG, DeLeo VA. Contact and Occupational Dermatology, 2nd Ed. St. Louis: Mosby, 1997., p. 156-7

Kanerva - Rustemeyer L, Elsner P, John SM, Maibach HI (eds). Kanerva's Occupational Dermatology, 2nd Ed. Berlin: Springer-Verlag, 2012., p. 1830

AIHA - Workplace Environmental Exposure Level Guides, Complete Set and Update Set. Fairfax, VA: AIHA, 2008.

▸ Haz-Map, Information on Hazardous Chemicals and Occupational Diseases

13.1.8 Fire Potential

Combustible liquid when exposed to heat or flame ...

Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3061

▸ Hazardous Substances Data Bank (HSDB)

13.1.9 Skin, Eye, and Respiratory Irritations

Mildly irritating to the eyes.

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p. (2001). Available from, as of December 31, 2009: https://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

▸ Hazardous Substances Data Bank (HSDB)

May cause primary skin irritation in some people, possibly due to dehydration, but the material is not a sensitizer.

Cavender FL, Sowinski EJ; Patty's Toxicology CD-ROM (2005). NY, NY: John Wiley & Sons; Glycols. Online Posting Date: April 16, 2001

▸ Hazardous Substances Data Bank (HSDB)

May cause transitory stinging, blepharospasm, and lacrimation.

Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons, New York, N.Y. (2001)., p. V7 33

▸ Hazardous Substances Data Bank (HSDB)

13.2 Safety and Hazard Properties

13.2.1 Flammable Limits

Lower flammable limit: 2.6% by volume; Upper flammable limit: 12.5% by volume

Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 325-102

▸ Hazardous Substances Data Bank (HSDB)

13.2.2 Lower Explosive Limit (LEL)

2.6 % (NTP, 1992)

National Toxicology Program, Institute of Environmental Health Sciences, National Institutes of Health (NTP). 1992. National Toxicology Program Chemical Repository Database. Research Triangle Park, North Carolina.

▸ CAMEO Chemicals

2.6%

▸ Occupational Safety and Health Administration (OSHA)

13.2.3 Upper Explosive Limit (UEL)

12.6 % (NTP, 1992)

National Toxicology Program, Institute of Environmental Health Sciences, National Institutes of Health (NTP). 1992. National Toxicology Program Chemical Repository Database. Research Triangle Park, North Carolina.

▸ CAMEO Chemicals

12.6%

▸ Occupational Safety and Health Administration (OSHA)

13.2.4 Explosive Limits and Potential

Above 99 °C explosive vapor/air mixtures may be formed.

International Program on Chemical Safety/Commission of the European Communities; International Chemical Safety Card on Propylene glycol (July, 1997). Available from, as of January 4, 2010: https://www.inchem.org/pages/icsc.html

▸ Hazardous Substances Data Bank (HSDB)

Explosive in the form of vapor when exposed to heat or flame. May react with hydrofluoric acid + nitric acid + silver nitrate to form the explosive silver fulminate.

Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3061

▸ Hazardous Substances Data Bank (HSDB)

Lower explosive limit: 2.6%; Upper explosive limit: 12.6%

Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3061

▸ Hazardous Substances Data Bank (HSDB)

Explosive limits , vol% in air: 2.6-12.6

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

13.3 First Aid Measures

Inhalation First Aid

Fresh air, rest.

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

Skin First Aid

Remove contaminated clothes. Rinse skin with plenty of water or shower.

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

Eye First Aid

Rinse with plenty of water (remove contact lenses if easily possible).

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

Ingestion First Aid

Rinse mouth. Seek medical attention if you feel unwell.

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

13.3.1 First Aid

EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.

SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment.

INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.

INGESTION: DO NOT INDUCE VOMITING. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. Be prepared to transport the victim to a hospital if advised by a physician. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

National Toxicology Program, Institute of Environmental Health Sciences, National Institutes of Health (NTP). 1992. National Toxicology Program Chemical Repository Database. Research Triangle Park, North Carolina.

▸ CAMEO Chemicals

13.4 Fire Fighting

Fire Extinguishing Agents: Water fog, alcohol foam, carbon dioxide, dry chemical. (USCG, 1999)

U.S. Coast Guard. 1999. Chemical Hazard Response Information System (CHRIS) - Hazardous Chemical Data. Commandant Instruction 16465.12C. Washington, D.C.: U.S. Government Printing Office.

▸ CAMEO Chemicals

Use water spray, powder, alcohol-resistant foam, carbon dioxide.

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

13.4.1 Fire Fighting Procedures

Water fog, alcohol foam, carbon dioxide, dry chemical.

U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Volume II. Washington, D.C.: U.S. Government Printing Office, 1984-5.

▸ Hazardous Substances Data Bank (HSDB)

In case of fire, keep drums, etc, cool by spraying water.

International Program on Chemical Safety/Commission of the European Communities; International Chemical Safety Card on Propylene glycol (July, 1997). Available from, as of January 4, 2010: https://www.inchem.org/pages/icsc.html

▸ Hazardous Substances Data Bank (HSDB)

13.4.2 Firefighting Hazards

Vapor is heavier than air.

International Program on Chemical Safety/Commission of the European Communities; International Chemical Safety Card on Propylene glycol (July, 1997). Available from, as of January 4, 2010: https://www.inchem.org/pages/icsc.html

▸ Hazardous Substances Data Bank (HSDB)

13.5 Accidental Release Measures

13.5.1 Spillage Disposal

Absorb liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

13.5.2 Cleanup Methods

SRP: Wastewater from contaminant suppression, cleaning of protective clothing/equipment, or contaminated sites should be contained and evaluated for subject chemical or decomposition product concentrations. Concentrations shall be lower than applicable environmental discharge or disposal criteria. Alternatively, pretreatment and/or discharge to a permitted wastewater treatment facility is acceptable only after review by the governing authority and assurance that "pass through" violations will not occur. Due consideration shall be given to remediation worker exposure (inhalation, dermal and ingestion) as well as fate during treatment, transfer and disposal. If it is not practicable to manage the chemical in this fashion, it must be evaluated in accordance with EPA 40 CFR Part 261, specifically Subpart B, in order to determine the appropriate local, state and federal requirements for disposal.

- Hazardous Substances Data Bank (HSDB)

Collect leaking and spilled liquid in sealable containers as far as possible. Wash away spilled liquid with plenty of water.

International Program on Chemical Safety/Commission of the European Communities; International Chemical Safety Card on Propylene glycol (July, 1997). Available from, as of January 4, 2010: https://www.inchem.org/pages/icsc.html

- Hazardous Substances Data Bank (HSDB)

13.5.3 Disposal Methods

SRP: The most favorable course of action is to use an alternative chemical product with less inherent propensity for occupational harm/injury/toxicity or environmental contamination. Recycle any unused portion of the material for its approved use or return it to the manufacturer or supplier. Ultimate disposal of the chemical must consider: the material's impact on air quality; potential migration in soil or water; effects on animal and plant life; and conformance with environmental and public health regulations.

- Hazardous Substances Data Bank (HSDB)

13.5.4 Preventive Measures

SRP: The scientific literature for the use of contact lenses by industrial workers is inconsistent. The benefits or detrimental effects of wearing contact lenses depend not only upon the substance, but also on factors including the form of the substance, characteristics and duration of the exposure, the uses of other eye protection equipment, and the hygiene of the lenses. However, there may be individual substances whose irritating or corrosive properties are such that the wearing of contact lenses would be harmful to the eye. In those specific cases, contact

lenses should not be worn. In any event, the usual eye protection equipment should be worn even when contact lenses are in place.

▸ Hazardous Substances Data Bank (HSDB)

SRP: Local exhaust ventilation should be applied wherever there is an incidence of point source emissions or dispersion of regulated contaminants in the work area. Ventilation control of the contaminant as close to its point of generation is both the most economical and safest method to minimize personnel exposure to airborne contaminants. Ensure that the local ventilation moves the contaminant away from the worker.

▸ Hazardous Substances Data Bank (HSDB)

Above 99 °C use a closed system, ventilation.

International Program on Chemical Safety/Commission of the European Communities; International Chemical Safety Card on Propylene glycol (July, 1997). Available from, as of January 4, 2010: https://www.inchem.org/pages/icsc.html

▸ Hazardous Substances Data Bank (HSDB)

Propylene glycol should be handled in a well-ventilated environment; eye protection is recommended.

Rowe, R.C., Sheskey, P.J., Quinn, M.E.; (Eds.), Handbook of Pharmaceutical Excipients 6th edition Pharmaceutical Press, London, England 2009, p. 593

▸ Hazardous Substances Data Bank (HSDB)

13.6 Handling and Storage

13.6.1 Nonfire Spill Response

SMALL SPILLS AND LEAKAGE: If you should spill this chemical, use absorbent paper to pick up all liquid spill material. Seal the absorbent paper, as well as any of your clothing which may be contaminated, in a vapor-tight plastic bag for eventual disposal. Wash any surfaces you may have contaminated with a soap and water solution. Do not reenter the contaminated area until the Safety Officer (or other responsible person) has verified that the area has been properly cleaned.

STORAGE PRECAUTIONS: You should protect this material from exposure to light and moisture. Keep it away from oxidizing materials and store it under refrigerated temperatures. (NTP, 1992)

National Toxicology Program, Institute of Environmental Health Sciences, National Institutes of Health (NTP). 1992. National Toxicology Program Chemical Repository Database. Research Triangle Park, North

Carolina.

▸ CAMEO Chemicals

13.6.2 Safe Storage

Separated from strong oxidants and alkalis. Dry. Well closed. Ventilation along the floor.

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

13.6.3 Storage Conditions

Propylene glycol is hygroscopic and should be stored in a well-closed container, protected from light, in a cool, dry place.

Rowe, R.C., Sheskey, P.J., Quinn, M.E.; (Eds.), Handbook of Pharmaceutical Excipients 6th edition Pharmaceutical Press, London, England 2009, p. 593

▸ Hazardous Substances Data Bank (HSDB)

Propylene glycol, dipropylene glycol, and tripropylene glycol are stable materials that require no special handling procedures. They are noncorrosive and can be transported or stored in stainless steel, aluminum, and lined steel containers. Carbon steel is also acceptable, although slight iron contamination may occur upon extended periods of storage. U.S.P.-grade propylene glycol is typically stored in stainless steel.

Sullivan, CJ; Ullmann's Encyclopedia of Industrial Chemistry 7th ed. (2008). NY, NY: John Wiley & Sons; Propanediols. Online Posting Date: June 15, 2000.

▸ Hazardous Substances Data Bank (HSDB)

13.7 Exposure Control and Personal Protection

13.7.1 Other Standards Regulations and Guidelines

Workplace Environmental Exposure Level (WEEL): 8-hr Time-weighted Average (TWA) 10vmg/cu m.

American Industrial Hygiene Association; Emergency Response Planning Guidelines & Workplace Environmental Exposure Levels. Fairfax, VA 2009, p. 42

▸ Hazardous Substances Data Bank (HSDB)

13.7.2 Inhalation Risk

No indication can be given whether a harmful concentration in the air will be reached.

- ILO-WHO International Chemical Safety Cards (ICSCs)

13.7.3 Effects of Short Term Exposure

The substance is mildly irritating to the eyes and respiratory tract. Ingestion of large amounts could cause metabolic acidosis.

- ILO-WHO International Chemical Safety Cards (ICSCs)

13.7.4 Acceptable Daily Intakes

JECFA: ADI: 0 to 25 mg/kg bw

Burdock, G.A. (ed.). Fenaroli's Handbook of Flavor Ingredients. 6th ed.Boca Raton, FL 2010, p. 1748

- Hazardous Substances Data Bank (HSDB)

13.7.5 Allowable Tolerances

Residues of propylene glycol are exempted from the requirement of a tolerance when used in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops or to raw agricultural commodities after harvest. Use: solvent, cosolvent.

40 CFR 180.910 (USEPA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of February 7, 2010: https://www.ecfr.gov

- Hazardous Substances Data Bank (HSDB)

Residues of propylene glycol are exempted from the requirement of a tolerance when used in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to animals. Use: solvent, cosolvent.

40 CFR 180.930 (USEPA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of February 7, 2010: https://www.ecfr.gov

- Hazardous Substances Data Bank (HSDB)

13.7.6 Personal Protective Equipment (PPE)

Goggles. (USCG, 1999)

U.S. Coast Guard. 1999. Chemical Hazard Response Information System (CHRIS) - Hazardous Chemical Data. Commandant Instruction 16465.12C. Washington, D.C.: U.S. Government Printing Office.

▸ CAMEO Chemicals

Protective gloves, safety spectacles.

International Program on Chemical Safety/Commission of the European Communities; International Chemical Safety Card on Propylene glycol (July, 1997). Available from, as of January 4, 2010: https://www.inchem.org/pages/icsc.html

▸ Hazardous Substances Data Bank (HSDB)

13.7.7 Preventions

Fire Prevention

NO open flames.

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

Inhalation Prevention

Avoid inhalation of mist and vapour. Use ventilation.

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

Skin Prevention

Protective gloves.

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

Eye Prevention

Wear safety spectacles.

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

Ingestion Prevention

Do not eat, drink, or smoke during work.

▸ ILO-WHO International Chemical Safety Cards (ICSCs)

13.8 Stability and Reactivity

13.8.1 Air and Water Reactions

Water soluble.

▸ CAMEO Chemicals

13.8.2 Reactive Group

Alcohols and Polyols

▸ CAMEO Chemicals

13.8.3 Reactivity Profile

PROPYLENE GLYCOL is hygroscopic. It is sensitive to excessive heat (tends to oxidize at high temperatures). This compound can react with oxidizing materials. It is incompatible with acid chlorides, acid anhydrides, chloroformates, and reducing agents. It dissolves many essential oils. A mixture of this compound with hydrofluoric acid and silver nitrate was put in a glass bottle which burst 30 minutes later. (NTP, 1992)

National Toxicology Program, Institute of Environmental Health Sciences, National Institutes of Health (NTP). 1992. National Toxicology Program Chemical Repository Database. Research Triangle Park, North Carolina.

▸ CAMEO Chemicals

13.8.4 Hazardous Reactivities and Incompatibilities

Reacts with strong oxidants, causing fire hazard.

International Program on Chemical Safety/Commission of the European Communities; International Chemical Safety Card on Propylene glycol (July, 1997). Available from, as of January 4, 2010: https://www.inchem.org/pages/icsc.html

▸ Hazardous Substances Data Bank (HSDB)

Propylene glycol is incompatible with oxidizing reagents such as potassium permanganate.

Rowe, R.C., Sheskey, P.J., Quinn, M.E.; (Eds.), Handbook of Pharmaceutical Excipients 6th edition Pharmaceutical Press, London, England 2009, p. 593

▸ Hazardous Substances Data Bank (HSDB)

No significantly dangerous substances are produced after contact with light, humidity or commonly available chemicals. Propylene glycol may react with hydrofluoric acid + nitric acid + silver nitrate to form the explosive silver fulminate.

IPCS; Poisons Information Monograph 443: Propylene glycol (May 1994). Available from, as of January 4, 2009: https://www.inchem.org/documents/pims/chemical/pim443.htm

▸ Hazardous Substances Data Bank (HSDB)

A chemical polishing mixture /of hydrofluoric acid, propylene glycol, and silver nitrate/ was put into a closed glass bottle which burst 30 min later, and formation of silver fulminate was suggested. However, in absence of the silver salt such mixtures evolve gas and should not be stored in any event, especially after use for metal polishing, when the dissolved metal(s) tend to further destabilize the mixture.

Bretherick, L. Handbook of Reactive Chemical Hazards. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 1167

▸ Hazardous Substances Data Bank (HSDB)

13.9 Regulatory Information

The Australian Inventory of Industrial Chemicals

Chemical: 1,2-Propanediol

▸ Australian Industrial Chemicals Introduction Scheme (AICIS)

REACH Registered Substance

Status: Active Update: 12-05-2023 https://echa.europa.eu/registration-dossier/-/registered-dossier/16001

▸ European Chemicals Agency (ECHA)

New Zealand EPA Inventory of Chemical Status

1,2-Propanediol: Does not have an individual approval but may be used under an appropriate group standard

▸ New Zealand Environmental Protection Authority (EPA)

13.9.1 Atmospheric Standards

This action promulgates standards of performance for equipment leaks of Volatile Organic Compounds (VOC) in the Synthetic Organic Chemical Manufacturing Industry (SOCMI). The intended effect of these standards is to require all newly constructed, modified, and reconstructed SOCMI process units to use the best demonstrated system of continuous emission reduction for equipment leaks of VOC, considering costs, non air quality health and environmental impact and energy requirements. Propylene glycol is produced, as an intermediate or a final product, by process units covered under this subpart.

40 CFR 60.489 (USEPA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of February 7, 2010: https://www.ecfr.gov

▸ Hazardous Substances Data Bank (HSDB)

13.9.2 State Drinking Water Standards

(NY) NEW YORK 1,000 ug/L

USEPA/Office of Water; Federal-State Toxicology and Risk Analysis Committee (FSTRAC). Summary of State and Federal Drinking Water Standards and Guidelines (11/93) To Present

▸ Hazardous Substances Data Bank (HSDB)

13.9.3 State Drinking Water Guidelines

(NH) NEW HAMPSHIRE 140,000 ug/ L

USEPA/Office of Water; Federal-State Toxicology and Risk Analysis Committee (FSTRAC). Summary of State and Federal Drinking Water Standards and Guidelines (11/93) To Present

▸ Hazardous Substances Data Bank (HSDB)

13.9.4 FIFRA Requirements

Residues of propylene glycol are exempted from the requirement of a tolerance when used in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops or to raw agricultural commodities after harvest. Use: solvent, cosolvent.

40 CFR 180.910 (USEPA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of February 7, 2010: https://www.ecfr.gov

▸ Hazardous Substances Data Bank (HSDB)

Residues of propylene glycol are exempted from the requirement of a tolerance when used in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to animals. Use: solvent, cosolvent.

40 CFR 180.930 (USEPA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of February 7, 2010: https://www.ecfr.gov

▸ Hazardous Substances Data Bank (HSDB)

The Agency has completed its assessment of the dietary, drinking water, residential, ecological and occupational risks associated with the use of pesticide products containing the active ingredients propylene glycol and dipropylene glycol. Based on a review of these data, the Agency has sufficient information on the human health and ecological effects of propylene glycol and dipropylene glycol to make a decision as part of the tolerance reassessment process under FFDCA and reregistration under FIFRA, as amended by FQPA. The Agency has determined that propylene glycol and dipropylene glycol containing products are eligible for reregistration.

USEPA/Office of Pesticide Programs; Reregistration Eligibility Decision Document - Propylene Glycol and Dipropylene Glycol p.15 EPA 739-R-06-002 (September 2006). Available from, as of February 15, 2010: https://www.epa.gov/pesticides/reregistration/status.htm

▸ Hazardous Substances Data Bank (HSDB)

EPA has determined that the established exemption from a requirement for a tolerance for propylene glycol and dipropylene glycol, meet the safety standards under the FQPA amendments to section 408(b)(2)(C) of the FFDCA, that there is a reasonable certainty of no harm for infants and children. ... In determining whether or not infants and children are particularly susceptible to toxic effects from propylene glycol and dipropylene glycol residues, the Agency considered the completeness of the database for developmental and reproductive effects, the nature of the effects observed, and other information. The FQPA Safety Factor has been removed (i.e., reduced to 1X) for propylene glycol and dipropylene glycol because there is no pre- or post-natal evidence for increased susceptibility following exposure.

USEPA/Office of Pesticide Programs; Reregistration Eligibility Decision Document - Propylene Glycol and Dipropylene Glycol p.16 EPA 739-R-06-002 (September 2006). Available from, as of February 15, 2010: https://www.epa.gov/pesticides/reregistration/status.htm

▸ Hazardous Substances Data Bank (HSDB)

As the federal pesticide law FIFRA directs, EPA is conducting a comprehensive review of older pesticides to consider their health and environmental effects and make decisions about their future use. Under this pesticide reregistration program, EPA examines newer health and safety

data for pesticide active ingredients initially registered before November 1, 1984, and determines whether the use of the pesticide does not pose unreasonable risk in accordance to newer saftey standards, such as those described in the Food Quality Protection Act of 1996. Pesticides for which EPA had not issued Registration Standards prior to the effective date of FIFRA '88 were divided into three lists based upon their potential for human exposure and other factors, with List B containing pesticides of greater concern than those on List C, and with List C containing pesticides of greater concern than those on List D. Propylene glycol is found on List C. Case No: 3126; Pesticide type: insecticide, fungicide, antimicrobial; Case Status: OPP is reviewing data from the pesticide's producers regarding its human health and/or environmental effects, or OPP is determining the pesticide's eligibility for reregistration and developing the Reregistration Eligibility Decision (RED) document.; Active ingredient (AI): Propylene glycol; Data Call-in (DCI) Date(s): 08/02/93; AI Status: The producers of the pesticide have made commitments to conduct the studies and pay the fees required for reregistration, and are meeting those commitments in a timely manner.

USEPA/OPP; Status of Pesticides in Registration, Reregistration and Special Review p.276 (Spring, 1998) EPA 738-R-98-002

▸ Hazardous Substances Data Bank (HSDB)

13.9.5 FDA Requirements

Substance added directly to human food affirmed as generally recognized as safe (GRAS).

21 CFR 184.1666 (USFDA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of February 7, 2010: https://www.ecfr.gov

▸ Hazardous Substances Data Bank (HSDB)

Propylene glycol used as an emulsifying agent in animal drugs, feeds, and related products is generally recognized as safe when used in accordance with good manufacturing or feeding practice.

21 CFR 582.4666 (USFDA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of November 10, 2003: https://www.ecfr.gov

▸ Hazardous Substances Data Bank (HSDB)

Propylene glycol used as a general purpose food additive in animal drugs, feeds, and related products is generally recognized as safe when used in accordance with good manufacturing or feeding practice.

21 CFR 582.1666 (USFDA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of February 7, 2010: https://www.ecfr.gov

Hazardous Substances Data Bank (HSDB)

Drug products containing certain active ingredients offered over-the-counter (OTC) for certain uses. A number of active ingredients have been present in OTC drug products for various uses, as described below. However, based on evidence currently available, there are inadequate data to establish general recognition of the safety and effectiveness of these ingredients for the specified uses: propylene glycol is included in pediculicide drug products.

21 CFR 310.545 (USFDA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of February 7, 2010: https://www.ecfr.gov

Hazardous Substances Data Bank (HSDB)

For more FDA Requirements (Complete) data for Propylene glycol (7 total), please visit the HSDB record page.

Hazardous Substances Data Bank (HSDB)

13.10 Other Safety Information

Chemical Assessment

IMAP assessments - 1,2-Propanediol: Environment tier I assessment

IMAP assessments - 1,2-Propanediol: Human health tier I assessment

Australian Industrial Chemicals Introduction Scheme (AICIS)

13.10.1 Special Reports

DHHS/NTP-CERHR; Propylene Glycol (CAS No. 57-55-6): Reproduction and Fertility Assessment in CD-1 Mice When Administered in Drinking Water, NTP Study No. RACB84068 (September 1985). NTP-CERHR monographs are transmitted to federal and state agencies, interested parties, and the public and are available in electronic PDF format on the CERHR web site and in printed text or CD-ROM from the CERHR.[Available from, as of August 14, 2002: http://ntp.niehs.nih.gov/index.cfm?objectid=0847F35A-0850-D1E7-B02ED4DDD150F990]

Hazardous Substances Data Bank (HSDB)

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane, CAS No. 57-55-6 (May 2001). This OECD Initial Assessment of HPV Chemicals is part of a series of OECD SIDS documents published by UNEP Chemicals to facilitate the access to information needed for health and environmental risk assessments of

chemicals.[Available from, as of March 8, 2010: http://www.chem.unep.ch/irptc/sids/OECDSIDS/57-55-6.pdf]

- Hazardous Substances Data Bank (HSDB)

European Commission, ESIS; IUCLID Dataset, Propane-1,2-diol (57-55-6) (2000 CD-ROM edition) contains information on use, toxicology, and environmental effects of this chemical as supplied to the European Union by industry.[Available from, as of January 12, 2009: http://esis.jrc.ec.europa.eu/]

- Hazardous Substances Data Bank (HSDB)

IPCS; Poisons Information Monograph 443: Propylene glycol (May 1994). Poisons Information Monographs (PIM) are a global database with evaluated information on substances commonly involved in cases of poisoning.[Available from, as of March 8, 2010: http://www.inchem.org/documents/pims/chemical/pim443.htm]

- Hazardous Substances Data Bank (HSDB)

For more Special Reports (Complete) data for Propylene glycol (9 total), please visit the HSDB record page.

- Hazardous Substances Data Bank (HSDB)

14 Toxicity

14.1 Toxicological Information

CDC-ATSDR Toxicological Profile

- Agency for Toxic Substances and Disease Registry (ATSDR)

14.1.1 Toxicity Summary

EXPOSURE. Propylene glycol (PG) production capacity in the US was 1312 million pounds (596 kilotons) in 1998. Domestic demand was 1050 million pounds (477 kilotons). PG is used as an ingredient in cosmetics at concentrations of <0.1% to >50%. Approximately 4000 cosmetic products contained PG in 1994. Uses of PG, with percent of demand, are: unsaturated polyester resins, 26 percent; antifreeze and de- icing fluids, 22 percent; food, drug and cosmetics uses, 18 percent; liquid detergents, 11 percent; functional fluids (inks, specialty anti-freeze, de-icing lubricants), 4 percent; pet foods, 3 percent; paints and coatings, 5 percent;

tobacco, 3 percent; miscellaneous, including plasticizer use, 8 percent. HEALTH. Propylene glycol (PG) is not acutely toxic. The lowest oral LD50 values range between 18 and 23.9 mg/kg (5 different species) and the reported dermal LD50 is 20.8 mg/kg. PG is essentially nonirritating to the skin and mildly irritating to the eyes. Numerous studies support that PG is not a skin sensitizer. Repeated exposures of rats to propylene glycol in drinking water or feed did not result in adverse effects at levels up to 10% in water (estimated at about 10 g/kg bw/day) or 5% in feed (dosage reported as 2.5 g/kg bw/day) for periods up to 2 years. In cats, two studies of at least 90 days duration show that a species-specific effect of increased Heinz bodies was observed (NOAEL = 80 mg/kg bw/day; LOAEL = 443 mg/kg bw/day), with other hematological effects (decrease in number of erythrocytes and erythrocyte survival) reported at higher doses (6-12% in diet, or 3.7-10.1 g/cat/day). Propylene glycol did not cause fetal or developmental toxicity in rats, mice, rabbits, or hamsters (NOAELs range from 1.2 to 1.6 g/kg bw/day in four species). No reproductive effects were found when propylene glycol was administered at up to 5% in the drinking water (reported as 10.1 g/kg bw/day) of mice. Propylene glycol was not a genetic toxicant as demonstrated by a battery of in vivo (micronucleus, dominant lethal, chromosome aberration) and in vitro (bacterial and mammalian cells and cultures) studies. No increase in tumors was found in all tissues examined when propylene glycol was administered in the diet of rats (2.5 g/kg bw/day for 2 years), or applied to the skin of female rats (100% PG; total dose not reported; 14 months) or mice (mouse dose estimated at about 2 g/kg bw/week; lifetime). These data support a lack of carcinogenicity for PG. ENVIRONMENT. ... Measured freshwater aquatic toxicity data for fish, daphnia and algae report LC/EC50 values of >18,000 mg/L. Therefore, PG is not acutely toxic to aquatic organisms except at very high concentrations. Using an assessment factor of 100 and the Ceriodaphnia data (48- hour EC 50 = 18,340 mg/l), the predicted no effect concentration is 183 mg/L.

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) pp.3-4 (2001). Available from, as of December 31, 2009: https://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

▸ Hazardous Substances Data Bank (HSDB)

14.1.2 EPA IRIS Information

Substance	Propylene glycol
Toxicity Summary	EPA IRIS Summary PDF (Update: Jun-01-1991)

▸ EPA Integrated Risk Information System (IRIS)

14.1.3 EPA Provisional Peer-Reviewed Toxicity Values

Chemical Substance	Propylene Glycol
Reference Dose (RfD), Chronic	2 x 10^1 mg/kg-day
Reference Dose (RfD), Subchronic	2 x 10^1 mg/kg-day
PPRTV Assessment	PDF Document
Weight-Of-Evidence (WOE)	Not likely to be carcinogenic to humans
Last Revision	2008

▸ EPA Provisional Peer-Reviewed Toxicity Values (PPRTVs)

14.1.4 RAIS Toxicity Values

Inhalation Chronic Reference Concentration (RfC) (mg/m^3)	0.003
Inhalation Chronic Reference Concentration Reference	PPRTV Archive
Inhalation Subchronic Reference Concentration (RfCs) (mg/m^3)	0.0280122699386503
Inhalation Subchronic Reference Concentration Reference	ATSDR Final
Inhalation Short-term Reference Concentration (RfCt) (mg/m^3)	0.0280122699386503
Inhalation Short-term Reference Concentration Reference	ATSDR Final
Oral Chronic Reference Dose (RfDoc) (mg/kg-day)	20
Oral Chronic Reference Dose Reference	PPRTV Current
Oral Subchronic Chronic Reference Dose (RfDos) (mg/kg-day)	20
Oral Subchronic Chronic Reference Dose Reference	PPRTV Current

- Risk Assessment Information System (RAIS)

14.1.5 Carcinogen Classification

Carcinogen Classification	No indication of carcinogenicity to humans (not listed by IARC).

- Toxin and Toxin Target Database (T3DB)

14.1.6 Symptoms

Inhalation Exposure

Dry throat. Cough.

- ILO-WHO International Chemical Safety Cards (ICSCs)

Eye Exposure

Dryness of eyes. Pain. Itching.

- ILO-WHO International Chemical Safety Cards (ICSCs)

Ingestion Exposure

See Effects of short-term exposure

- ILO-WHO International Chemical Safety Cards (ICSCs)

14.1.7 Target Organs

Respiratory (From the Nose to the Lungs)

- Agency for Toxic Substances and Disease Registry (ATSDR)

14.1.8 Acute Toxicity Link

Chemical: PROPYLENE GLYCOL

- USGS Columbia Environmental Research Center

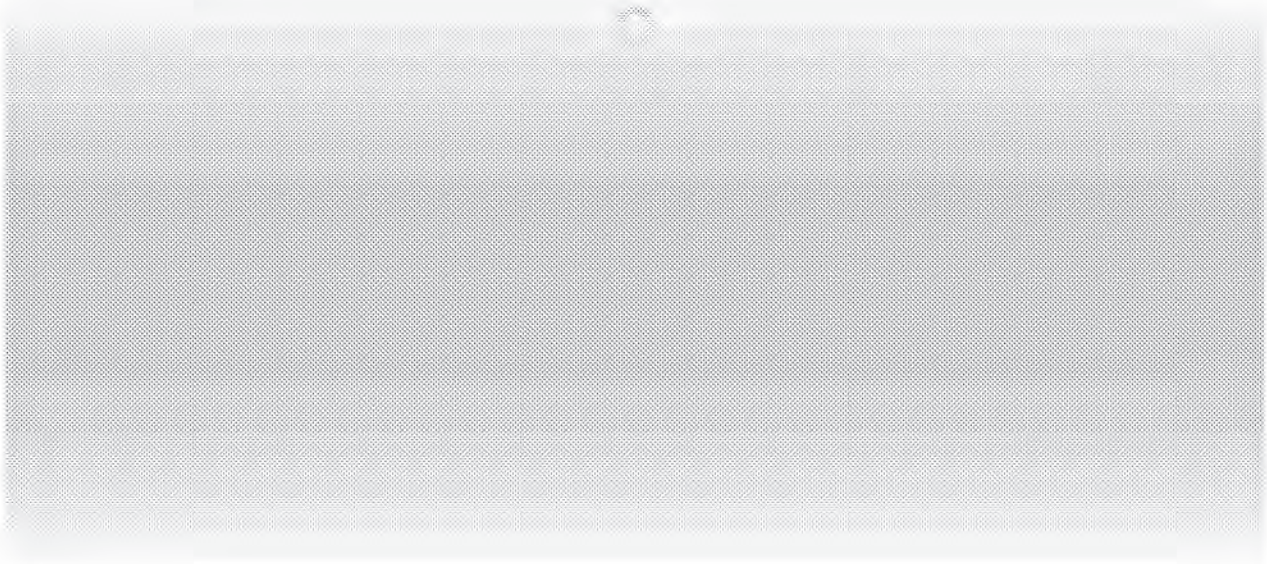
14.1.9 Adverse Effects

Neurotoxin - Acute solvent syndrome

Skin Sensitizer - An agent that can induce an allergic reaction in the skin.

▸ Haz-Map, Information on Hazardous Chemicals and Occupational Diseases

14.1.10 Acute Effects



▸ ChemIDplus

14.1.11 Interactions

The effects of propylene-glycol (PG) alone and the interactions between PG and calcium channel blockers were investigated on the inward calcium current at motor nerve terminals in mice. Phrenic nerve/diaphragm preparations from male ICR-mice were used. Examining the effect of 5% PG on the potassium current at the nerve terminal showed two positive spikes generated by treatment with d-tubocurarine (d-Tc) at the terminal part of the nerve terminal. The second positive spike is ascribed to the outward potassium current. PG did not change this spike at all, suggesting that this compound had no effect on the potassium channels. Pretreatments with d-Tc, tetraethylammonium (TEA), and 3,4-diaminopyridine (DAP) evoked the prolonged negative component of the action potential at the terminal part of the nerve terminal. PG augmented this component which is ascribed to the inward calcium current. The effects of calcium channel blockers were examined to determine whether the calcium channel blockers antagonize PG. Cumulative addition of cadmium-chloride, manganese-chloride, or

cobalt-chloride suppressed the prolonged negative component that had been augmented by treatment with PG.

Hattori T, Maehashi H; J Mol Cell Toxicol 9 (4): 373-5 (1996)

▸ Hazardous Substances Data Bank (HSDB)

14.1.12 Antidote and Emergency Treatment

Check the anion gap, arterial pH, renal function, and glucose level. Serum propylene glycol levels up to 1,000 mg/dL do not correlate well with clinical status. Patients have been conscious with serum levels of 760 mg/dL.

Ellenhorn, M.J. and D.G. Barceloux. Medical Toxicology - Diagnosis and Treatment of Human Poisoning. New York, NY: Elsevier Science Publishing Co., Inc. 1988., p. 810

▸ Hazardous Substances Data Bank (HSDB)

Maintain an open airway and assist ventilation if necessary. Administer supplemental oxygen. Treat coma, convulsions, cardiac arrhythmias, and metabolic acidosis if they occur. Observe the patient for several hours to monitor for for development of metabolic acidosis, especially if the patient is symptomatic or there is known co-ingestion of ethanol. Treat hypocalcemia with intravenous calcium gluconate or calcium chloride

Olson, K.R. (ed.) Poisoning & Drug Overdose. 3rd edition. Lange Medical Books/McGraw-Hill, New York, NY. 1999., p. 169

▸ Hazardous Substances Data Bank (HSDB)

Immediate first aid: Ensure that adequate decontamination has been carried out. If patient is not breathing, start artificial respiration, preferably with a demand-valve resuscitator, bag-valve-mask device, or pocket mask, as trained. Perform CPR as necessary. Immediately flush contaminated eyes with gently flowing water. Do not induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration. Keep patient quiet and maintain normal body temperature. Obtain medical attention. /Ethylene glycol, glycols, and related compounds/

Currance, P.L. Clements, B., Bronstein, A.C. (Eds).; Emergency Care For Hazardous Materials Exposure. 3Rd edition, Elsevier Mosby, St. Louis, MO 2005, p. 262

▸ Hazardous Substances Data Bank (HSDB)

Basic treatment: Establish a patent airway (oropharyngeal or nasopharyngeal airway, if needed). Suction if necessary. Watch for signs of respiratory insufficiency and assist ventilations if necessary. Administer oxygen by nonrebreather mask at 10 to 15 L/min. Monitor for pulmonary edema and treat if necessary ... . Monitor for shock and treat if necessary ... .

Anticipate seizures and treat if necessary ... . For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with 0.9% saline (NS) during transport ... . Do not use emetics. For ingestion, rinse mouth and administer 5 ml/kg up to 200 ml of water for dilution if the patient can swallow, has a strong gag reflex, and does not drool. Administer activated charcoal ... . /Ethylene glycol, glycols, and related compounds/

Currance, P.L. Clements, B., Bronstein, A.C. (Eds).; Emergency Care For Hazardous Materials Exposure. 3Rd edition, Elsevier Mosby, St. Louis, MO 2005, p. 262-3

▸ Hazardous Substances Data Bank (HSDB)

Advanced treatment: Consider orotracheal or nasotracheal intubation for airway control in the patient who is unconscious, has severe pulmonary edema, or is in severe respiratory distress. Positive-pressure ventilation techniques with a bag-valve-mask device may be beneficial. Consider drug therapy for pulmonary edema ... . Monitor cardiac rhythm and treat arrhythmias if necessary ... . Start IV administration of D5W /SRP: "To keep open", minimal flow rate/. Use 0.9% saline (NS) lactated Ringer's (LR) if signs of hypovolemia are present. For hypotension with signs of hypovolemia, administer fluid cautiously. Consider vasopressors if patient is hypotensive with a normal fluid volume. Watch for signs of fluid overload ... . Treat seizures with diazepam or lorazepam ... . Use proparacaine hydrochloride to assist eye irrigation ... . /Ethylene glycol, glycols, and related compounds/

Currance, P.L. Clements, B., Bronstein, A.C. (Eds).; Emergency Care For Hazardous Materials Exposure. 3Rd edition, Elsevier Mosby, St. Louis, MO 2005, p. 263

▸ Hazardous Substances Data Bank (HSDB)

14.1.13 Human Toxicity Excerpts

/HUMAN EXPOSURE STUDIES/ Results from human patch testing show no sensitization potential after semi-occlusive or occlusive epicutaneous application to the skin of volunteers (in excess of 300 subjects in total). These studies demonstrate that it is not irritating to skin or eye, nor does it cause sensitization by skin contact.

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.17 (2001). Available from, as of December 31, 2009: https://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

▸ Hazardous Substances Data Bank (HSDB)

/HUMAN EXPOSURE STUDIES/ Patch-test in humans, 15 uL 100% propylene glycol/test chamber for 48 hr. Results: not irritating.

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.56 (2001). Available from, as of December 31, 2009: https://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

Hazardous Substances Data Bank (HSDB)

/HUMAN EXPOSURE STUDIES/ In 6 human volunteers, pads containing /propylene glycol/ test substance were fixed to the forearm for 2 hr, observation time: 7 days. Results: not irritating.

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.56 (2001). Available from, as of December 31, 2009: https://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

Hazardous Substances Data Bank (HSDB)

/HUMAN EXPOSURE STUDIES/ Cream containing 12% propylene glycol was tested on 204 persons. Results: not sensitizing.

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.60 (2001). Available from, as of December 31, 2009: https://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

Hazardous Substances Data Bank (HSDB)

For more Human Toxicity Excerpts (Complete) data for Propylene glycol (45 total), please visit the HSDB record page.

Hazardous Substances Data Bank (HSDB)

14.1.14 Non-Human Toxicity Excerpts

/LABORATORY ANIMALS: Acute Exposure/ Acute oral toxicity studies yielded similar, low acute toxicities with relatively high LD50 values ranging from 8000-46000 mg/kg/day propylene glycol for rodents and 18000-20000 mg/kg/day for both rabbits and guinea pigs. Clinical signs (loss of balance, marked depression, and analgesia) were reported in the rabbit and guinea pig only at extremely high doses that exceeded the established limit dose (5000 mg/kg) for an acute oral toxicity study. Similar effects were also evident in one study with mice only at doses that resulted in lethality (LD50 value of 24800 mg/kg/day).

US EPA; Revised Toxicology Chapter in Support of Issuance of the Reregistration Eligibility Decision (RED) Document. PC Code for Propylene Glycol: 068603; PC Code for Dipropylene Glycol: 068604. Reregistration Case Number: 3126. (February 5, 2007). Available from, as of February 24, 2010: https://www.regulations.gov/search/Regs/home.html#home

Hazardous Substances Data Bank (HSDB)

/LABORATORY ANIMALS: Acute Exposure/ Propylene glycol induced degeneration of goblet cells (+69%) in tracheal lining of rabbits after 20 and 120 minutes of aerosol exposure to 10% aerosol in an acute inhalation toxicity study; no other toxicological effects were observed.

US EPA; Revised Toxicology Chapter in Support of Issuance of the Reregistration Eligibility Decision (RED) Document. PC Code for Propylene Glycol: 068603; PC Code for Dipropylene Glycol: 068604. Reregistration Case Number: 3126. (February 5, 2007). Available from, as of February 24, 2010: https://www.regulations.gov/search/Regs/home.html#home

▸ Hazardous Substances Data Bank (HSDB)

/LABORATORY ANIMALS: Acute Exposure/ In primary eye irritation studies, propylene glycol was instilled in the eyes of rabbits (0.1-0.5 mL). There were no treatment-related effects on the corneas of the animals and propylene glycol was classified as a non-irritant.

US EPA; Revised Toxicology Chapter in Support of Issuance of the Reregistration Eligibility Decision (RED) Document. PC Code for Propylene Glycol: 068603; PC Code for Dipropylene Glycol: 068604. Reregistration Case Number: 3126. (February 5, 2007). Available from, as of February 24, 2010: https://www.regulations.gov/search/Regs/home.html#home

▸ Hazardous Substances Data Bank (HSDB)

/LABORATORY ANIMALS: Acute Exposure/ In a series of skin sensitization tests, no reactions were observed in guinea pigs exposed to solutions up to 70% propylene glycol.

US EPA; Revised Toxicology Chapter in Support of Issuance of the Reregistration Eligibility Decision (RED) Document. PC Code for Propylene Glycol: 068603; PC Code for Dipropylene Glycol: 068604. Reregistration Case Number: 3126. (February 5, 2007). Available from, as of February 24, 2010: https://www.regulations.gov/search/Regs/home.html#home

▸ Hazardous Substances Data Bank (HSDB)

For more Non-Human Toxicity Excerpts (Complete) data for Propylene glycol (102 total), please visit the HSDB record page.

▸ Hazardous Substances Data Bank (HSDB)

14.1.15 Non-Human Toxicity Values

LD50 Rat oral 21000 - 33700 mg/kg

Cavender FL, Sowinski EJ; Patty's Toxicology CD-ROM (2005). NY, NY: John Wiley & Sons; Glycols. Online Posting Date: April 16, 2001

▸ Hazardous Substances Data Bank (HSDB)

LD50 Rat oral 22,000 mg/kg

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.6 (2001). Available from, as of December 31, 2009: https://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

Hazardous Substances Data Bank (HSDB)

LD50 Rat ip 6660 mg/kg

Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3061

Hazardous Substances Data Bank (HSDB)

LD50 Rat iv 6423 mg/kg

Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3061

Hazardous Substances Data Bank (HSDB)

For more Non-Human Toxicity Values (Complete) data for Propylene glycol (20 total), please visit the HSDB record page.

Hazardous Substances Data Bank (HSDB)

14.1.16 National Toxicology Program Studies

Propylene glycol ... was tested for reproductive toxicity in Swiss CD-1 mice using the RACB protocol. It was part of a series of glycol ethers & congeners evaluated for structure-activity correlations using this design. Data collected on body weights, clinical signs, & food/water consumption during the dose-range-finding segment (Task 1) were used to set concns for the main study (Task 2) at 0.0, 1.0, 2.5, 5.0% PG in drinking water. These concns produced calculated consumption estimates of nearly =1.819, 4.796, & 10.118 g/kg bw/day. Although water consumption in the F0 generation was consistently higher for all groups (by 6 to 15%), these increases were not statistically different from controls. There was no effect on body weights during ... the continuous cohabitation portion of the study. All groups had > or =4.6 litters/pair, with > or =11.9 pups/litter. There was no treatment-related effect on pup weight adjusted for litter size (control value: 1.55 g). The viability & growth of the final litter was unaffected by PG consumption. Since there was no effect on fertility, a Task 3 crossover was not conducted. At the time this study was conducted, the protocol called for no necropsy of F0 animals in the absence of a fertility effect, so the F0 mice were killed & discarded without necropsy. For the second generation, just the control & 5% PG groups were evaluated. There was no treatment-related effect on mating, fertility, or on the number, weight, or viability of the F2 offspring. After delivery of the F2 pups, the F1 adults were killed & necropsied. There was no effect on body or organ weights in males or females, no change in sperm endpoints, & no change in estrous cycle parameters. Serum total calcium levels were measured in serum of the F1 mice, & was found unchanged by PG exposure from a control value of 9.2 mg/dL. In

summary, propylene glycol, under the conditions of this experiment, has no effect on fertility & reproduction in either generation of Swiss mice at up to 10 g/kg/day.

Department of Health & Human Services/National Institute of Environmental Health Sciences, National Toxicology Program; Propylene Glycol (CAS No. 57-55-6): Reproduction and Fertility Assessment in CD-1 Mice When Administered in Drinking Water, NTP Study No. RACB84068 (September 1985) Available from, as of August 14, 2002: https://ntp.niehs.nih.gov/index.cfm?objectid=0847F35A-0850-D1E7-B02ED4DDD150F990

▸ Hazardous Substances Data Bank (HSDB)

14.1.17 Populations at Special Risk

/Infant, premature/ The decreased size of premature infants and an increased serum half-life ... for propylene glycol in premature infants predispose them to a greater probability of toxic effects from over administration of propylene glycol. There is particular concern for very small infants and those receiving multiple IV medications containing propylene glycol. Absorption of propylene glycol from ointments applied to burns and injection of multivitamin products in infants has resulted in serum hyperosmolality, which was associated with cardiorespiratory arrest in one case.

DHHS/NTP-CERHR; NTP-CERHR Monograph on the Potential Human Reproductive and Developmental Effects of Propylene Glycol (March 2004) NIH Pub No. 04-4482 pp.II-45-46. Available from, as of January 11, 2010: https://cerhr.niehs.nih.gov/evals/eggp/propylene/PG_Monograph.pdf

▸ Hazardous Substances Data Bank (HSDB)

/Infant; Infant, newborn; Infant, premature; Child, preschool/ Hyperosmolarity and lactic acidosis, both of which occur most frequently in patients with consumption of large quantities of propylene glycol or on administration to neonates, children under 4 years of age, pregnant women, and patients with hepatic or renal failure.

Rowe, R.C., Sheskey, P.J., Quinn, M.E.; (Eds.), Handbook of Pharmaceutical Excipients 6th edition Pharmaceutical Press, London, England 2009, p. 593

▸ Hazardous Substances Data Bank (HSDB)

/Children/ In children, seizures and respiratory depression have occurred after taking liquid medications containing propylene glycol.

DHHS/NTP-CERHR; NTP-CERHR Monograph on the Potential Human Reproductive and Developmental Effects of Propylene Glycol (March 2004) NIH Pub No. 04-4482 p.II-44 . Available from, as of January 11, 2010: https://cerhr.niehs.nih.gov/evals/eggp/propylene/PG_Monograph.pdf

▸ Hazardous Substances Data Bank (HSDB)

Adverse effects /from propylene glycol/ may also occur in patients treated with disulfiram or metronidazole.

Rowe, R.C., Sheskey, P.J., Quinn, M.E., (Eds.), Handbook of Pharmaceutical Excipients 6th edition Pharmaceutical Press, London, England 2009, p. 593

- Hazardous Substances Data Bank (HSDB)

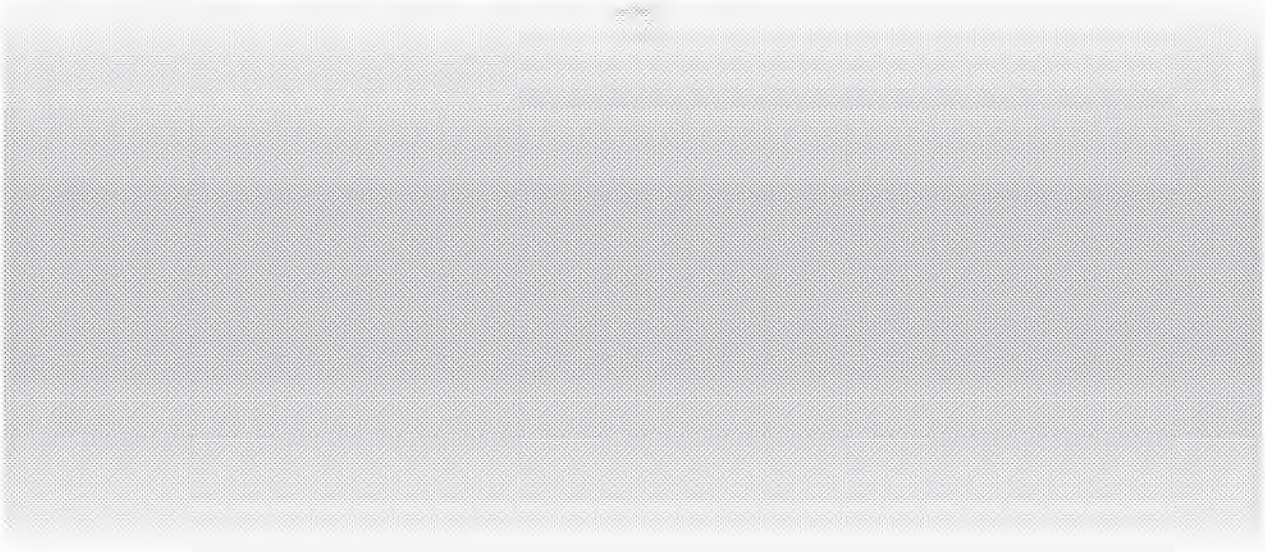
For more Populations at Special Risk (Complete) data for Propylene glycol (9 total), please visit the HSDB record page.

- Hazardous Substances Data Bank (HSDB)

14.2 Ecological Information

14.2.1 EPA Ecotoxicity

Pesticide Ecotoxicity Data from EPA



- EPA Pesticide Ecotoxicity Database

14.2.2 Ecotoxicity Values

EC50; Species: Selenastrum capricornutum (green algae); Concentration: 19,000 mg/L for 96 hr; Effect: 14-day growth rate /Conditions of bioassay not specified/

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.6 (2001). Available from, as of December 31, 2009: https://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

Hazardous Substances Data Bank (HSDB)

EC50; Species: Selenastrum capricornutum (green algae); Concentration: 18,100 mg/L for 14 days; Effect: 14-day growth rate /Conditions of bioassay not specified/

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.6 (2001). Available from, as of December 31, 2009: https://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

Hazardous Substances Data Bank (HSDB)

EC50; Species: Daphnia magna (Water flea, age 6-24 hr); Conditions: freshwater, static, 20 °C, pH > or =7.0; Concentration: >10000000 ug/L for 24, 48 hr; Effect: intoxication, immobilization /formulation/

Kuhn R et al; Water Res 23 (4): 495-9 (1989) as cited in the ECOTOX database. Available from, as of December 31, 2009

Hazardous Substances Data Bank (HSDB)

LC50; Species: Daphnia magna (water flea); Conditions: static; Concentration: 43,500 mg/L for 48 hr

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.5 (2001). Available from, as of December 31, 2009: https://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

Hazardous Substances Data Bank (HSDB)

For more Ecotoxicity Values (Complete) data for Propylene glycol (23 total), please visit the HSDB record page.

Hazardous Substances Data Bank (HSDB)

14.2.3 Ecotoxicity Excerpts

/BIRDS and MAMMALS/ Due to the low likelihood of exposure and low toxicity of propylene glycol ..., the /Environmental Protection/ Agency expects no effects to listed species or critical habitats and therefore makes a "No Effect" determination for this chemical.

USEPA/Office of Pesticide Programs; Reregistration Eligibility Decision Document - Propylene glycol and Dipropylene glycol p.15 EPA-739-R-06-002 (September 2006). Available from, as of December 31, 2009: https://www.epa.gov/pesticides/reregistration/status.htm

Hazardous Substances Data Bank (HSDB)

/AQUATIC SPECIES/ The very low toxicity of propylene glycol to aquatic organisms, as indicated by the high LC50 values ..., further supports the unlikelihood of adverse effects to fish and aquatic invertebrates.

USEPA/Office of Pesticide Programs; Reregistration Eligibility Decision Document - Propylene glycol and Dipropylene glycol p.14 EPA-739-R-06-002 (September 2006). Available from, as of December 31, 2009: https://www.epa.gov/pesticides/reregistration/status.htm

▸ Hazardous Substances Data Bank (HSDB)

/AQUATIC SPECIES/ ...This research investigated the contributions of environmentally significant concentrations of selected /aircraft deicing fluid/ (ADF) components to the toxicity of ADF-containing waste streams, and to the inhibition of biodegradation of propylene glycol (PG), the most important component of ADF. The component chemicals studied were PG, the corrosion inhibitor 4(5)-methylbenzotriazole (MeBT; common name: tolyltriazole), and proprietary mixes of corrosion inhibitors, buffers, and surfactants referred to as the additive package or AdPack. Relative to PG alone, the different additives increased the toxicity of ADF and decreased PG biodegradation rates. In enrichments of soil microorganisms acclimated to ADF, the MeBT component significantly decreased cell growth rates and yields, and inhibited PG biodegradation to a greater extent than the AdPack. Microtox tests indicated that MeBT is the ADF component most toxic to microorganisms. However, acute aquatic toxicity tests indicated that the AdPack components were more toxic than MeBT to Ceriodaphnia dubia and Pimephales promelas, although both components were more toxic than PG alone. /Aircraft deicing fluid/

Cornell JS et al; Environ Chem Toxicol 19 (6): 1465-72 (2000)

▸ Hazardous Substances Data Bank (HSDB)

/AQUATIC SPECIES/ Streams receiving runoff from General Mitchell International Airport (GMIA), Milwaukee, Wisconsin, USA, were studied to assess toxic impacts of aircraft and runway deicers. Elevated levels of constituents related to deicing (propylene glycol, ethylene glycol, and ammonia) were observed in stream samples. The LC50s of type I deicer for Ceriodaphnia dubia, Pimephelas promelas, Hyalela azteca, and Chironimus tentans and the EC50 for Microtox were less than 5,000 mg/L of propylene glycol. Concentrations up to 39,000 mg/L were observed at airport outfall sites in samples collected during deicing events. The IC25s of type I deicer for C. dubia and P. promelas were less than 1,500 mg/L of propylene glycol. Concentrations up to 960 mg/L were observed in low-flow samples at an airport outfall site. Measured toxicity of stream water was greatest during winter storms when deicers were applied. Chronic toxicity was observed at airport outfall samples from low-flow periods in the winter and the summer, with the greater toxic impacts from the winter sample. All forms of toxicity in stream-water samples decreased as downstream flows increased. /Aircraft and runway deicers/

Corsi SR et al; Environ Toxicol Chem 20 (7): 1483-90 (2001)

▸ Hazardous Substances Data Bank (HSDB)

/AQUATIC SPECIES/ ... Many of the /aircraft/ deicers are formulated mixtures of ethylene glycol (EG) or propylene glycol (PG) and a variety of additives. Because these deicers may be intentionally or accidentally released into aquatic ecosystems, the possibility exists for direct and indirect adverse effects on aquatic organisms. Laboratory studies evaluated the comparative toxicity of formulated glycol deicers and pure materials on the water flea, Ceriodaphnia dubia, and fathead minnow, Pimephales promelas. Acute (48 hr and 96 hr) and short-term chronic tests were performed according to USEPA guidelines. The formulated mixtures were found to be substantially more toxic than either of the pure glycol materials. The 48 hr LC50s for C. dubia were 13,140 mg/L and 1,020 mg/L using formulated EG and PG, and 34,400 mg/L and 18,340 mg/L using pure EG and PG, respectively. The 96 hr LC50s for P. promelas were 8,050 mg/L and 710 mg/L using formulated EG and PG, and 72,860 mg/L and 55,770 mg/L using pure EG and PG, respectively. Chronic IC25s for C. dubia were 3,960 mg/L and 640 mg/L using formulated EG and PG, 12,310 mg/L and 13,470 mg/L using pure EG and PG. Chronic IC25s for P. promelas were 3,660 mg/L and 110 mg/L using formulated EG and PG, 22,520 mg/L and 6,940 mg/L using pure EG and PG. For airports that have stormwater discharge permits, numerical limits for EG and PG are generally listed, potential toxicity is assumed to be due to the glycol materials. However, other compounds in the mixtures may either contribute substantially to, or in some cases overshadow, the toxicity of the glycol materials.

Pillard DA; Environ Toxicol Chem 14 (2): 311-5 (1995)

▸ Hazardous Substances Data Bank (HSDB)

14.2.4 US EPA Regional Screening Levels for Chemical Contaminants

Resident Soil (mg/kg)	1.30e+06
Industrial Soil (mg/kg)	1.60e+07
Tapwater (ug/L)	4.00e+05
MCL (ug/L)	2.00e-01
Risk-based SSL (mg/kg)	8.10e+01
Chronic Oral Reference Dose (mg/kg-day)	2.00e+01
Volatile	Volatile

Mutagen	Mutagen
Fraction of Contaminant Absorbed in Gastrointestinal Tract	1
Fraction of Contaminant Absorbed Dermally from Soil	0.1

▸ EPA Regional Screening Levels for Chemical Contaminants at Superfund Sites

14.2.5 US EPA Regional Removal Management Levels for Chemical Contaminants

Resident Soil (mg/kg)	3.80e+06
Industrial Soil (mg/kg)	4.90e+07
Tapwater (ug/L)	1.20e+06
MCL (ug/L)	2.00e-01
Chronic Oral Reference Dose (mg/kg-day)	2.00e+01
Volatile	Volatile
Mutagen	Mutagen
Fraction of Contaminant Absorbed in Gastrointestinal Tract	1
Fraction of Contaminant Absorbed Dermally from Soil	0.1

▸ EPA Regional Screening Levels for Chemical Contaminants at Superfund Sites

14.2.6 Environmental Fate / Exposure Summary

Propylene glycol's production and use as an antifreeze in breweries and dairy establishments, substitute for ethylene glycol and glycerol, in the manufacture of synthetic resins, emulsifier in foods, solvent for food colors and flavors, and pharmaceutic aid (humectant, solvent) may result in its release to the environment through various waste streams. Its use to create artificial smoke and mist for theatrical use, as an airplane de-icing fluid and in aerosol mists

that are commonly used in hospitals and public buildings for disinfection purposes will result in its direct release to the environment. If released to air, a vapor pressure of 0.13 mm Hg at 25 °C indicates propylene glycol will exist solely as a vapor in the ambient atmosphere. Vapor-phase propylene glycol 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 32 hours. Propylene glycol does not contain chromophores that absorb at wavelengths >290 nm and therefore is not expected to be susceptible to direct photolysis by sunlight. If released to soil, propylene glycol 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 1.3X10-8 atm-cu m/mole. Propylene glycol is not expected to volatilize from dry soil surfaces based upon its vapor pressure. Propylene glycol was mineralized 73-78% in laboratory studies conducted using an agricultural soil over a 51 day incubation period, suggesting biodegradation will be an important environmental fate process in soil. If released into water, propylene glycol is not expected to adsorb to suspended solids and sediment based upon the estimated Koc. Volatilization from water surfaces is not expected to be an important fate process based upon this compound's estimated Henry's Law constant. Numerous screening studies using wastewater or sewage inoculum as seed suggest that propylene glycol will be degraded readily in aqueous environments. An estimated BCF of 3 suggests the potential for bioconcentration in aquatic organisms is low. Propylene glycol is not expected to undergo hydrolysis since this compound lacks functional groups that hydrolyze under environmental conditions. Occupational exposure to propylene glycol may occur through inhalation and dermal contact with this compound at workplaces where propylene glycol is produced or used. Monitoring and use data indicate that the general population may be exposed to propylene glycol via inhalation and dermal contact with consumer products containing propylene glycol. (SRC)

▸ Hazardous Substances Data Bank (HSDB)

14.2.7 Artificial Pollution Sources

Propylene glycol's production and use as an antifreeze in breweries and dairy establishments, substitute for ethylene glycol and glycerol, in the manufacture of synthetic resins, emulsifier in foods, solvent for food colors and flavors, and pharmaceutic aid (humectant, solvent)(1) may result in its release to the environment through various waste streams(SRC). Its use to create artificial smoke and mist for theatrical use, as an airplane de-icing fluid(1) and in aerosol mists that are commonly used in hospitals and public buildings for disinfection purposes(2) will result in its direct release to the environment(SRC).

(1) O'Neil MJ, ed; The Merck. 14th ed Whitehouse Station, NJ: Merck and Co., Inc., p. 1350 (2006)

(2) Finis L et al; Patty's Toxicology 5th ed. Bingham E et al, eds., New York, NY: John Wiley & Sons 7: 26-31 (2001)

▸ Hazardous Substances Data Bank (HSDB)

14.2.8 Environmental Fate

TERRESTRIAL FATE: Based on a classification scheme(1), an estimated Koc value of 1(SRC), determined from a log Kow of -0.92(2) and a regression-derived equation(3), indicates that propylene glycol is expected to have very high mobility in soil(SRC). Volatilization of propylene glycol from moist soil surfaces is not expected to be an important fate process(SRC) given an estimated Henry's Law constant of 1.3X10-8 atm-cu m/mole(SRC), derived from its vapor pressure, 0.13 mm Hg(4), and assigned value for water solubility of 1X10+6 mg/L (miscible)(5). Propylene glycol is not expected to volatilize from dry soil surfaces(SRC) based upon its vapor pressure(4). Laboratory experiments using agricultural soils from South Carolina conducted at 22 °C and a fortification of 1,000 ppm propylene glycol, yielded 73-78% mineralization during a 51 day incubation period(6), suggesting that biodegradation will be an important fate process in soils(SRC).

(1) Swann RL et al; Res Rev 85: 17-28 (1983)

(2) Hansch C et al; Exploring QSAR. Hydrophobic, Electronic, and Steric Constants. ACS Prof Ref Book. Heller SR, consult. ed., Washington, DC: Amer Chem Soc p. 7 (1995)

(3) US EPA; Estimation Program Interface (EPI) Suite. Ver. 4.0. Jan, 2009. Available from https://www.epa.gov/oppt/exposure/pubs/episuitedl.htm as of Feb 12, 2010.

(4) Daubert TE, Danner RP; Physical and Thermodynamic Properties of Pure Chemicals Data Compilation Washington, DC: Taylor and Francis (1989)

(5) Yalkowsky SH, Dannenfelser RM; The AQUASOL dATAbASE of Aqueous Solubility. Ver 5. Tucson, AZ: Univ AZ, College of Pharmacy (1992)

(6) Shupack DP, Anderson TA; Water Air Soil Pollut 118: 53-58 (2000)

▸ Hazardous Substances Data Bank (HSDB)

AQUATIC FATE: Based on a classification scheme(1), an estimated Koc value of 1(SRC), determined from a log Kow of -0.92(2) and a regression-derived equation(3), indicates that propylene glycol is not expected to adsorb to suspended solids and sediment(SRC). Volatilization from water surfaces is not expected(3) based upon an estimated Henry's Law constant of 1.3X10-8 atm-cu m/mole(SRC), derived from its vapor pressure, 0.13 mm Hg(5), and assigned value for water solubility of 1X10+6 mg/L (miscible)(6). According to a classification scheme(7), an estimated BCF of 3(SRC), from its log Kow(2) and a regression-derived equation(8), suggests the potential for bioconcentration in aquatic organisms is low(SRC). Numerous screening studies using wastewater or sewage inoculum as seed, suggests that propylene glycol will be degraded readily under aqueous environments(9-11).

(1) Swann RL et al; Res Rev 85: 17-28 (1983)

(2) Hansch C et al; Exploring QSAR. Hydrophobic, Electronic, and Steric Constants. ACS Prof Ref Book. Heller SR, consult. ed., Washington, DC: Amer Chem Soc p. 7 (1995)

(3) US EPA; Estimation Program Interface (EPI) Suite. Ver. 4.0. Jan, 2009. Available from https://www.epa.gov/oppt/exposure/pubs/episuitedl.htm as of Feb 12, 2010.

(4) Lyman WJ et al; Handbook of Chemical Property Estimation Methods. Washington, DC: Amer Chem Soc pp. 15-1 to 15-29 (1990)

(5) Daubert TE, Danner RP; Physical and Thermodynamic Properties of Pure Chemicals Data Compilation Washington, DC: Taylor and Francis (1989)

(6) Yalkowsky SH, He Y; Handbook of Aqueous Solubility Data: An Extensive Compilation of Aqueous Solubility Data for Organic Compounds Extracted from the AQUASOL dATAbASE. Boca Raton, FL: CRC Press LLC, (2003)

(7) Franke C et al; Chemosphere 29: 1501-14 (1994)

(8) Meylan WM et al; Environ Toxicol Chem 18: 664-72 (1999)

(9) Bridie AL et al; Water Res 13: 627-30 (1979)

(10) Helfgott TB et al; An Index of Refractory Organics. USEPA-66/2-77-174 (1977)

(11) Wagner R; Vom Wasser 47: 241-65 (1976)

▸ Hazardous Substances Data Bank (HSDB)

ATMOSPHERIC FATE: According to a model of gas/particle partitioning of semivolatile organic compounds in the atmosphere(1), propylene glycol, which has a vapor pressure of 0.13 mm Hg at 25 °C(2), is expected to exist solely as a vapor in the ambient atmosphere. Vapor-phase propylene glycol is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals(SRC); the half-life for this reaction in air is estimated to be 32 hours(SRC), calculated from its rate constant of 1.2X10-11 cu cm/molecule-sec at 25 °C(3). Propylene glycol does not contain chromophores that absorb at wavelengths >290 nm and therefore is not expected to be susceptible to direct photolysis by sunlight(4).

(1) Bidleman TF; Environ Sci Technol 22: 361-367 (1988)

(2) Daubert TE, Danner RP; Physical and Thermodynamic Properties of Pure Chemicals Data Compilation Washington, DC: Taylor and Francis (1989)

(3) Atkinson R; J Phys Chem Ref Data Monograph 1 (1989)

(4) Lyman WJ et al; Handbook of Chemical Property Estimation Methods. Washington, DC: Amer Chem Soc pp. 8-12 (1990)

▸ Hazardous Substances Data Bank (HSDB)

14.2.9 Environmental Biodegradation

AEROBIC: Propylene glycol achieved 64% of its theoretical BOD using a sewage inoculum and a 5 day incubation period(1). A Warburg respirometer study employing a sewage seed showed

that propylene glycol reached 78% of its theoretical BOD during a 40 day incubation period(2). Propylene glycol achieved 2.2, 56.7 and 80% of its theoretical BOD using a sewage inoculum and 5, 10, and 50 day incubation periods, respectively(3). Using raw wastewater and synthetic seawater as inoculum, propylene glycol achieved 55 and 83% of its theoretical BOD during 5 and 20 day incubation periods, respectively(4). Using wastewater from pretreated domestic sewage, propylene glycol reached 74.5% of its theoretical BOD in 5 days(5). Propylene glycol underwent 73-78% mineralization within 51 days when incubated with various agricultural soils from Clemson University, SC under laboratory conditions at 22 °C and 1,000 ppm propylene glycol in the soil; 40-79% mineralization was observed for propylene glycol incubated in the same soils for 64 days at 7 °C(6).

(1) Bridie AL et al; Water Res 13: 627-30 (1979)

(2) Helfgott TB et al; An Index of Refractory Organics. USEPA-66/2-77-174 (1977)

(3) Lamb CB, Jenkins GF; p. 326-9 in Proc 8th Industrial Waste Conf, Purdue Univ (1952)

(4) Price KS et al; J Water Pollut Control Fed 46: 63-77 (1974)

(5) Wagner R; Vom Wasser 47: 241-65 (1976)

(6) Shupack DP, Anderson TA; Water Air Soil Pollut 118: 53-58 (2000)

▸ Hazardous Substances Data Bank (HSDB)

AEROBIC: Propylene glycol is mineralized to CO2 in soil microcosms incubated at temperatures ranging from -2 to 25 °C. No lag time period was observed. Degradation occurred with propylene glycol alone and in combination with ethylene glycol and diethylene glycol at glycol concentrations ranging from 392 to 5278 mg/kg suggesting that high levels of glycols in deicing fluids are unlikely to inhibit biodegradation. Complete disappearance of 0.045% propylene glycol occurred after 12 days at 8 °C and 57% of the theoretical oxygen demand was recovered after 34 days. With 0.45% propylene glycol, 76% degradation and 44% mineralization was obtained after 111 days(1). The rate of biodegradation ranged from 11.4 to 41.4 mg/kg soil per day at 8 °C with an average of 22.7 mg/kg per day. Rates at 25 °C were approximately 3.4 times faster than those at 8 °C, ranging from 78.9 to 88 mg/kg per day with a mean of 83.5 mg/kg per day. At -2 °C, biodegradation rates for propylene glycol ranged from 1.1 to 3.5 mg/kg per day with a mean of 2.3 mg/kg per day. After 111 days of incubation at -2 °C, 14% degradation to the parent compound was observed and the BOD was 8% of the theoretical oxygen demand(1).

(1) Klecka GM et al; Ecotox Environ Saf 25: 280-95 (1993)

▸ Hazardous Substances Data Bank (HSDB)

AEROBIC: Proylene glycol reached 90% of its theoretical BOD in 14 days in the Japanese MITI test(1). A mixture of propylene glycol, diethylene glycol and potassium acetate reached 32.9, 30.2%, and 24.1% of its theoretical BOD in 5 days, respectively at 8 °C, 4 °C and 1 °C(2). The

measured surface biodegradation rates for deicing fluids, specifically propylene glycol, was 0.073 day-1(2). Aircraft deicing fluid, the major constituents being ethylene glycol and propylene glycol, reached concentrations ranging from 350-245,000 mg/L, with an average of 87,000 mg/L, of its theoretical BOD after 5 days(3).

(1) Sedykh A, Klopman G; SAR QSAR Environ Res 18(7-8): 693-709 (2007)

(2) Revitt DM, Worrall P; Water Sci Technol 48: 103-111 (2003)

(3) Zitomer DH, Tonuk GU; J Environ Eng 129: 123-129 (2003)

▸ Hazardous Substances Data Bank (HSDB)

ANAEROBIC: Using an activated sludge or digester sludge incubated under anaerobic conditions, propylene glycol was completely degraded within 5-9 days, while a sterile control showed no degradation(1). Rapid propylene glycol degradation is observed in topsoil materials high in organic matter at 20 °C; in subsoil materials, degradation of propylene glycol is very slow and incomplete(2).

(1) Kaplan DL et al; Environ Sci Technol 16: 723-5 (1982)

(2) Jaesche P et al; J Contam Hydrol 85: 271-286 (2006)

▸ Hazardous Substances Data Bank (HSDB)

14.2.10 Environmental Abiotic Degradation

Under ordinary conditions propylene glycol is stable, but at high temps it tends to oxidize giving rise to products such as propionaldehyde, lactic acid, pyruvic acid and acetic acid.

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 2006., p. 1350

▸ Hazardous Substances Data Bank (HSDB)

The rate constant for the vapor-phase reaction of propylene glycol with photochemically-produced hydroxyl radicals has been measured as 1.2X10-11 cu cm/molecule-sec at 25 °C(1). This corresponds to an atmospheric half-life of about 32 hours at an atmospheric concentration of 5X10+5 hydroxyl radicals per cu cm(1). Propylene glycol is not expected to undergo hydrolysis in the environment due to the lack of hydrolyzable functional groups(2). Propylene glycol does not contain chromophores that absorb at wavelengths >290 nm and therefore is not expected to be susceptible to direct photolysis by sunlight(2). The rate constant for the reaction of propylene glycol with hydroxyl radicals in aqueous solution is approximately 0.94-1.68X10+9 L/mol-sec(3); if the hydroxyl radical concn of sunlit natural water is assumed to be 1X10-17 moles/L(4), the half-life would be approximately 1.3-2.3 years(SRC).

(1) Atkinson R; J Phys Chem Ref Data Monograph 1 (1989)

(2) Lyman WJ et al; Handbook of Chemical Property Estimation Methods. Washington, DC: Amer Chem Soc pp. 7-4, 7-5, 8-12 (1990)

(3) Anbar M, Neta P; Int J Appl Radiation Isotopes 18: 493-523 (1967)

(4) Mill T et al; Science 207: 886-7 (1980)

▸ Hazardous Substances Data Bank (HSDB)

14.2.11 Environmental Bioconcentration

An estimated BCF of 3 was calculated for propylene glycol(SRC), using a log Kow of -0.92(1) and a regression-derived equation(2). According to a classification scheme(3), this BCF suggests the potential for bioconcentration in aquatic organisms is low(SRC).

(1) Hansch C et al; Exploring QSAR. Hydrophobic, Electronic, and Steric Constants. ACS Prof Ref Book. Heller SR, consult. ed., Washington, DC: Amer Chem Soc p. 7 (1995)

(2) Meylan WM et al; Environ Toxicol Chem 18: 664-72 (1999)

(3) Franke C et al; Chemosphere 29: 1501-14 (1994)

▸ Hazardous Substances Data Bank (HSDB)

14.2.12 Soil Adsorption / Mobility

The Koc of propylene glycol is estimated as 1(SRC), using a log Kow of -0.92(1) and a regression-derived equation(2). According to a classification scheme(3), this estimated Koc value suggests that propylene glycol is expected to have very high mobility in soil(SRC).

(1) Hansch C et al; Exploring QSAR. Hydrophobic, Electronic, and Steric Constants. ACS Prof Ref Book. Heller SR, consult. ed., Washington, DC: Amer Chem Soc p. 7 (1995)

(2) US EPA; Estimation Program Interface (EPI) Suite. Ver. 4.0. Jan, 2009. Available from https://www.epa.gov/oppt/exposure/pubs/episuitedl.htm as of Feb 12, 2010.

(3) Swann RL et al; Res Rev 85: 17-28 (1983)

▸ Hazardous Substances Data Bank (HSDB)

14.2.13 Volatilization from Water / Soil

The Henry's Law constant for propylene glycol is estimated as 1.3X10-8 atm-cu m/mole(SRC) derived from its vapor pressure, 0.13 mm Hg(1), and assigned value for water solubility of 1X10+6 mg/L (miscible)(2). This Henry's Law constant indicates that propylene glycol is

expected to be essentially nonvolatile from water surfaces(3). Propylene glycol is not expected to volatilize from dry soil surfaces(SRC) based upon its vapor pressure(1).

(1) Daubert TE, Danner RP; Physical and Thermodynamic Properties of Pure Chemicals Data Compilation Washington, DC: Taylor and Francis (1989)

(2) Yalkowsky SH, He Y; Handbook of Aqueous Solubility Data: An Extensive Compilation of Aqueous Solubility Data for Organic Compounds Extracted from the AQUASOL dATAbASE. Boca Raton, FL: CRC Press LLC, (2003)

(3) Lyman WJ et al; Handbook of Chemical Property Estimation Methods. Washington, DC: Amer Chem Soc pp. 15-1 to 15-29 (1990)

▸ Hazardous Substances Data Bank (HSDB)

14.2.14 Environmental Water Concentrations

GROUNDWATER: Propylene glycol was detected at a concentration of 4 mg/L in samples from a perched water table at the Ottawa Airport, Ontario, Canada(1).

(1) ATSDR; Toxicological Profile for Propylene Glycol. Atlanta, GA: Agency for Toxic Substances and Disease Registry, US Public Health Service (2009). Available from, as of August 25, 2010: https://www.atsdr.cdc.gov/toxprofiles/index.asp

▸ Hazardous Substances Data Bank (HSDB)

SURFACE WATER: Trigg Lake and Big Bear Creek, in the vicinity of the Dallas/Fort Worth International Airport, TX, were monitored for aircraft deicer/anti-icer fluid runoff from October 2002 to April 2004. Glycol concentrations at outfalls ranged from less than 81 to 23,800 mg/L; concentrations in Big Bear Creek ranged from less than 18 to 230 mg/L, with 10 and 35% of what was applied to aircraft was subsequently discharged into the creek. Glycol effluent released to Trigg Lake was initially diluted and degraded prior to reaching the lake outlet(1). Propylene glycol was detected in storm water runoff at the Salt Lake City airport Utah at concentrations up to 19,000 mg/L. The compound may also be released to surface water as a metabolite of the military propellant propylene glycol dinitrate which is found in waste water streams from munitions facilities(2).

(1) Corsi SR et al; Environ Toxicol Chem 25: 2890-900 (2006)

(2) ATSDR; Toxicological Profile for Propylene Glycol. Atlanta, GA: Agency for Toxic Substances and Disease Registry, US Public Health Service (2009). Available from, as of August 25, 2010: https://www.atsdr.cdc.gov/toxprofiles/index.asp

▸ Hazardous Substances Data Bank (HSDB)

14.2.15 Effluent Concentrations

Propylene glycol was identified, not quantified, in a wastewater effluent from a chemical plant in Memphis, TN in Aug 1974(1).

(1) Shackelford WM, Keith JL; Frequency of Organic Compounds Identified in Water. USEPA-600/4-76-062 p. 205 (1976)

▸ Hazardous Substances Data Bank (HSDB)

14.2.16 Atmospheric Concentrations

INDOOR AIR: Propylene glycol was detected in indoor air concentrations at the maximum concentration of 69.3 ug/cu m and the average concentration of 7.7 ug/cu m(1).

(1) Stolz P et al; in Indoor Air in Organic Indoor Air Pollutants. Occurrence, Measurement, Evaluation. Salthammer T, ed., New York, NY: Wiley-VCH, pp. 117-125 (1999)

▸ Hazardous Substances Data Bank (HSDB)

14.2.17 Other Environmental Concentrations

Propylene glycol was identified as a volatile component of latex-backed carpets(1). Propylene glycol was detected in newly manufactured and site houses at concentrations of 1.1-12.0 ppb and < 2.2-360 ppb in North America(2).

(1) USCPSC; Status Report for Chemical Emissions from New Carpets. US Consumer Product Safety Commission (1993)

(2) Hodgson At et al; Indoor Air 10: 178-9 (2000)

▸ Hazardous Substances Data Bank (HSDB)

Propylene glycol was detected in snowbanks within the General Mitchell International Airport in Wisconsin, a medium-sized airport. The compound was identified as the main constituent, with the concentration ranging from 144 to 8,210 kg from February 2000-March 2003. Glycol content in snowbanks ranged from 0.17- 11.4%(1)

(1) Corsi SR et al; Environ Sci Technol 40: 3195-3202 (2006)

▸ Hazardous Substances Data Bank (HSDB)

Propylene glycol was present in the following consumer product categories: paint primers and varnishes, all purpose cleaners, room deodorants and disinfectants, personal deodorants, and metal cleaners and polishes(1). The weight percentage of propylene glycol in the products ranged from 16.15% to 42.47%(1). Propylene glycol was also detected in oven spray cleaner at unknown concentrations(2).

(1) USEPA; Compilation and speciation of National Emissions Factor for consumer/commercial solvent use. Information compiled to support urban air toxics assessment studies. USEPA-450/2-89-008 (1989)

(2) Salthammer T; in Organic Indoor Air Pollutants. Occurrence, Measurement, Evaluation. Salthammer T, ed., New York, NY: Wiley-VCH, pp. 219-232 (1999)

▸ Hazardous Substances Data Bank (HSDB)

14.2.18 Probable Routes of Human Exposure

According to the 2006 TSCA Inventory Update Report, the number of persons reasonably likely to be exposed in the industrial manufacturing, processing, and use for propylene glycol is 1000 or greater; the data may be greatly underestimated(1).

(1) US EPA; Inventory Update Reporting (IUR). Non-confidential 2006 IUR Records by Chemical, including Manufacturing, Processing and Use Information. Washington, DC: U.S. Environmental Protection Agency. Available from, as of March 2, 2010: https://cfpub.epa.gov/iursearch/index.cfm

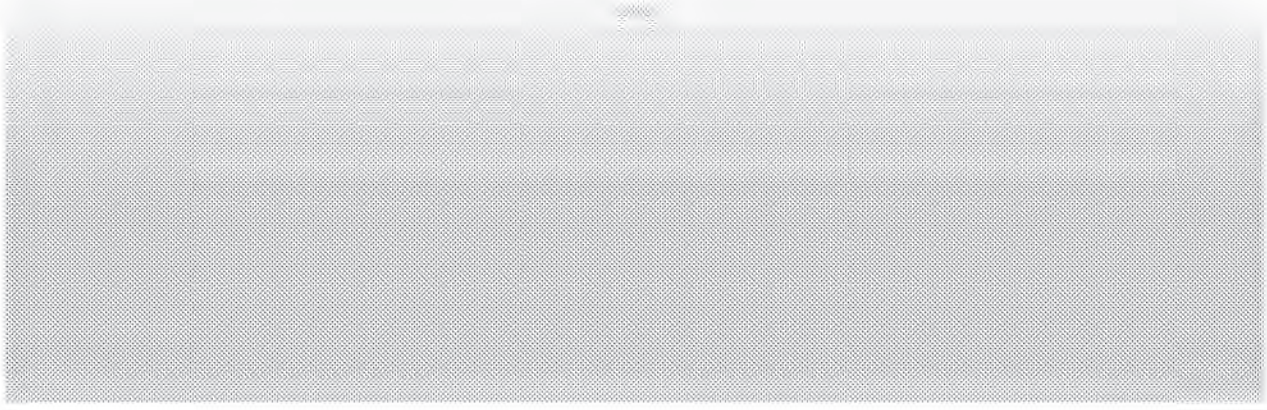
▸ Hazardous Substances Data Bank (HSDB)

NIOSH (NOES Survey 1981-1983) has statistically estimated that 2,238,429 workers (936,584 of these are female) are potentially exposed to propylene glycol in the US(1). Occupational exposure to propylene glycol may occur through inhalation and dermal contact with this compound at workplaces where propylene glycol is produced or used(SRC). Monitoring and use data indicate that the general population may be exposed to propylene glycol via inhalation and dermal contact with consumer products containing propylene glycol(SRC).

(1) NIOSH; NOES, National Occupational Exposure Survey conducted from 1981-1983. Estimated numbers of employees potentially exposed to specific agents by 2-digit standard industrial classification (SIC). Available from, as of Feb 12, 2010: https://www.cdc.gov/noes/

▸ Hazardous Substances Data Bank (HSDB)

15 Associated Disorders and Diseases



Comparative Toxicogenomics Database (CTD); Open Targets

Associated Occupational Diseases with Exposure to the Compound

Contact dermatitis, allergic [Category: Skin Disease]

Encephalopathy, chronic solvent [Category: Chronic Poisoning]

Solvents, acute toxic effect [Category: Acute Poisoning]

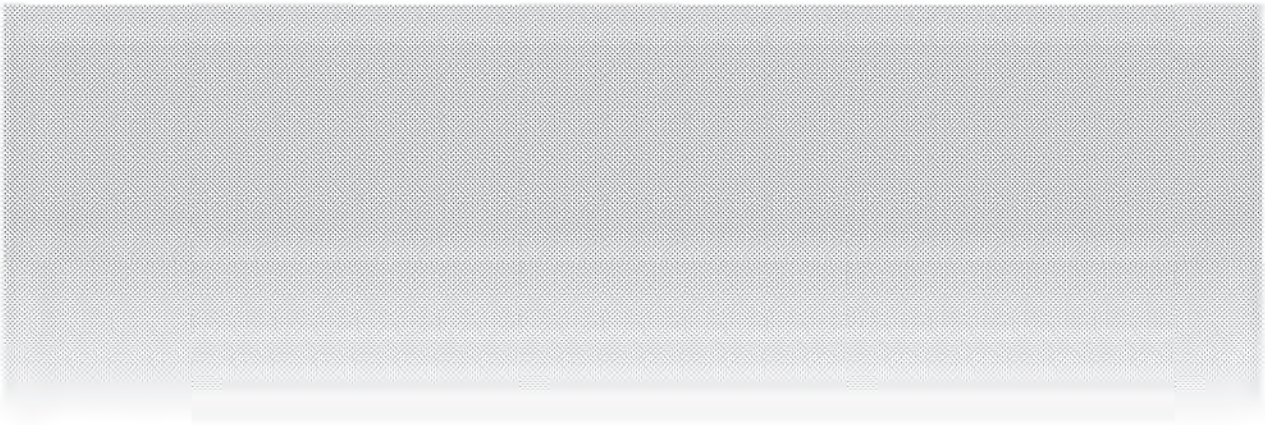
Haz-Map, Information on Hazardous Chemicals and Occupational Diseases

16 Literature

16.1 Consolidated References

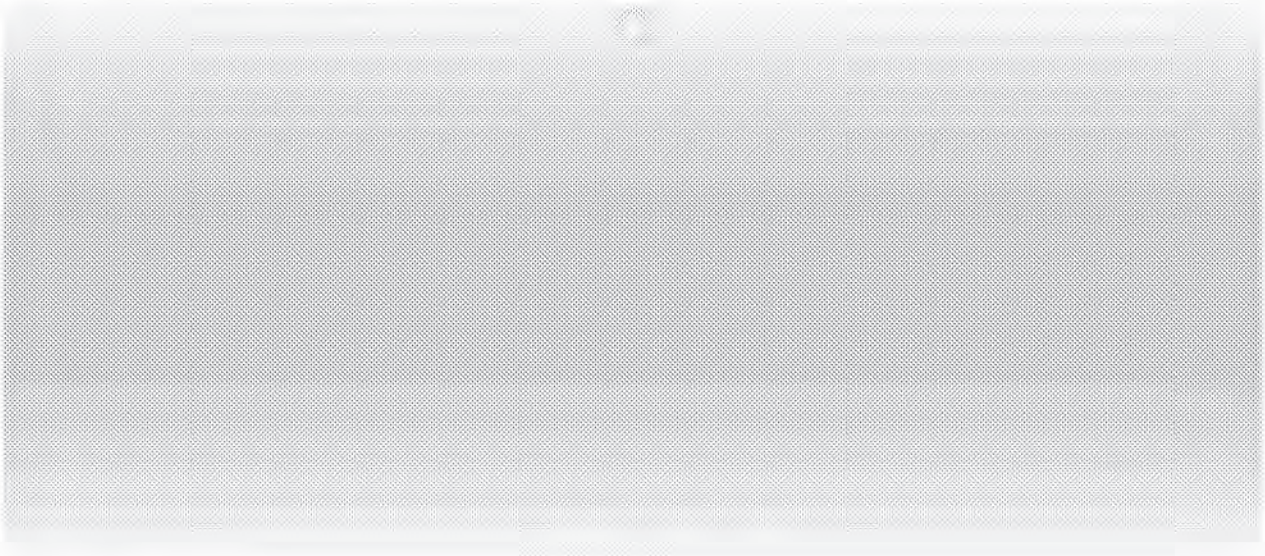
PubChem

16.2 NLM Curated PubMed Citations



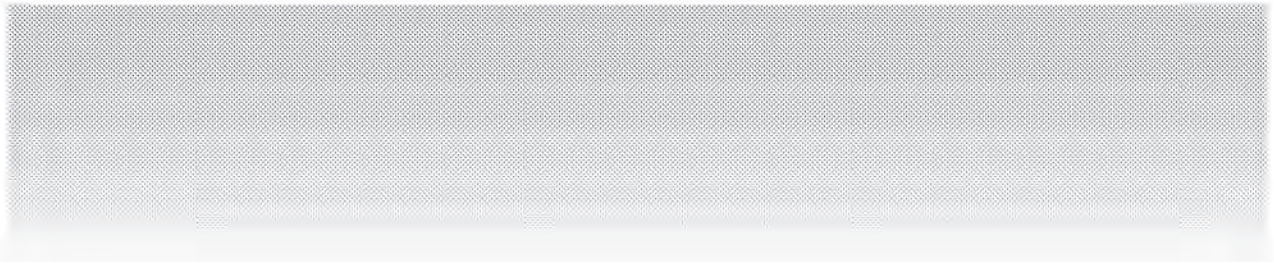
▸ PubChem

16.3 Springer Nature References



▸ Springer Nature

16.4 Thieme References

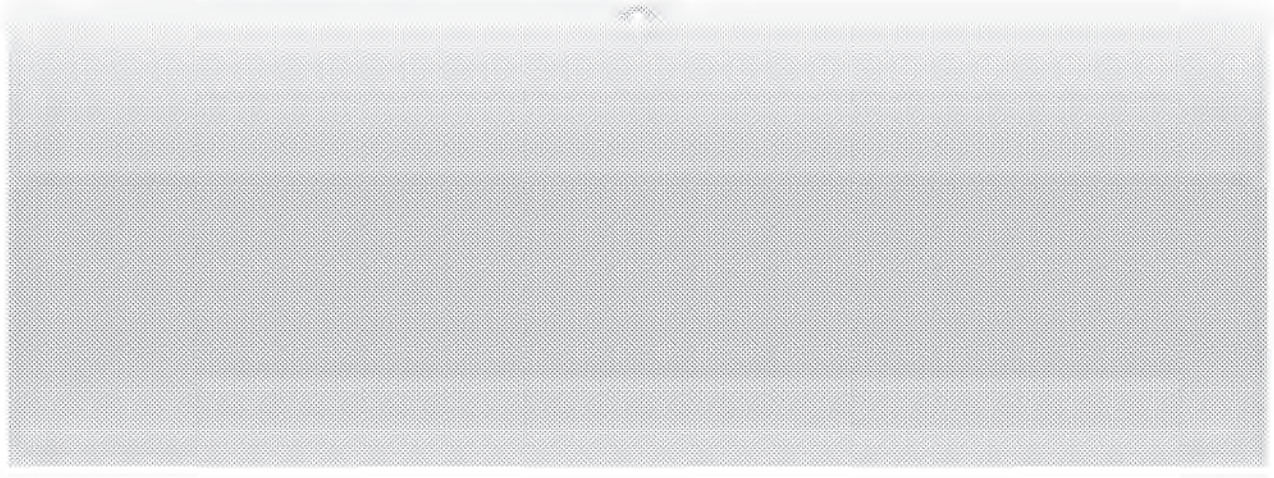


▸ Thieme Chemistry

16.5 Wiley References

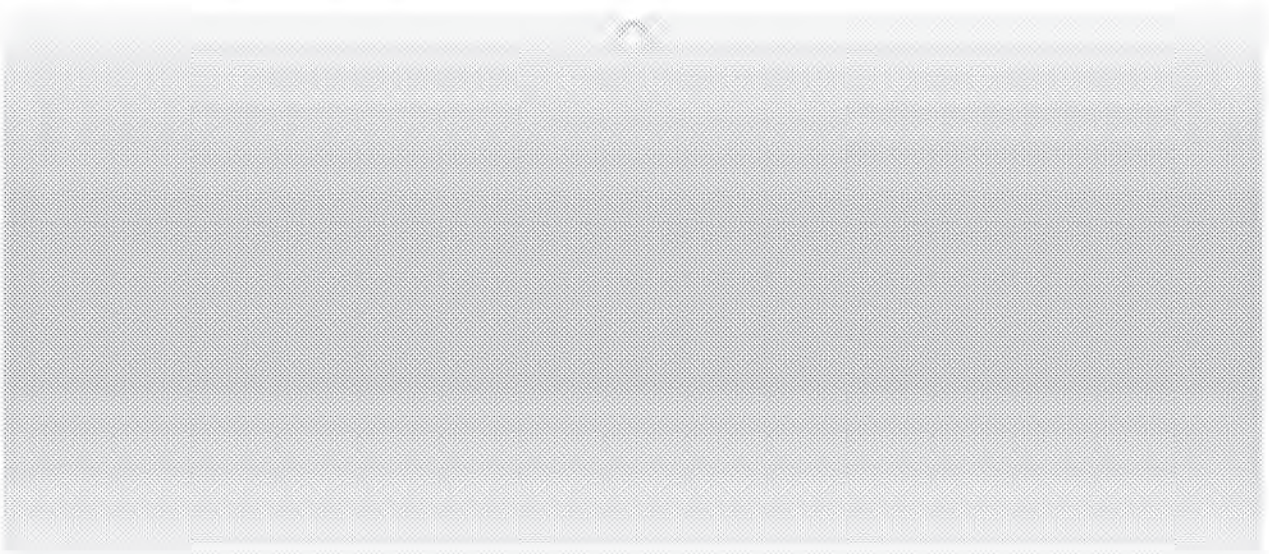
▸ Wiley

16.6 Chemical Co-Occurrences in Literature



PubChem

16.7 Chemical-Gene Co-Occurrences in Literature



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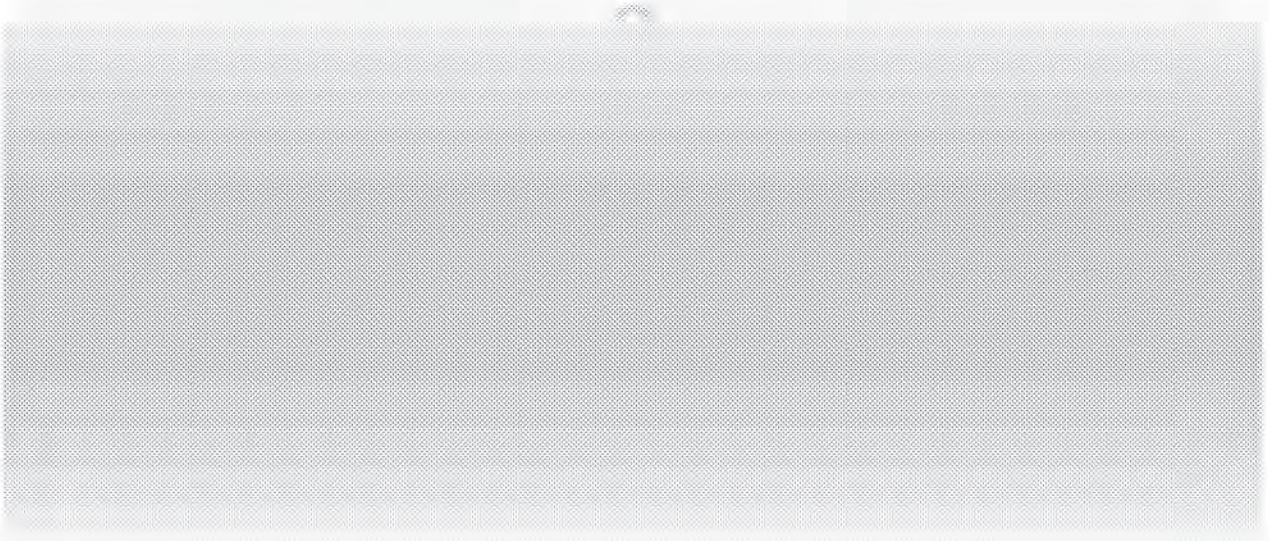
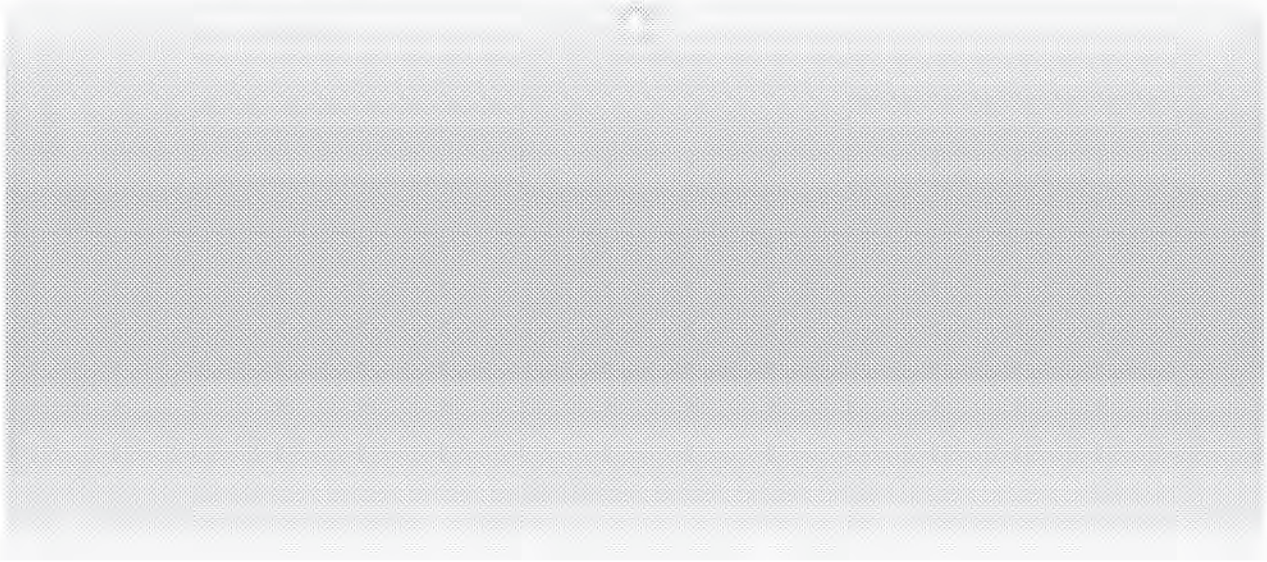
16.8 Chemical-Disease Co-Occurrences in Literature



PubChem

17 Patents

17.1 Depositor-Supplied Patent Identifiers



PubChem

Link to all deposited patent identifiers

PubChem

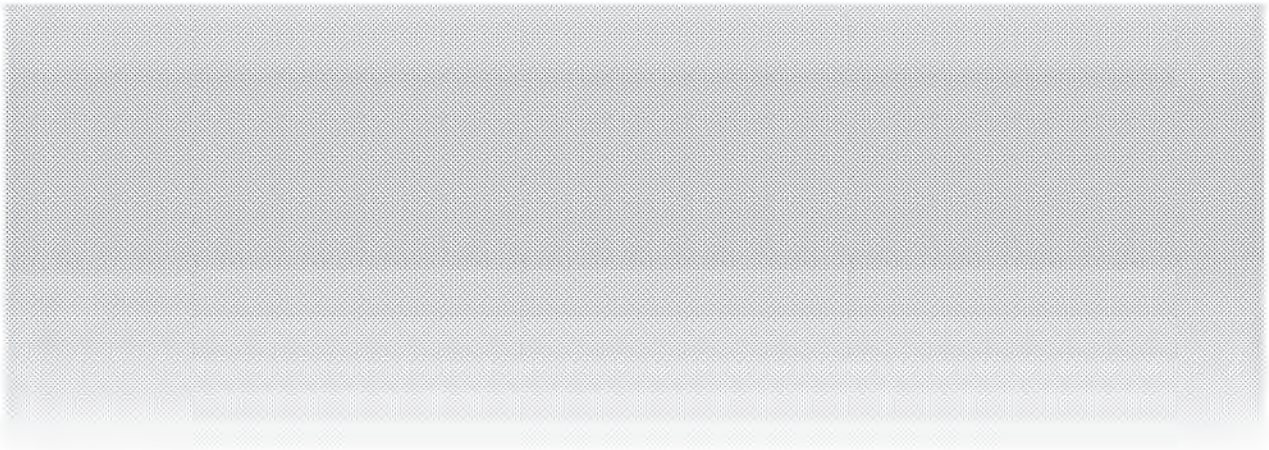
17.2 WIPO PATENTSCOPE

Patents are available for this chemical structure:

https://patentscope.wipo.int/search/en/result.jsf?inchikey=DNIAPMSPPWPWGF-UHFFFAOYSA-N

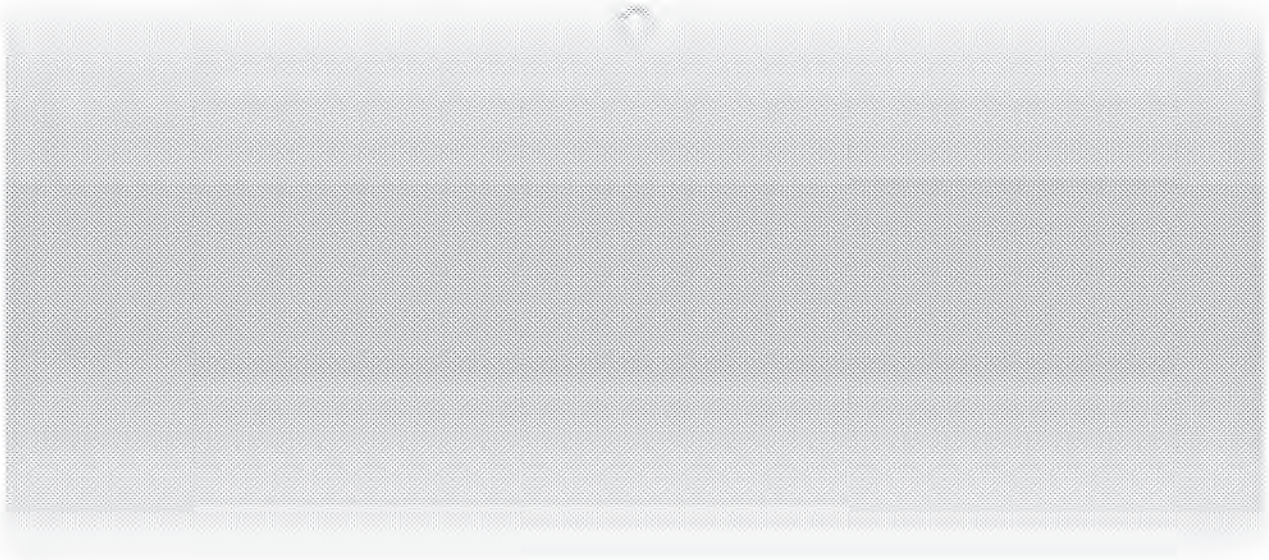
PATENTSCOPE (WIPO)

17.3 Chemical Co-Occurrences in Patents



▸ PubChem

17.4 Chemical-Disease Co-Occurrences in Patents



▸ PubChem

17.5 Chemical-Gene Co-Occurrences in Patents

PubChem

18 Interactions and Pathways

18.1 Protein Bound 3D Structures

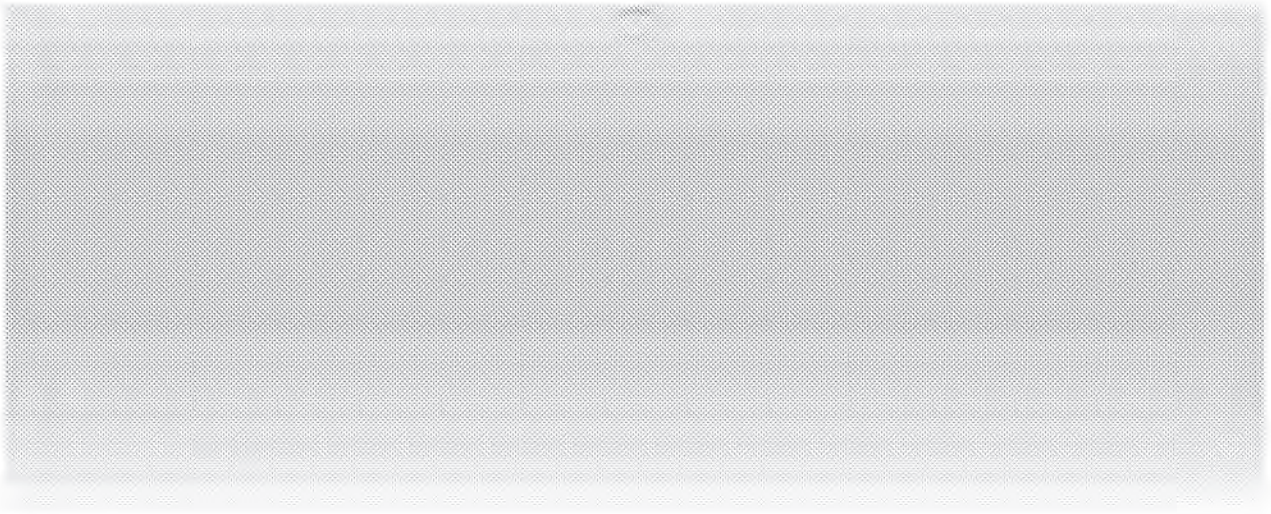
View 1 protein in NCBI Structure

PubChem

18.2 Chemical-Target Interactions

Comparative Toxicogenomics Database (CTD); Drug Gene Interaction database (DGIdb); Toxin an...

18.3 Drug-Drug Interactions



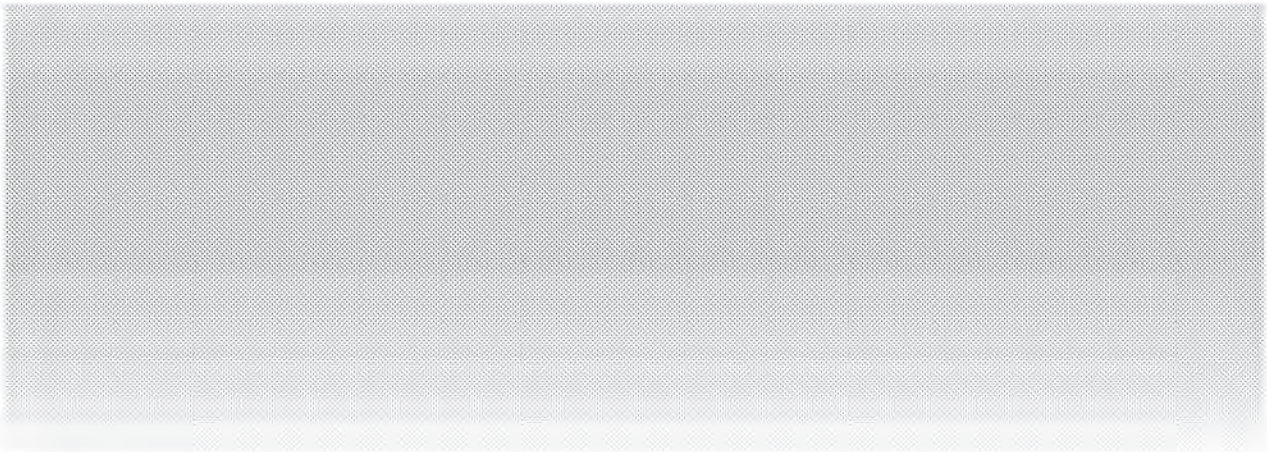
▸ DrugBank

18.4 Pathways

▸ PubChem

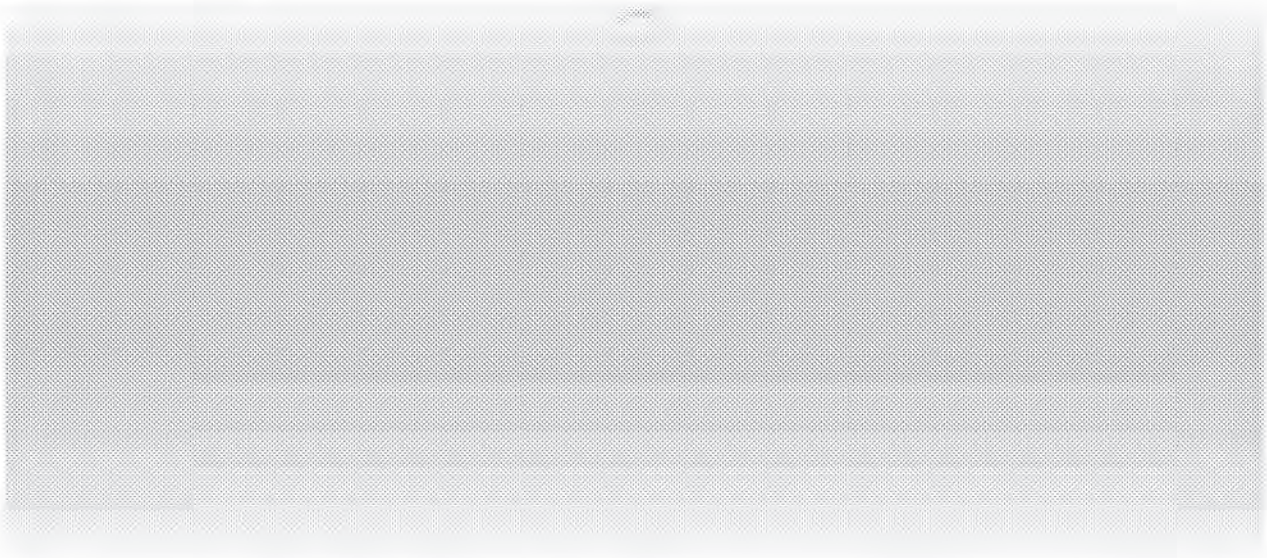
19 Biological Test Results

19.1 BioAssay Results



▸ PubChem

20 Taxonomy



The LOTUS initiative for Open Natural Products Research: frozen dataset union wikidata (with metadata) | DOI:10.5281/zenodo.5794106

▸ E. coli Metabolome Database (ECMDB); LOTUS - the natural products occurrence database; Natur...

21 Classification

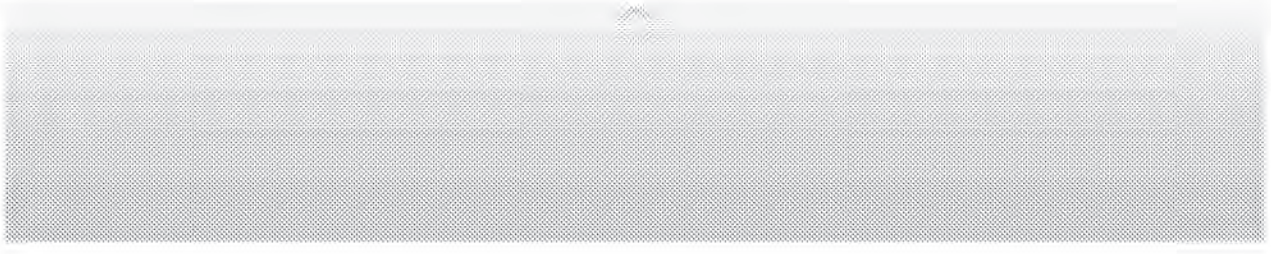
21.1 MeSH Tree

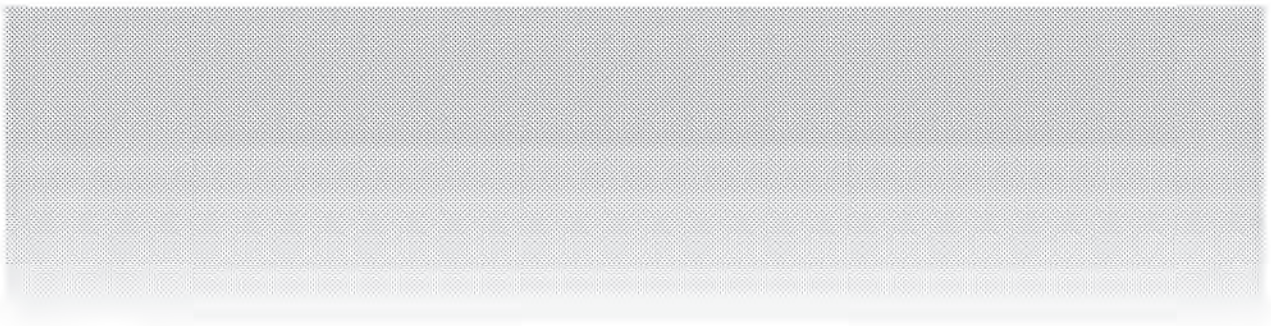
▸ Medical Subject Headings (MeSH)

21.2 NCI Thesaurus Tree

▸ NCI Thesaurus (NCIt)

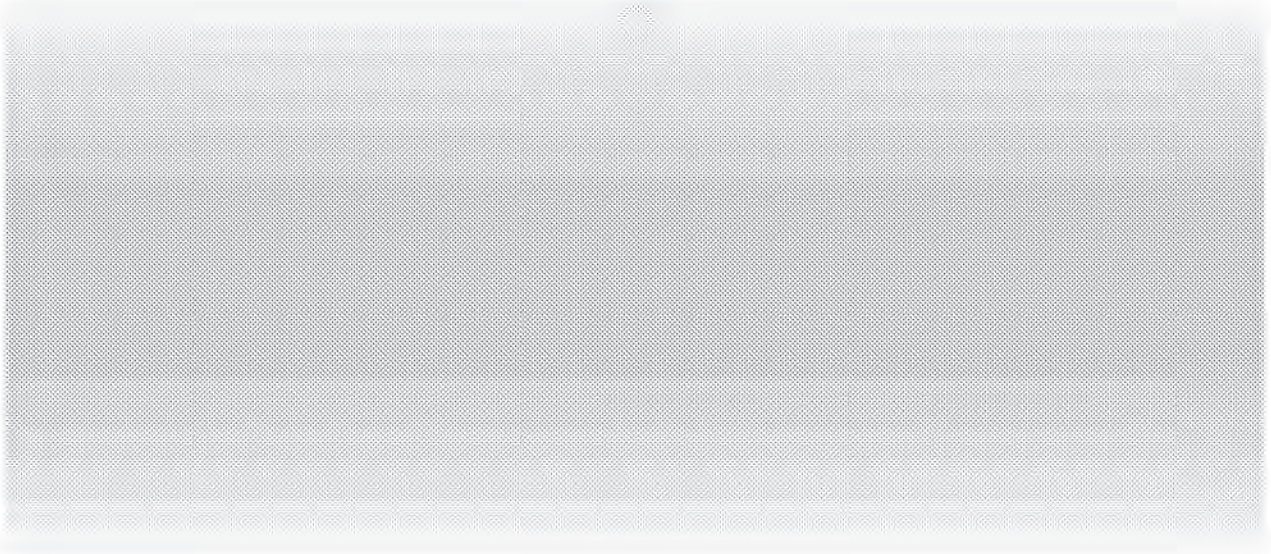
21.3 ChEBI Ontology





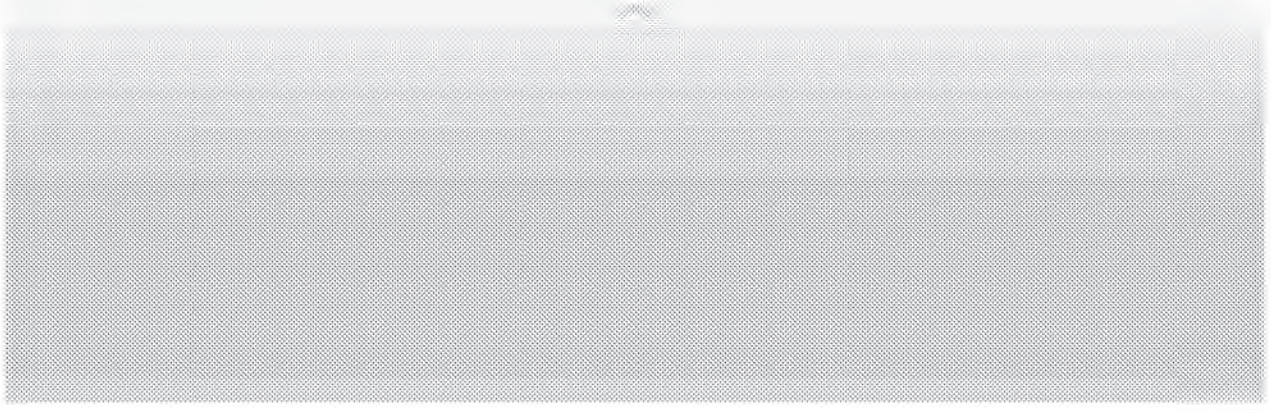
▸ ChEBI

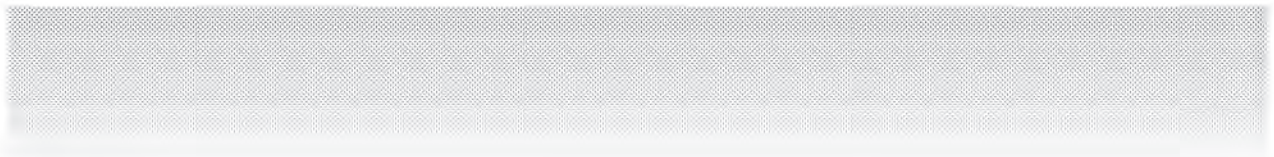
21.4 KEGG: Drug



▸ KEGG

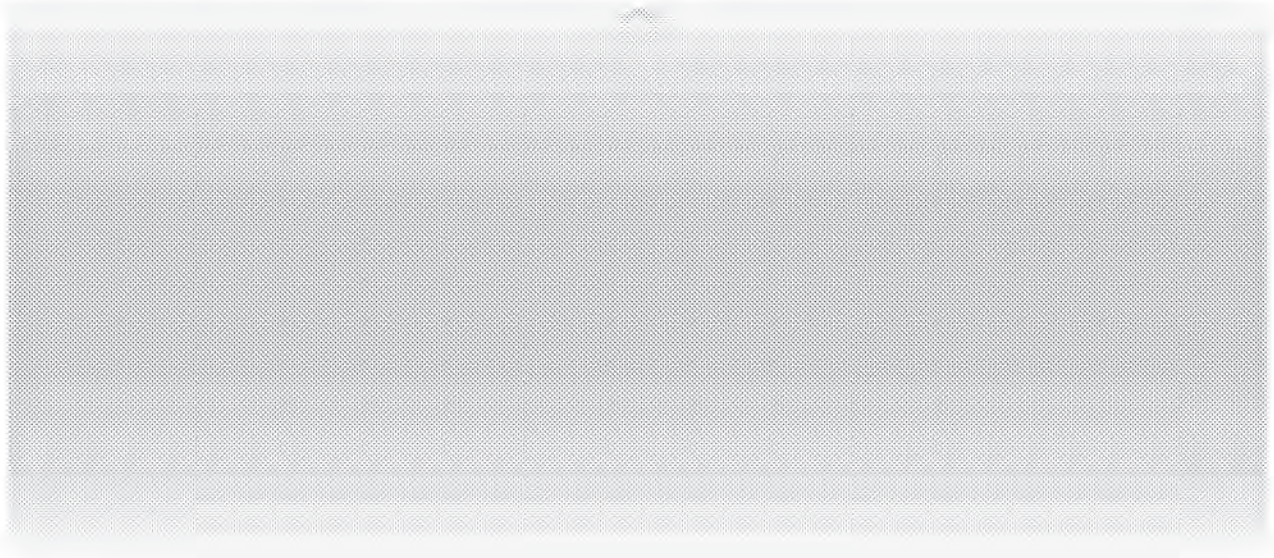
21.5 KEGG: JP15





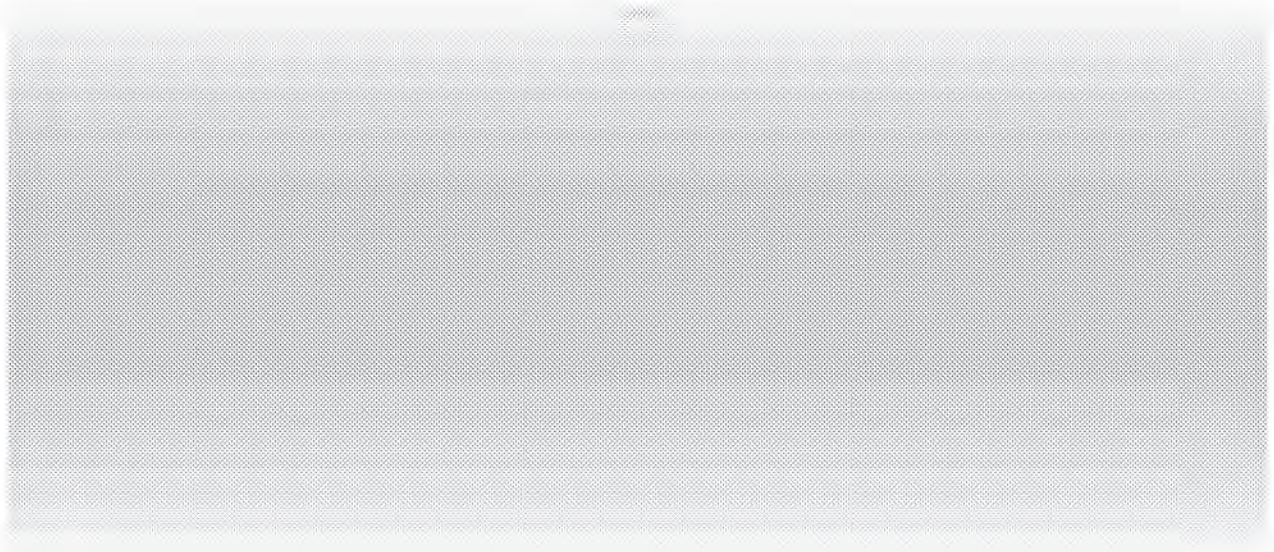
▸ KEGG

21.6 KEGG: Animal Drugs



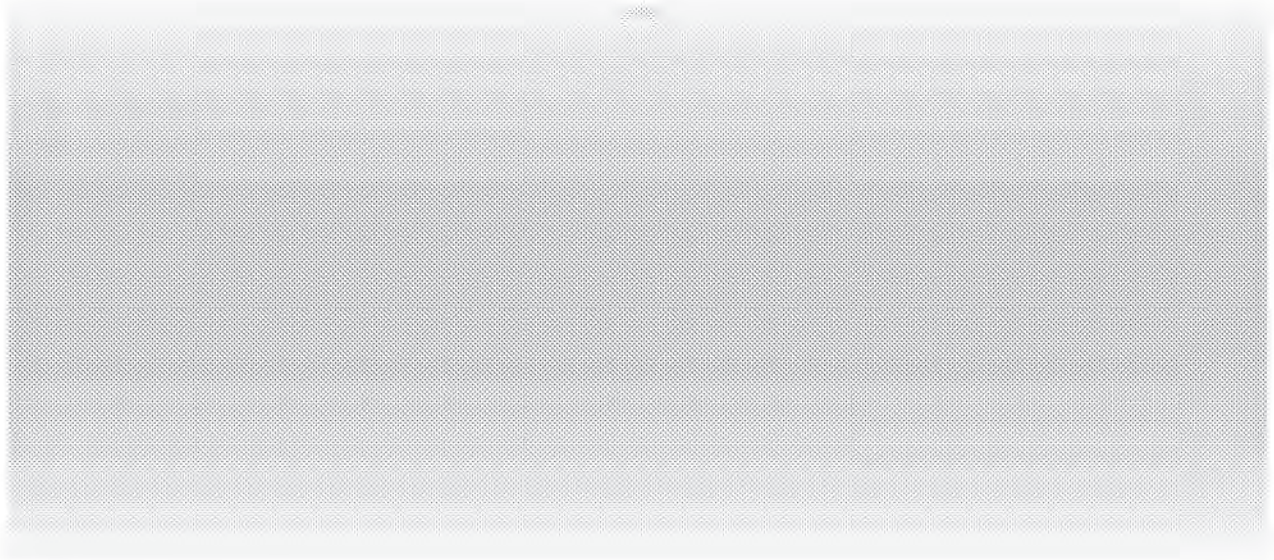
▸ KEGG

21.7 EPA Safer Choice



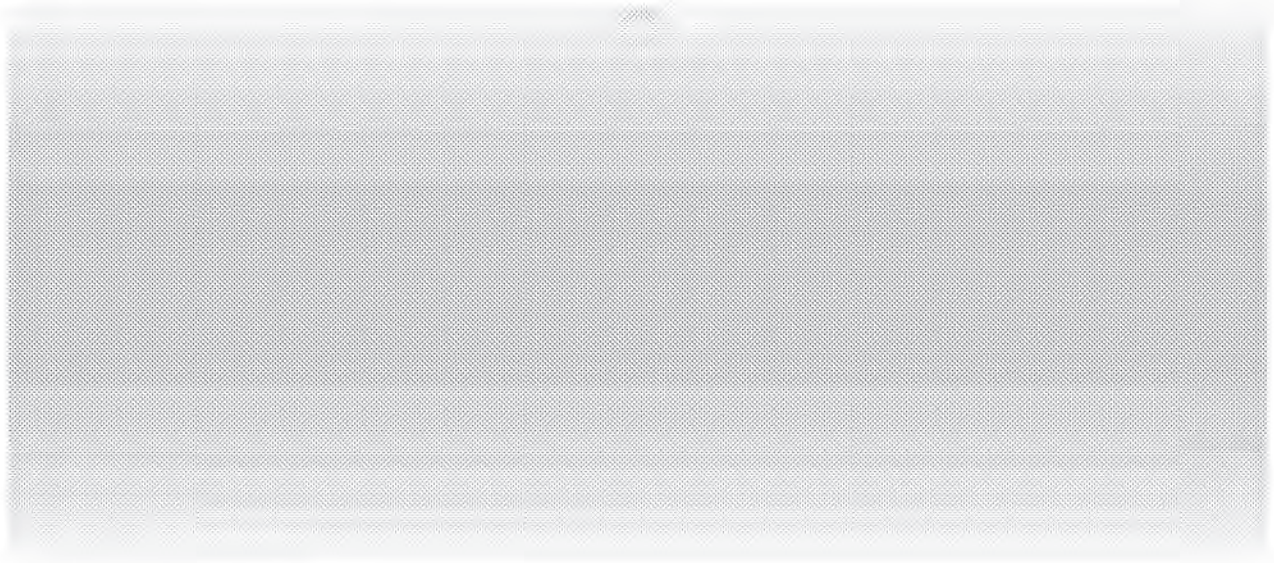
EPA Safer Choice

21.8 ChemIDplus



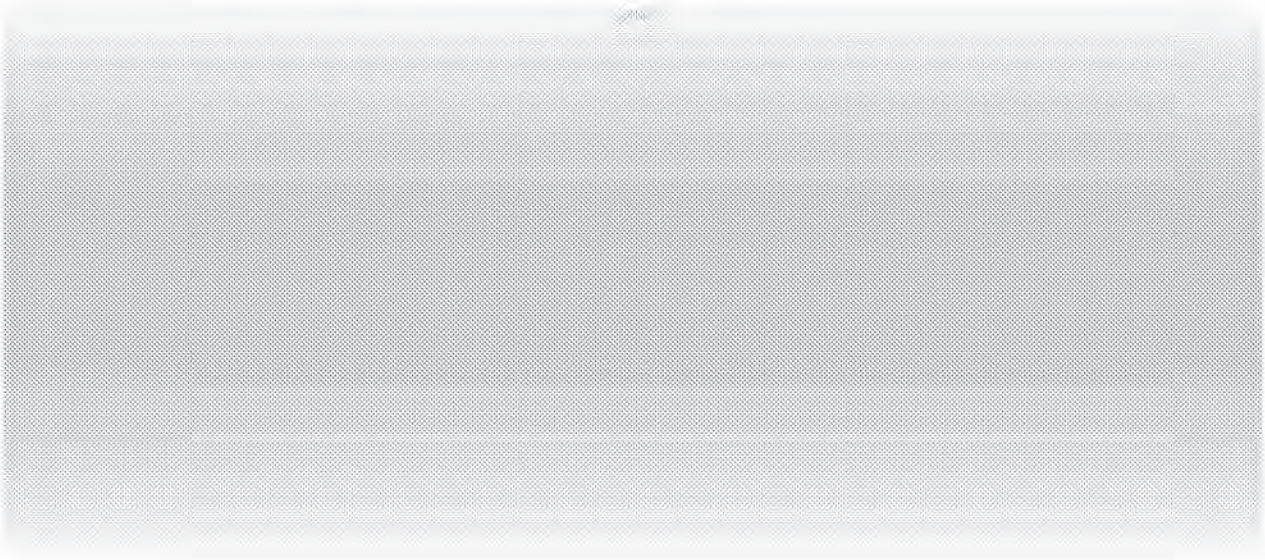
ChemIDplus

21.9 CAMEO Chemicals



CAMEO Chemicals

21.10 ChEMBL Target Tree

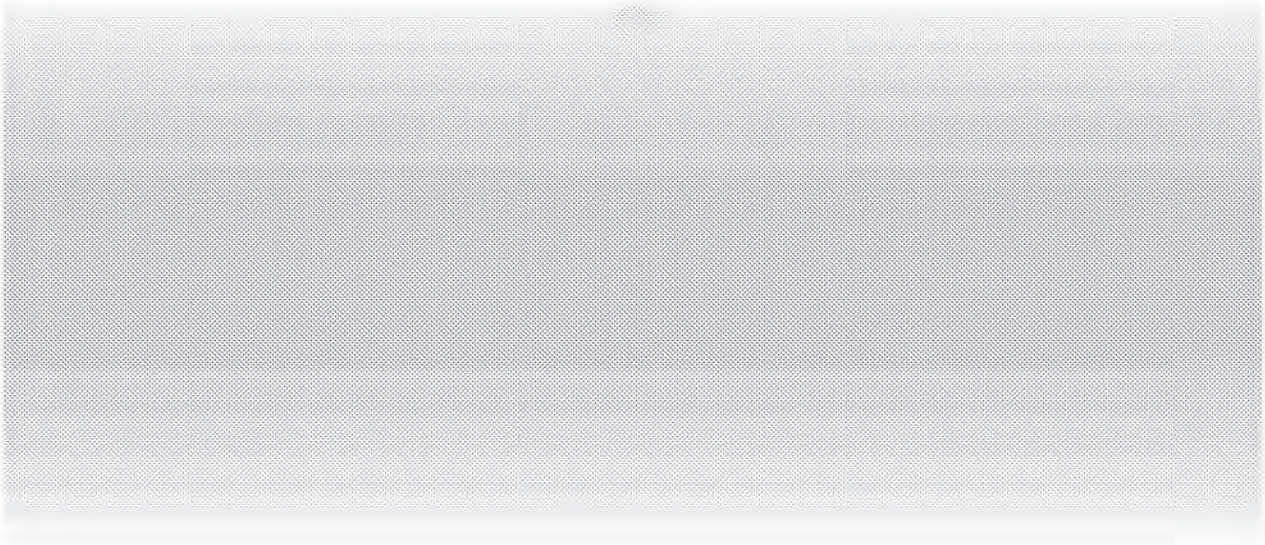


- ChEMBL

21.11 Household Products Database Tree

- Consumer Product Information Database (CPID)

21.12 UN GHS Classification

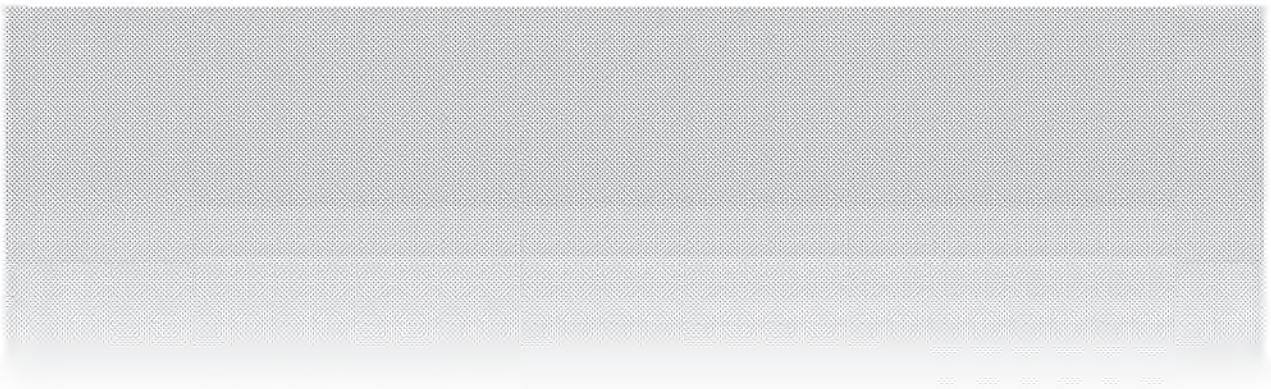


▸ GHS Classification (UNECE)

21.13 EPA CPDat Classification

▸ EPA Chemical and Products Database (CPDat)

21.14 NORMAN Suspect List Exchange Classification

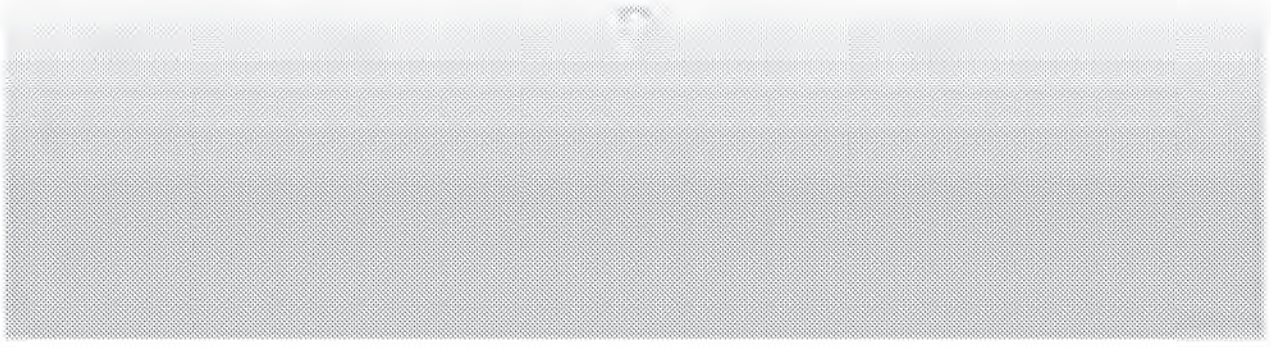


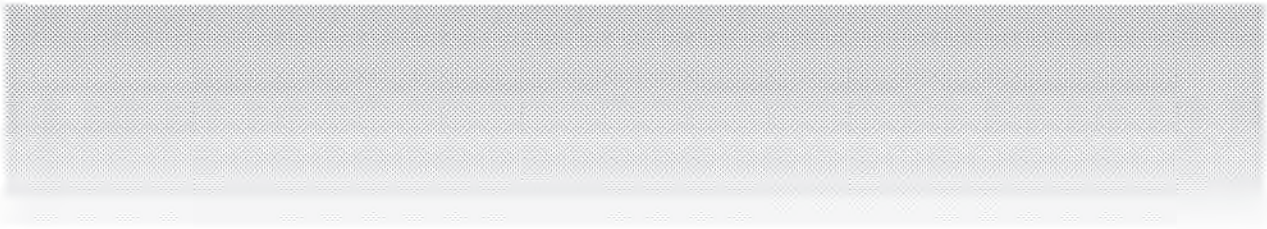
NORMAN Suspect List Exchange

21.15 EPA DSSTox Classification

EPA DSSTox

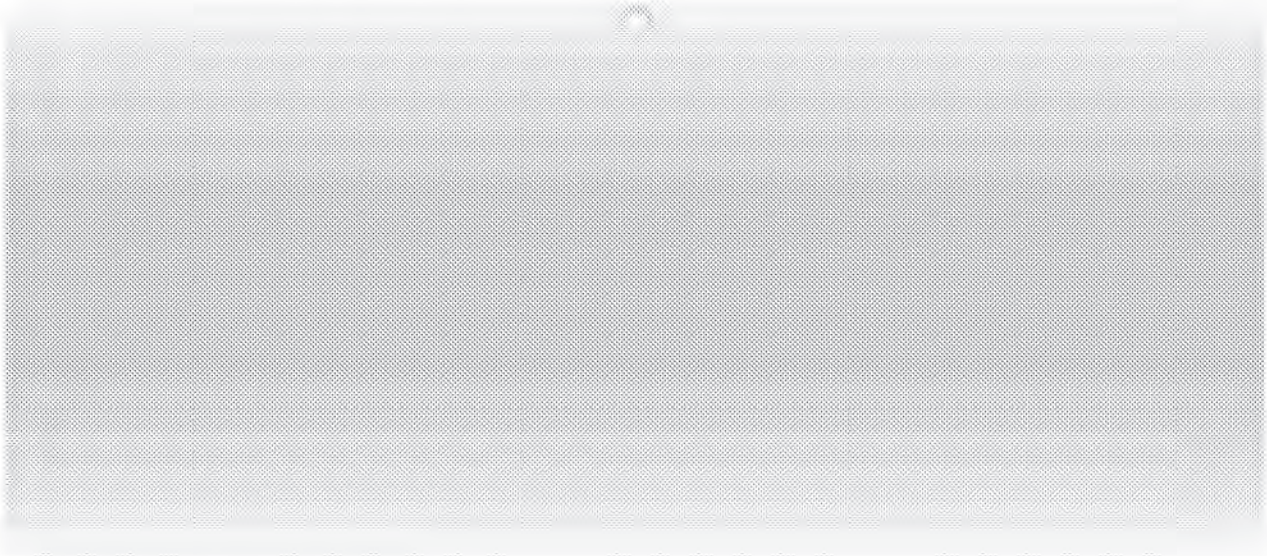
21.16 Consumer Product Information Database Classification





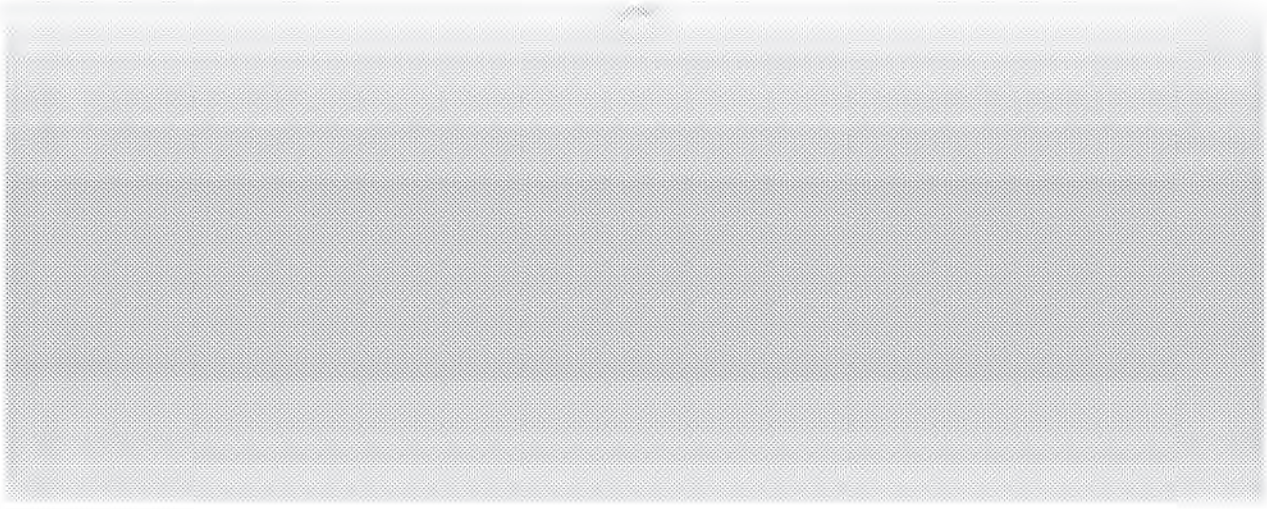
▸ Consumer Product Information Database (CPID)

21.17 EPA TSCA and CDR Classification



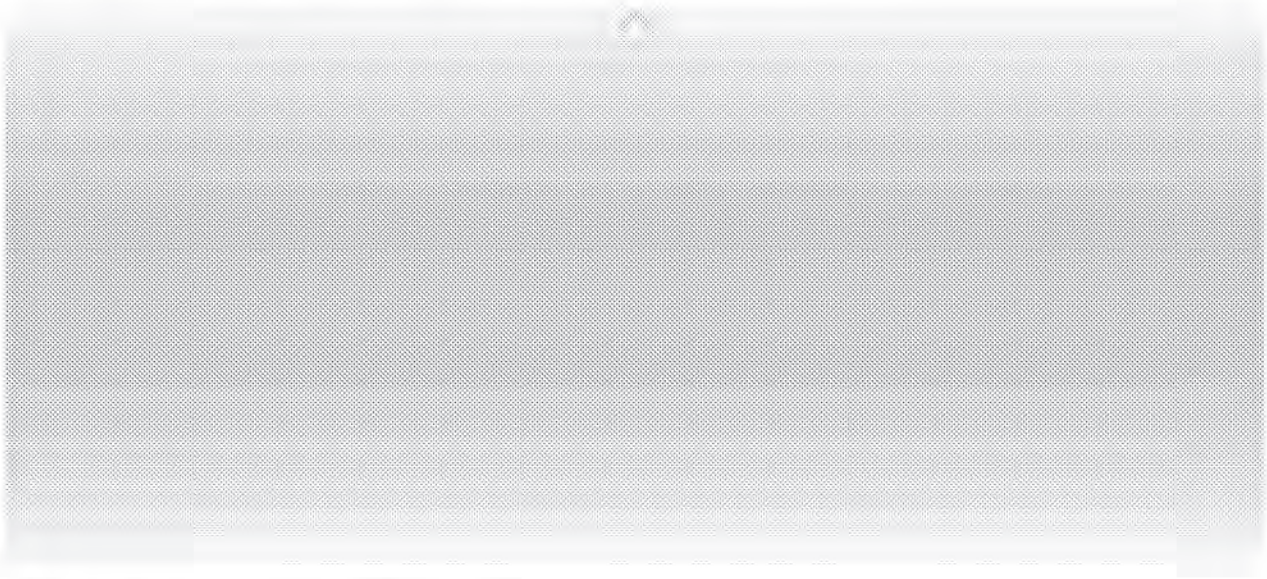
▸ EPA Chemicals under the TSCA

21.18 LOTUS Tree



- LOTUS - the natural products occurrence database

21.19 FDA Drug Type and Pharmacologic Classification



- National Drug Code (NDC) Directory

21.20 EPA Substance Registry Services Tree

▸ EPA Substance Registry Services

21.21 MolGenie Organic Chemistry Ontology

▸ MolGenie

21.22 Chemicals in PubChem from Regulatory Sources

▸ PubChem

22 Information Sources

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https://wwwn.cdc.gov/TSP/substances/ToxSubstance.aspx?toxid=240

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https://haz-map.com/About

Propylene glycol

https://haz-map.com/Agents/685

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PROPYLENE GLYCOL

https://cameochemicals.noaa.gov/chemical/9030

CAMEO Chemical Reactivity Classification

https://cameochemicals.noaa.gov/browse/react

4. ChEBI

Propane-1,2-diol

https://www.ebi.ac.uk/chebi/searchId.do?chebiId=CHEBI:16997

ChEBI Ontology

http://www.ebi.ac.uk/chebi/userManualForward.do#ChEBI%20Ontology

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Propylene glycol

https://www.drugbank.ca/drugs/DB01839

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https://www.wikidata.org/wiki/Q161495

LOTUS Tree

https://lotus.naturalproducts.net/

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NCI Thesaurus

https://ncit.nci.nih.gov

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https://platform.opentargets.org/drug/CHEMBL286398

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1,2-Propanediol
https://services.industrialchemicals.gov.au/search-assessments/

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https://services.industrialchemicals.gov.au/search-inventory/

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(±)-Propylene glycol
https://commonchemistry.cas.org/detail?cas_rn=57-55-6

14. ChemIDplus

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Propylene glycol [USP:JAN]
https://pubchem.ncbi.nlm.nih.gov/substance/?source=chemidplus&sourceid=0000057556

ChemIDplus Chemical Information Classification
https://pubchem.ncbi.nlm.nih.gov/source/ChemIDplus

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propylene glycol
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Glycol, polypropylene (P750)
https://dtp.cancer.gov/dtpstandard/servlet/dwindex?searchtype=NSC&outputformat=html&searchlist=35749

Glycol, polypropylene (P1200)

https://dtp.cancer.gov/dtpstandard/servlet/dwindex?searchtype=NSC&outputformat=html&searchlist=35748

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1,2-Propanediol

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EPA TSCA Classification

https://www.epa.gov/tsca-inventory

18. EPA DSSTox

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1,2-Propylene glycol

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CompTox Chemicals Dashboard Chemical Lists

https://comptox.epa.gov/dashboard/chemical-lists/

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https://iris.epa.gov/ChemicalLanding/&substance_nmbr=543

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Propane-1,2-diol

https://chem.echa.europa.eu/100.000.307

1,2-Propanediol

https://echa.europa.eu/substance-information/-/substanceinfo/100.121.699

Propane-1,2-diol (EC: 200-338-0)

https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/44442

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https://gsrs.ncats.nih.gov/ginas/app/beta/substances/6DC9Q167V3

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Propylene glycol

https://pubchem.ncbi.nlm.nih.gov/source/hsdb/174

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PROPYLENE GLYCOL

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https://www.osha.gov/chemicaldata/882

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https://rais.ornl.gov/

Propylene Glycol

https://rais.ornl.gov/cgi-bin/tools/TOX_search

29. EU Food Improvement Agents

PROPANE-1,2-DIOL

http://data.europa.eu/eli/reg/2012/231/2024-04-23

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https://www.ebi.ac.uk/chembl/explore/compound/CHEMBL286398

ChEMBL Protein Target Tree

https://www.ebi.ac.uk/chembl/g/#browse/targets

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https://www.whatsinproducts.com/contents/view/1/6

Propylene glycol

https://www.whatsinproducts.com/chemicals/view/1/47/000057-55-6

Household Products Classification

https://hpd.nlm.nih.gov/

Consumer Products Category Classification

https://www.whatsinproducts.com/

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Propylene Glycol

https://cir-reports.cir-safety.org/cir-ingredient-status-report/?id=a7897269-5091-40fc-b93a-13b212b47593

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https://comptox.epa.gov/dashboard/DTXSID0021206#exposure

EPA CPDat Classification
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https://www.norman-network.com/nds/SLE/

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39. IUPAC Digitized pKa Dataset

1,2-Propanediol
https://github.com/IUPAC/Dissociation-Constants

40. Natural Product Activity and Species Source (NPASS)

Propylene Glycol
https://bidd.group/NPASS/compound.php?compoundID=NPC114270

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Propylene Glycol

https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search?tool=rml

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1,2-Propanediol
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1,2-DIHYDROXYPROPANE
https://apps.who.int/food-additives-contaminants-jecfa-database/Home/Chemical/786

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https://www.usgs.gov/foia

PROPYLENE GLYCOL
https://www.cerc.usgs.gov/data/acute/arychemdesc.asp?Chemical=P0520

46. EU Clinical Trials Register

https://www.clinicaltrialsregister.eu/

47. NITE-CMC

Propane-1,2-diol (Propylene glycol) - FY2018 (New/original classication)
https://www.chem-info.nite.go.jp/chem/english/ghs/18-meti-0003e.html

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PROPYLENE GLYCOL
https://www.hfpappexternal.fda.gov/scripts/fdcc/index.cfm?set=FoodSubstances&id=PROPYLENEGLYCOL

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PROPYLENE GLYCOL
https://www.femaflavor.org/flavor-library/propylene-glycol

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Propylene glycol

https://foodb.ca/compounds/FDB008274

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1,2-PROPANEDIOL

https://massbank.eu/MassBank/Result.jsp?inchikey=DNIAPMSPPWPWGF-UHFFFAOYSA-N

52. Japan Chemical Substance Dictionary (Nikkaji)

http://jglobal.jst.go.jp/en/redirect?Nikkaji_No=J1.918F

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https://www.kegg.jp/entry/C00583

https://www.kegg.jp/entry/D00078

Therapeutic category of drugs in Japan

http://www.genome.jp/kegg-bin/get_htext?br08301.keg

Drugs listed in the Japanese Pharmacopoeia

http://www.genome.jp/kegg-bin/get_htext?br08311.keg

Animal drugs in Japan

http://www.genome.jp/kegg-bin/get_htext?br08331.keg

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1,2-PROPANEDIOL

https://mona.fiehnlab.ucdavis.edu/spectra/browse?

query=exists(compound.metaData.name:%27InChIKey%27%20and%20compound.metaData.value:%27DNIAPMSPPWP

WGF-UHFFFAOYSA-N%27)

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Propylene Glycol
http://www.nist.gov/srd/nist1a.cfm

56. SpectraBase

1,2-Propane diol
https://spectrabase.com/spectrum/4NGYoz7eMq

1,2-Propanediol
https://spectrabase.com/spectrum/T9ilVJ06ezM

1,2-Propanediol
https://spectrabase.com/spectrum/4P0jceTzv0r

1,2-Propanediol
https://spectrabase.com/spectrum/BAE3SnLC0GX

1,2-Propanediol
https://spectrabase.com/spectrum/5ch5mgYQgJ.f

1,2-Propanediol
https://spectrabase.com/spectrum/6R9uBOhKXJv

1,2-Propanediol
https://spectrabase.com/spectrum/4rcoomafpRV

alpha-Propylene glycol
https://spectrabase.com/spectrum/KWduhitSeZg

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1,2-propanediol
https://www.metabolomicsworkbench.org/data/StructureData.php?RegNo=87196

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propylene glycol

https://rxnav.nlm.nih.gov/id/rxnorm/34693

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66. Wikipedia

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MeSH Tree

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Pharmaceutical Vehicles

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Solvents

https://www.ncbi.nlm.nih.gov/mesh/68012997

69. PubChem

https://pubchem.ncbi.nlm.nih.gov

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GHS Classification

http://www.unece.org/trans/danger/publi/ghs/ghs_welcome_e.html

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EPA SRS List Classification

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MolGenie Organic Chemistry Ontology

https://github.com/MolGenie/ontology/

73. PATENTSCOPE (WIPO)

SID 403029368

https://pubchem.ncbi.nlm.nih.gov/substance/403029368

74. NCBI

https://www.ncbi.nlm.nih.gov/projects/linkout

TO: USpatentmail@klgates.com
FROM: noreply@uspto.gov
CC: patentcenter_eofficeaction@uspto.gov
SUBJECT: USPTO: Patent Electronic System - Correspondence Notification for Customer Number 26285

Wed Apr 23 05:01:27 EDT 2025

Dear Patent Center Customer:

Correspondence Address:

K&LGATES LLP-Pittsburgh
210 SIXTH AVENUE
PITTSBURGH,PENNSYLVANIA,15222-2613
UNITED STATES

This is a courtesy notification regarding the following USPTO patent application(s) associated with your Customer Number, 26285, that have new outgoing correspondence. This correspondence is now available for viewing in Patent Center.

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Application	Document	Mailroom Date	Attorney Docket No.
19072608	CTNF	04/23/2025	210189PCTUSCON
19072608	892	04/23/2025	210189PCTUSCON

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Sincerely,

The Patent Center Team

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of: Min Kuang

Application Serial No.: 19/072,608

371(c) Date: March 6, 2025

Art Unit: 1731

Examiner: Guino-o Uzzle, Marites A

Confirmation No.: 6883

WOOD PRESERVATIVE COMPOSITION COMPRISING 4,5-DICHLORO-2-OCTYLISOTHIAZOL-3(2H)-ONE, A METHOD TREATING A WOOD SUBSTRATE THEREWITH, AND A WOOD PRODUCT PRODUCED THEREFROM

Docket No.: 210189PCTUSCON

K&L Gates LLP
Pittsburgh, Pennsylvania 15222
May 7, 2025

VIA ELECTRONIC FILING

Commissioner for Patents
P.O. Box: 1450
Alexandria, VA 22313-1450

AMENDMENT TRANSMITTAL

1. Transmitted herewith is an amendment for this application.

STATUS

2. Applicant is

☐ A statement that this filing is by a small entity is hereby asserted in accordance with the rule change effective September 8, 2000, 65 Fed. Reg. 54603.

☒ other than a small entity.

EXTENSION OF TERM

NOTE: "Extension of Time in Patent Cases (Supplement Amendments) - If a timely and complete response has been filed after a Non-Final Office Action, an extension of time is not required to permit filing and/or entry of an additional amendment after expiration of the shortened statutory period.

If a timely response has been filed after a Final Office Action, an extension of time is required to permit filing and/or entry of a Notice of Appeal or filing and/or entry of an additional amendment after expiration of the shortened statutory period unless the timely-filed response placed the application in condition for allowance. Of course, if a Notice of Appeal has been filed within the shortened statutory period, the period has ceased to run." Notice of December 10, 1985 (1061 O.G. 34-35).

NOTE: See 37 CFR 1.645 for extensions of time in interference proceedings, and 37 CFR 1.550(c) for extensions of time in reexamination proceedings.

3. The proceedings herein are for a patent application and the provisions of 37 CFR 1.136 apply.

(complete (a) or (b), as applicable)

(a) ☐ Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d) for the total number of months checked below:

Extension (months)	Fee for other than small entity	Fee for small entity
☐ one month	$ 235.00	$ 94.00
☐ two months	$ 690.00	$ 276.00
☐ three months	$1,590.00	$ 636.00
☐ four months	$2,495.00	$ 998.00

Fee: $

If an additional **extension** of time is required, please consider this a petition therefor.

(check and complete the next item, if applicable)

☐ An extension for _____ months has already been secured and the fee paid therefor of $_____ is deducted from the total fee due for the total months of extension now requested.

Extension fee due with this request **$**

OR

(b) ☒ Applicant believes that no extension of term is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition for extension of time.

FEE FOR CLAIMS

4. The fee for claims (37 CFR 1.16(b)-(d) has been calculated as shown below:

(Col. 1)		(Col. 2)		(Col. 3)	SMALL ENTITY			OTHER THAN A SMALL ENTITY	
CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NO PREVIOUSLY PAID FOR		PRESENT EXTRA	RATE	ADDIT. FEE	OR	RATE	ADDIT. FEE
TOTAL	27 •	MINUS	30 ••	= 0	X80=	$0		X200=	$0
INDEP.	3 •	MINUS	3 •••	= 0	X240=	$0		X600=	$0
☐ FIRST PRESENTATION OF MULTIPLE DEP. CLAIM					+370=	$0		+925=	$0
					TOTAL ADDIT. FEE	$0	OR	TOTAL ADDIT. FEE	$0

• If the entry in Col. 1 is less than entry in Col. 2, write "0" in Col. 3.

•• If the "Highest No. Previously Paid for" IN THIS SPACE is less than 20, enter "20."

••• If the "Highest No. Previously Paid for" IN THIS SPACE is less than 3, enter "3."
The "Highest No. Previously Paid for" (Total or indep.) is the highest number found in the appropriate box in Col. 1 of a prior amendment or the number of claims originally filed.

WARNING "After final rejection or action (§ 1.113) amendments may be made cancelling claims or complying with any requirement of form which has been made." 37 CFR § 1.116(a) (emphasis added).

Complete (c) or (d), as applicable)

(c) ☒ No additional fee for claims is required.

OR

(d) ☐ Total additional fee for claims required $_____

FEE PAYMENT

5. ☐ Attached is a check in the sum of $ _____

☐ Charge Account No. _____ sum of $_____

FEE DEFICIENCY

NOTE: If there is a fee deficiency and there is no authorization to charge an account, additional fees are necessary to cover the additional time consumed in making up the original deficiency. If the maximum, six-month period has expired before the deficiency is noted and corrected, the application is held abandoned. In those instances where authorization to charge is included, processing delays are encountered in returning the papers to the PTO Finance Branch in order to apply these charges prior to action on the cases. Authorization to charge the deposit account for any fee deficiency should be checked. See the Notice of April 7, 1986, (1065 O.G. 31-33).

6. ☒ If any additional extension and/or fee is required, charge Account No.

02-1818.

AND/OR

7. ☒ If any additional fee for claims is required, charge Account No.

02-1818.

/William E. Kuss/
SIGNATURE OF ATTORNEY

Reg. No.: 41,919

Tel. No.: (412) 355-6323

Customer No. 26285

William E. Kuss
(type or print name of attorney)

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Pittsburgh, PA 15222-2613

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of: Min Kuang	WOOD PRESERVATIVE COMPOSITION COMPRISING 4,5-DICHLORO-2-OCTYLISOTHIAZOL-3(2H)-ONE, A METHOD TREATING A WOOD SUBSTRATE THEREWITH, AND A WOOD PRODUCT PRODUCED THEREFROM
Application Serial No.: 19/072,608	
371(c) Date: March 6, 2025	
Art Unit: 1731	
Examiner: Guino-o Uzzle, Marites A	Docket No.: 210189PCTUSCON
Confirmation No.: 6883	

RESPONSE TO OFFICE ACTION

May 7, 2025

VIA PATENT CENTER

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

Applicant submits this Response in reply to the Office Action issued on April 23, 2025 ("*Office Action*") for the above-identified patent application ("*Subject Application*"). In this Response:

Amendments to the Specification begin on page 2;

Amendments to the Claims begin on page 3; and

Remarks begin on page 7.

AMENDMENTS TO THE SPECIFICATION

Please amend paragraph [0009] of the specification of the *Subject Application* as indicated below. No new matter has been added.

[0009] Certain exemplary aspects of the present disclosure will now be described to provide an overall understanding of the principles of the structure, function, manufacture, and use of the compositions, methods, and products disclosed herein. ~~One or more examples of these aspects are illustrated in the accompanying drawings. Those of ordinary skill in the art will understand that the devices and methods specifically described herein and illustrated in the accompanying drawings are non-limiting exemplary aspects and that~~ [[t]]The scope of the various examples of the present disclosure is defined solely by the claims. The features ~~illustrated or~~ described in connection with one exemplary aspect may be combined with the features of other aspects. Such modifications and variations are intended to be included within the scope of the present disclosure.

AMENDMENTS TO THE CLAIMS

The following listing of the claims replaces all prior versions and listings of the claims in the *Subject Application*.

Claims 1-42 (Canceled)

43. (Currently Amended) A wood preservative composition comprising:

~~at least 0.5%~~ 40% by weight to 60% by weight 4,5-dichloro-2-octylisothiazol-3-one (DCOI) based on a total weight of the composition; and

40% by weight to 60% by weight of a retaining additive comprising a wax based on the total weight of the composition,

wherein a weight ratio of the DCOI to the retaining additive is in a range of 1:5 to 5:1.

44. (Previously presented) The wood preservative composition of claim 43, wherein the weight ratio of the DCOI to the retaining additive is in a range of 1:1.5 to 1.5:1.

45. (Currently Amended) The wood preservative composition of claim 43, wherein the wax comprises ~~a paraffin wax,~~ an olefin wax, a petroleum wax, a carnauba wax, a polyethylene wax, ~~a slack wax,~~ a silicone wax, a polypropylene wax, a polytetrafluoroethylene (PTFE) synthetic wax, or a combination thereof.

46. (Previously presented) The wood preservative composition of claim 43, wherein the wax comprises a melting point in a range of 40 degrees Celsius to 100 degrees Celsius.

47. (Previously presented) The wood preservative composition of claim 43, wherein the wax comprises a melting point in a range of 75 degrees Celsius to 100 degrees Celsius.

48. (Previously presented) The wood preservative composition of claim 43, wherein the wax comprises a slack wax.

49. (Currently Amended) The wood preservative composition of claim 43, wherein the wax comprises a petroleum wax~~, a paraffin wax, or a combination thereof~~.

50. (Previously presented) The wood preservative composition of claim 43, wherein the wax comprises paraffin wax and a microcrystalline wax.

51. (Cancelled).

52. (Currently Amended) The wood preservative composition of claim 43, wherein the composition comprises 45% by weight to 55% [[%]] by weight of the DCOI based on the total weight of the composition and 45% by weight to 55% by weight of the retaining additive based on the total weight of the composition.

53. (Previously presented) The wood preservative composition of claim 43, wherein the composition consists essentially of the DCOI and the retaining additive.

54. (Previously presented) The wood preservative composition of claim 43, wherein the composition further comprises an organic solvent.

Claims 55-63. (Cancelled)

64. (Previously presented) A wood product comprising the wood preservative composition of claim 43.

Claims 65-66. (Cancelled)

67. (Currently Amended) A wood preservative composition consisting essentially of:

45% by weight to 55% by weight 4,5-dichloro-2-octylisothiazol-3-one (DCOI) based on a total weight of the composition; and

45% by weight to 55% by weight of a retaining additive comprising a first petroleum wax

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and a second petroleum wax comprising a paraffin wax, wherein the retaining additive comprises a melting point in a range of 75 degrees Celsius to 100 degrees Celsius.

Claims 68-72 (Cancelled).

73. (New) A method of treating a wood substrate, the method comprising:
diluting the composition of claim 43 with an organic solvent to form a diluted composition.

74. (New) The method of claim 73, wherein the organic solvent comprises a hydrocarbon solvent, an amine solvent, a glycol solvent, a ketone solvent, an ester solvent, an alcohol solvent, a halogenated solvent, a biodegradable organic solvent, or combinations thereof.

75. (New) The method of claim 73, wherein the organic solvent comprises diesel, biodiesel, or a combination thereof.

76. (New) The method of claim 73, wherein the organic solvent comprises a flash point of at least 40 degrees Celsius.

77. (New) The method of claim 73, wherein the organic solvent comprises a flash point of at least 60 degrees Celsius.

78. (New) The method of claim 73, wherein the organic solvent comprises a flash point of at least 80 degrees Celsius.

79. (New) The method of claim 73, wherein the retaining additive has a solubility in the organic solvent of at least 0.5%.

80. (New) The method of claim 73, wherein the retaining additive has a solubility in the organic solvent of at least 1%.

81. (New) The method of claim 73, further comprising contacting the wood substrate with the diluted composition for a period of time suitable to inhibit fungal decay of the wood substrate.

82. (New) A wood product produced by the method of claim 73.

83. (New) The wood product of claim 82, wherein the wood product retains at least 0.05 pounds of DCOI per cubic foot of the wood product.

84. (New) The wood product of claim 82, wherein the wood product comprises a deck, a rail, a fence, a utility pole, a pile, a railway tie, a railroad bridge, cladding, siding, or a combination thereof.

85. (New) A wood preservative composition comprising:

40% by weight to 60% by weight 4,5-dichloro-2-octylisothiazol-3-one (DCOI) based on a total weight of the composition; and

40% by weight to 60% by weight of a retaining additive based on the total weight of the composition, wherein the retaining additive comprises a paraffin wax and a microcrystalline wax,

wherein a weight ratio of the DCOI to the retaining additive is in a range of 1:1.5 to 1.5:1.

86. (New) A method of treating a wood substrate, the method comprising:

diluting the composition of claim 85 with an organic solvent to form a diluted composition; and

contacting the wood substrate with the diluted composition for a period of time suitable to inhibit fungal decay of the wood substrate.

REMARKS

I. Application Status

Claims 43-72 were pending in the *Subject Application* and Subject to Examination.

In the *Office Action*, the disclosure is objected to because of informalities. Claims 51-52 are objected to for informalities. Claims 45, 49, 55, 67 and 69 are rejected under 35 U.S.C. § 112(b) as being indefinite. Claims 43-50 and 53 are rejected under 35 U.S.C. § 103 as being unpatentable over US Patent Publication No. 2006/0057300 to Cui et al. (hereinafter "*Cui*") as evidenced by PubChem (CID 91688) (hereinafter "*PubChem*") and/or IRM classification of refined petroleum waxes (hereinafter "IRM"). Claims 43-49, 54-55, 57-58 and 60-66 are rejected under 35 U.S.C. § 103 as being unpatentable over US Patent Publication No. 2007/0175360 A1 to Ashmore et al. (hereinafter "*Ashmore*") as evidenced by *PubChem*, *IRM*, and/or PubChem (CID 1030) (hereinafter "CID"). Claim 56 is rejected under 35 U.S.C. § 103 as being unpatentable over *Ashmore* in view of US Patent Publication No. 2021/0112812 A1 to Arumugam et al. (hereinafter "*Arumugam*"). Claims 68-72 are rejected under 35 U.S.C. § 103 as being unpatentable over *Arumugam* in view of *Cui* as evidenced by PubChem.

Applicant respectfully traverses the rejections in the *Office Action*. Applicant respectfully requests reconsideration, withdrawal of the rejections, and allowance of the *Subject Application*. References to paragraph numbering in the *Subject Application* herein refer to the paragraph numbering in Specification as originally filed

II. Allowable Subject Matter

Initially, Applicant would like to thank Examiner Guino-o Uzzle for the indication of allowable subject matter in claims 51, 52, and 67.

III. Examiner Interview

Applicant would like to thank Examiner Guino-o Uzzle for discussing the *Subject Application* with Applicant's representative, Robert J. Sovesky, on May 1, 2025, during a telephone

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conference. No presentation of the invention occurred. The rejections under 35 U.S.C. § 103 were discussed. No agreement on the allowance of the claims was reached.

IV. Amendments to the Claims

Claims 51, 55-63, 65-66, and 68-72 are canceled herein.

Claims 43, 45, 49, 52, and 67 are amended herein. Support for the amendments to the claims can be found throughout the *Specification*, such as, for example, at least in the original claims and paragraphs [0051]-[0052].

Claims 73-86 are newly added herein. Support for the newly added claims can be found throughout the *Specification*, such as, for example, at least in the original claims and paragraphs [0013] and [0050].

The amendments herein do not add new matter to the *Subject Application* and are compliant with 35 U.S.C. §§ 112 and 132(a). The amendments are made without prejudice or disclaimer and solely to expedite the early allowance of the *Subject Application*. Applicant reserves the right to pursue the subject matter of the original or previously pending claims in continuing applications.

V. Objections to the Specification

In the *Office Action*, the Specification is objected to for informalities. Paragraph [0009] of the Specification has been amended to address the informalities as requested by the *Office*. Accordingly, Applicant respectfully requests the objection to the Specification be withdrawn.

VI. Claim Objections

In the *Office Action*, claims 51-52 are objected to for informalities. Claim 51 has been canceled herein. Claim 52 has been amended to address the informality as requested by the *Office*. Accordingly, Applicant respectfully requests the objection to the claims be withdrawn.

VII. Claim Rejections Under 35 U.S.C. § 112

In the *Office Action*, claims 45, 49, 55, 67, and 69 are rejected under 35 U.S.C. § 112(a) as allegedly being indefinite. Applicant has amended claims 45, 49, and 67 have been amended to clarify the genus/species recitation as requested by the *Office*. For example, claim 45 has been amended to remove the narrower species of paraffin wax and a slack wax as the broad genus of a petroleum wax covers at least those species. Claim 49 has been amended to remove the narrower species of paraffin wax as it is covered by the broad genus of petroleum wax. Claim 67 has been amended to clarify the composition comprises at least two waxes, including a first petroleum wax and a second petroleum wax that comprises paraffin wax. Accordingly, Applicant respectfully requests the withdrawal of the rejection of claims 45, 49, and 67 under 35 U.S.C. § 112(a) based on the amendments.

Claims 55 and 69 have been canceled herein. Accordingly, the rejection of claims 55 and 69 under 35 U.S.C. § 112(a) are moot.

VIII. Claim Rejections Under 35 U.S.C. § 103

Applicant notes the burden is on the *Office* to establish a *prima facie* case of obviousness in view of the *Graham v. John Deere Co.* factual inquiries.[1] In particular, the *Office* must at least (1) determine the scope and contents of the prior art, (2) ascertain the differences between the prior art and the claims in issue, and (3) resolve the level of ordinary skill in the pertinent art.[2] "Once the *Graham* factual inquiries are resolved, [the *Office*] must determine the claimed invention would have been obvious to one of ordinary skill in the art."[3]

Claims 43-50, 53-66 and 68-72 are rejected under 35 U.S.C. § 103 over the applied references. Claims 51, 55-63, 65-66, and 68-72 are canceled herein and therefore the rejections under 35 U.S.C. § 103 of those claims are moot.

---

[1] See MPEP §2143; MPEP §2144 (citing *Graham v. John Deere*, 383 U.S. 1, 17-18 (1966)); see also *KSR International v. Teleflex Inc.*, 127 S.Ct. 1727, 82 USPQ2d 1385 (2007).
[2] See *id.*
[3] MPEP §2141 (III).

Independent claim 43 has been amended to include the allowable subject matter of claim 51 as indicated by the *Office* on page 23 of the *Office Action*. Accordingly, Applicant asserts that independent claim 43, as amended, is allowable over the applied references and requests an allowance thereof.

Dependent claims 44-50, 52-54, and 64 are allowable at least because each such claim directly or indirectly depends from claim 43. Accordingly, Applicant requests withdrawal of the rejections of claims 43-50, 52-54, and 64 under 35 U.S.C. § 103 and an allowance thereof.

IX. New Claims

New dependent claims 73-84 are allowable at least because each claim directly or indirectly depends from claim 43. Accordingly, Applicant respectfully requests an allowance of new claims 73-84.

New independent claim 85 is allowable at least for reciting 40% by weight to 60% by weight 4,5-dichloro-2-octylisothiazol-3-one (DCOI) based on a total weight of the composition and 40% by weight to 60% by weight of a retaining additive based on the total weight of the composition. Claim 86 is allowable at least for its dependency on claim 85. Accordingly, Applicant respectfully requests an allowance of new claims 85-86.

X. Conclusion

The claims of the *Subject Application* presented herein are believed to be in condition for allowance. Applicant respectfully requests favorable reconsideration and allowance of the *Subject Application*.

Applicant is not conceding that the claims of the *Subject Application* in their prior forms are not patentable over the art cited by the Office, as the present claims are submitted only to facilitate expeditious prosecution of the *Subject Application*. Applicant reserves the right to pursue these and other claims in continuing applications, subsequent responses, and/or appeal or pre-appeal proceedings.

This Response should not be taken as acquiescence to any of the specific rejections, assertions, statements, and the like, presented in the *Office Action* that Applicant has not explicitly addressed herein. Applicant reserves the right to specifically address all such rejections, assertions, and statements in continuing applications, subsequent responses, and/or appeal or pre-appeal proceedings, if necessary.

If the undersigned can be of assistance to the Office in addressing any additional issues to advance the application to a condition of allowance, please contact the undersigned at the number set forth below. The Office is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No. 02-1818.

Respectfully submitted,

/William E. Kuss/
William E. Kuss
Registration No. 41,919
K&L GATES LLP
K&L Gates Center
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Pittsburgh, PA 15222-2613
Tel: (412) 355-6323

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
19/072,608	**05/07/2025 05:47:29 PM Z ET**	**210189PCTUSCON**

Title of Invention

WOOD PRESERVATIVE COMPOSITION COMPRISING 4,5-DICHLORO-2-OCTYLISOTHIAZOL-3(2H)-ONE, A METHOD TREATING A WOOD SUBSTRATE THEREWITH, AND A WOOD PRODUCT PRODUCED THEREFROM

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	6883	FILED BY	Theresa Merante
PATENT CENTER #	70335525	FILING DATE	03/06/2025
CUSTOMER #	26285	FIRST NAMED INVENTOR	Min Kuang
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	William Kuss

Documents

TOTAL DOCUMENTS: 5

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
Amendment_Transmittal.pdf		4	Transmittal Letter	121 KB
Response_to_Office_Action.pdf		11	-	174 KB
Response_to_Office_Action-A....pdf	(1-1)	1	Amendment/Request for Reconsideration-After Non-Final Rejection	129 KB
Response_to_Office_Action-SPEC.pdf	(2-2)	1	Specification	126 KB
Response_to_Office_Action-CLM.pdf	(3-6)	4	Claims	136 KB
Response_to_Office_Action	(7-11)	5	Applicant Arguments/Remarks	152 KB

-REM.pdf Made in an Amendment

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
Amendment_Transmittal.pdf	7454AE910B983E212FA4FA147B23765D8637FB3533B17A7E729377C27EAC3A2F9D54B20F0BC38E5857589C7A9D4B2752829B6EE7CE6F87814E619A5317F40D22
Response_to_Office_Action.pdf	0FBD1BDB66F3B6AA1E3D6EF8CB8E8E922DCD6E10F9F1E83CB14DAB2665989B9D4C7C1AEC12EE405BA51184A7B7B100376540D62C6269F36594AC7A9A98F45FA8
Response_to_Office_Action-A....pdf	7FD1C240E62627C96C97D945D49DF1F266E01BD3EB462248E2B29CFEE2397F19A18EC522BB21EF10CB55CDA6AB4A55D9516E939BF03B140D1A5DB3D682FCBD08
Response_to_Office_Action-SPEC.pdf	25722934FE0E7513928BFC776DEFE431942EF5F90FE80DE273AD7602CD952F0B28710A88EF9B093B5FF062D4924C00D2378BE7BB3E7DDFC95B529971E2ED76AA
Response_to_Office_Action-CLM.pdf	C8BCB690AACCBE402BBC96A299AE621923794432509FA224A785EBBCF9A6B69E4AC5A0B34FFFC2AFBA754A1352C7069EB41C85820208F21037C73D3C6203C6E0
Response_to_Office_Action-REM.pdf	B5B3A198C3E77F1F00301035E6AD9B1B29F92A5A48FD51DE7DABD32674F8CE095D675D1713D61585A91E0AC34B76A61EAD0750EB85978D4D55AA59A9BC1533D4

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 19/072,608	Filing Date 03/06/2025	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $200 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $600 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	05/07/2025	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 27	Minus	** 30	= 0		x $200 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $600 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	SLIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/ALA H HUNTER/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

26285 7590 06/18/2025

K&L GATES LLP-Pittsburgh
210 SIXTH AVENUE
PITTSBURGH, PA 15222-2613

EXAMINER	
GUINO-O UZZLE, MARITES A	
ART UNIT	PAPER NUMBER
1731	

DATE MAILED: 06/18/2025

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
19/072,608	03/06/2025	Min Kuang	210189PCTUSCON	6883

TITLE OF INVENTION: WOOD PRESERVATIVE COMPOSITION COMPRISING 4,5-DICHLORO-2-OCTYLISOTHIAZOL-3(2H)-ONE, A METHOD TREATING A WOOD SUBSTRATE THEREWITH, AND A WOOD PRODUCT PRODUCED THEREFROM

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1290	$0.00	$0.00	$1290	09/18/2025

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PTOL-85 (Rev. 11/23)

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via the USPTO patent electronic filing system.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

26285 7590 06/18/2025
K&L GATES LLP-Pittsburgh
210 SIXTH AVENUE
PITTSBURGH, PA 15222-2613

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via the USPTO patent electronic filing system or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)

(Signature)

(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
19/072,608	03/06/2025	Min Kuang	210189PCTUSCON	6883

TITLE OF INVENTION: WOOD PRESERVATIVE COMPOSITION COMPRISING 4,5-DICHLORO-2-OCTYLISOTHIAZOL-3(2H)-ONE, A METHOD TREATING A WOOD SUBSTRATE THEREWITH, AND A WOOD PRODUCT PRODUCED THEREFROM

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1290	$0.00	$0.00	$1290	09/18/2025

EXAMINER	ART UNIT	CLASS-SUBCLASS
GUINO-O UZZLE, MARITES A	1731	106-018290

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑ Issue Fee ❑ Publication Fee (if required)

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via the USPTO patent electronic filing system ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

❑ Applicant asserting small entity status. See 37 CFR 1.27

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

❑ Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

Viance Exhibit 1004, Part 2 of 2
Viance v. Koppers Performance Chemicals
PGR2026-00023
Page 158 of 204

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
19/072,608	03/06/2025	Min Kuang	210189PCTUSCON	6883

26285 7590 06/18/2025

K&L GATES LLP-Pittsburgh
210 SIXTH AVENUE
PITTSBURGH, PA 15222-2613

EXAMINER	
GUINO-O UZZLE, MARITES A	
ART UNIT	PAPER NUMBER
1731	

DATE MAILED: 06/18/2025

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

PTOL-85 (Rev. 11/23)

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. The United States Patent and Trademark Office (USPTO) collects the information in this record under authority of 35 U.S.C. 2. The USPTO's system of records is used to manage all applicant and owner information including name, citizenship, residence, post office address, and other information with respect to inventors and their legal representatives pertaining to the applicant's/owner's activities in connection with the invention for which a patent is sought or has been granted. The applicable Privacy Act System of Records Notice for the information collected in this form is COMMERCE/PAT-TM-7 Patent Application Files, available in the Federal Register at 78 FR 19243 (March 29, 2013).
https://www.govinfo.gov/content/pkg/FR-2013-03-29/pdf/2013-07341.pdf

Routine uses of the information in this record may include disclosure to:

1) law enforcement, in the event that the system of records indicates a violation or potential violation of law;
2) a federal, state, local, or international agency, in response to its request;
3) a contractor of the USPTO having need for the information in order to perform a contract;
4) the Department of Justice for determination of whether the Freedom of Information Act (FOIA) requires disclosure of the record;
5) a Member of Congress submitting a request involving an individual to whom the record pertains, when the individual has requested the Member's assistance with respect to the subject matter of the record;
6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations;
7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals;
8) another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c));
9) the Office of Personnel Management (OPM) for personnel research purposes; and
10) the Office of Management and Budget (OMB) for legislative coordination and clearance.

If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.

Notice of Allowability	Application No. 19/072,608	Applicant(s) Kuang et al.	
	Examiner MARITES A GUINO-O UZZLE	Art Unit 1731	AIA (First Inventor to File) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to 05/07/2025.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are See Continuation Sheet . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some* c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____.
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____
5. ☑ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/M.G.U./ Examiner, Art Unit 1731	/AMBER R ORLANDO/ Supervisory Patent Examiner, Art Unit 1731

Continuation of 3. The allowed claim(s) is/are: 43-50,52-54,64,67 and 73-86

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Response to Amendment

2. In response to the amendment received on 05/07/2025:

- claims 43-50, 52-54, 64, 67 and 73-86 are currently pending;
- the objection to the specification is withdrawn in light of the amendments to the same;
- the objection to claims 51-52 are withdrawn in light of the amendment to the claims;
- the 112(b) rejection to claims 45, 49, 55, 67 and 69 are withdrawn in light of the amendment to the claims; and
- all prior art grounds of rejection are withdrawn in light of the amendments to the independent claims 43 and 67.

EXAMINER'S AMENDMENT

3. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in an interview with Robert Sovesky (Reg. No. 73,798) on 6/4/2025.

The application has been amended as follows:

4. Claim 85 line 5, delete the limitation "a paraffin wax and".

REASONS FOR ALLOWANCE

5. Claims 43-50, 52-54, 64, 67 and 73-86 are allowed.

6. The following is an examiner's statement of reasons for allowance: the prior art fails to teach all the cumulative limitations of each of the respective independent claims 43, 67 and 85.

Specifically, it is noted that Cui et al. (US 2006/0057300 A1) ("Cui" hereinafter) teaches most of the cumulative limitations of each of the respective independent claims 43, 67 and 85 for reasons as set forth in the office action dated 04/23/2025. However, Cui fails to teach the DCOI concentration of 40% by weight to 60% by weight based on the total weight of the composition (claims 43 and 85), DCOI concentration of 45% by weight to 55% by weight based on the total weight of the composition (claim 67), and the retaining additive concentration of 45% by weight to 55% by weight based on the total weight of the composition (claim 67). And, there are no prior art references that provide adequate teachings or apparent reason that would lead the person of ordinary skill to modify Cui as claimed.

As such, the prior fails to teach or render obvious all the cumulative limitations of each of the respective independent claims 43, 67 and 85 as claimed. Therefore, the cumulative limitations of each of the respective independent claims 43, 67 and 85 are considered allowable.

7. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MARITES A GUINO-O UZZLE whose telephone number is (571)272-1039. The examiner can normally be reached M-F 8am-4pm EST.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amber R Orlando can be reached at (571)270-3149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: https://patentcenter.uspto.gov. Visit https://www.uspto.gov/patents/apply/patent-center for more information about Patent Center and https://www.uspto.gov/patents/docx for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC)

at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service

Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/M.G.U./
Examiner, Art Unit 1731

/AMBER R ORLANDO/
Supervisory Patent Examiner, Art Unit 1731

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	19/072,608	Kuang et al.
	Examiner	**Art Unit**
	MARITES A GUINO-O UZZLE	1731

CPC						
Symbol					**Type**	**Version**
B27K	/	3	/	343	F	2013-01-01
C09D	/	5	/	14	I	2013-01-01
C09D	/	125	/	14	I	2013-01-01
C09D	/	167	/	08	I	2013-01-01
A01N	/	43	/	80	I	2013-01-01
B27K	/	3	/	40	I	2013-01-01
C09D	/	191	/	08	I	2013-01-01
B27K	/	2240	/	20	A	2013-01-01
B27K	/	2240	/	50	A	2013-01-01
B27K	/	2200	/	10	A	2013-01-01
B27K	/	2200	/	30	A	2013-01-01

CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

/MARITES A GUINO-O UZZLE/ Examiner, Art Unit 1731	04 June 2025	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	27	
/AMBER R ORLANDO/ Supervisory Patent Examiner, Art Unit 1731	09 June 2025	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	na

U.S. Patent and Trademark Office — Part of Paper No.: 20250602

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Viance v. Koppers Performance Chemicals
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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	19/072,608	Kuang et al.
	Examiner	Art Unit
	MARITES A GUINO-O UZZLE	1731

INTERNATIONAL CLASSIFICATION				
CLAIMED				
B27K	/	3	/	34
A01N	/	43	/	80
B27K	/	3	/	40
C09D	/	5	/	14
C09D	/	125	/	14
C09D	/	167	/	08
C09D	/	191	/	08

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

/MARITES A GUINO-O UZZLE/ Examiner, Art Unit 1731 (Assistant Examiner)	04 June 2025 (Date)	Total Claims Allowed: 27	
/AMBER R ORLANDO/ Supervisory Patent Examiner, Art Unit 1731 (Primary Examiner)	09 June 2025 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure na

U.S. Patent and Trademark Office — Part of Paper No.: 20250602

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	19/072,608	Kuang et al.
	Examiner	**Art Unit**
	MARITES A GUINO-O UZZLE	1731

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1		12		23		34	3	45		56	13	67	19	78
	2		13		24		35	4	46		57		68	20	79
	3		14		25		36	5	47		58		69	21	80
	4		15		26		37	6	48		59		70	22	81
	5		16		27		38	7	49		60		71	23	82
	6		17		28		39	8	50		61		72	24	83
	7		18		29		40		51		62	14	73	25	84
	8		19		30		41	9	52		63	15	74	26	85
	9		20		31		42	10	53	12	64	16	75	27	86
	10		21		32	1	43	11	54		65	17	76		
	11		22		33	2	44		55		66	18	77		

/MARITES A GUINO-O UZZLE/ Examiner, Art Unit 1731	04 June 2025	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	27	
/AMBER R ORLANDO/ Supervisory Patent Examiner, Art Unit 1731	09 June 2025	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	na

U.S. Patent and Trademark Office Part of Paper No.: 20250602

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	19/072,608	Kuang et al.
	Examiner	Art Unit
	MARITES A GUINO-O UZZLE	1731

CPC - Searched*		
Symbol	Date	Examiner
B27K3/343 A01N43/80 B27K3/40 C09D5/14 C09D125/14 C09D167/08 C09D191/08 B27K2200/10 B27K2200/30 B27K2240/20 B27K2240/50 B27K3/00 B27K3/34 B27K5/00 A01N43/00 C09D191/00 C09D191/06	04/15/2025	MGU
updated CPC search above	06/03/2025	MGU

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

/MARITES A GUINO-O UZZLE/ Examiner, Art Unit 1731	

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	19/072,608	Kuang et al.
	Examiner	Art Unit
	MARITES A GUINO-O UZZLE	1731

Search Notes		
Search Notes	**Date**	**Examiner**
PDP and PE2E SEARCH- inventor and assignee search	04/15/2025	MGU
Global Dossier search (attached)	04/15/2025	MGU
PE2E SEARCH- similarity, more like this, combination, text, CPC and interference searches (attached)	04/15/2025	MGU
web search (attached)	04/16/2025	MGU
discussed prior art, claim interpretation, double patenting and allowable subject matter with primary examiner Tony Green	04/16/2025	MGU
updated PDP and PE2E SEARCH- inventor and assignee search	06/03/2025	MGU
updated Global Dossier search (attached)	06/03/2025	MGU
SciFinder search (attached)	06/03/2025	MGU
updated PE2E SEARCH- similarity, more like this, combination, text, CPC and interference searches (attached)	06/03/2025	MGU
discussed amendments, allowable subject matter and new matter with primary examiner Tony Green	06/03/2025	MGU

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
B27K	B27K3/343 B27K3/40 B27K2200/10 B27K2200/30 B27K2240/20 B27K2240/50 B27K3/00 B27K3/34 B27K5/00	06/03/2025	MGU
A01N	A01N43/80 A01N43/00	06/03/2025	MGU
C09D	C09D5/14 C09D125/14 C09D167/08 C09D191/08 C09D191/00 C09D191/06	06/03/2025	MGU

/MARITES A GUINO-O UZZLE/ Examiner, Art Unit 1731	

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PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L43	55	((("KOPPERS") near3 ("PERFORMANCE") near3 ("CHEMICALS") near3 ("INC"))).AS,AANM.	(US-PGPUB; USPAT)	OR	ON	ON	2025/06/03 08:24 AM
L44	227	((("KOPPERS") near3 ("PERFORMANCE") near3 ("CHEMICALS") near3 ("INC"))).AS,AANM.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2025/06/03 08:24 AM
L45	3056	((("KUANG") near3 ("Min")) OR (("ZHANG") near3 ("Jun"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2025/06/03 08:25 AM
L46	520437	((("KUANG") near3 ("Min")) OR (("ZHANG") near3 ("Jun"))).INV.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2025/06/03 08:25 AM
L47	4991	(L44 L46) AND (preservative biocide (octyl NEAR isothiazol$3) di$1chloro$1octyl$1isothiazolinone octhilinone "DCOI" "DCOIT" (halogenated NEAR isothiazolinone))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO,	OR	ON	ON	2025/06/03 08:27 AM

			RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L48	1171	L47 AND (preservative biocide (octyl NEAR isothiazol$3) di$1chloro$1octyl$1isothiazolinone octhilinone "DCOI" "DCOIT" (halogenated NEAR isothiazolinone)).clm.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2025/06/03 08:28 AM
L49	95	L48 AND (wax$2 SAME (paraffin olefin petroleum carnauba poly$2ethylene slack silicone poly$1propylene "PTFE" synthetic poly$1tetra$1fluoro$1ethylene slack))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2025/06/03 08:37 AM
L50	12	(EP-2586840-$ | WO-2018183615-$ | EP-0349786-$ | US-5200188-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2025/06/03 09:24 AM
L51	3	WO-2018204195-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY,	OR	ON	ON	2025/06/03 09:40 AM

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			CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L52	1	15/531020	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2025/06/03 09:59 AM
L53	2	EP-0669191-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2025/06/03 10:03 AM
L54	2	EP-106563-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK,	OR	ON	ON	2025/06/03 10:30 AM

			TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L55	52	(Artificial Intelligence) Similar to: 19/072,608 with 0 CPC Selections and 0 Text Selections Text: (US-5777110-A OR NZ-512497-A OR CA-2352052-A1 OR EP-1135239-B1 OR AU-1398200-A OR WO-0032371-A1 OR AU-770641-B2 OR US-20060160791-A1 OR AU-3932797-A OR NO-20012631-L OR RU-2127266-C1 OR BR-8503466-A OR AU-2003221682-A1 OR BR-112012033030-B1 OR DE-69938108-T2 OR BR-112012002757-B1 OR TW-505503-B OR JP-2021073208-A OR US-20040063763-A1 OR US-9872498-B2 OR WO-0224688-A1 OR US-3628943-A OR KR-20030030016-A OR CN-101874495-A OR CN-104994859-B OR BR-112012002830-B1 OR GB-2239012-A OR US-20160235066-A1 OR EP-1194039-B1 OR US-3840599-A OR BR-112017015519-B1 OR BR-112017013641-B1 OR US-20120141597-A1 OR US-3904396-A OR US-20120148682-A1 OR CN-1059440-C OR KR-20110025676-A OR US-8476194-B2 OR JP-2014527530-A OR KR-100335756-B1 OR EP-1417887-B1 OR US-9974304-B2 OR TW-202012399-A OR AU-2011295864-A1 OR TW-539536-B OR CN-107922395-B OR KR-20130093000-A OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN))	OR	ON	ON	2025/06/03 11:02 AM

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Viance v. Koppers Performance Chemicals
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		CN-100537537-C OR WO-2014105821-A1 OR US-3776936-A).did.					
L56	55	(Artificial Intelligence) Similar to: 19/072,608 with 0 CPC Selections and 5 Text Selections Text: (US-5777110-A OR AU-1398200-A OR NZ-512497-A OR CA-2352052-A1 OR EP-1135239-B1 OR US-20060160791-A1 OR AU-770641-B2 OR WO-0032371-A1 OR BR-112012033030-B1 OR US-3904396-A OR BR-112017015519-B1 OR AU-3932797-A OR CH-647388-A5 OR US-3705155-A OR US-3776921-A OR US-4623658-A OR US-3309191-A OR US-6211118-B1 OR GB-2101889-A OR PL-205344-B1 OR JP-5734837-B2 OR CA-1158453-A OR LV-10157-B OR CN-85107306-A OR US-3628943-A OR US-4442096-A OR CS-241543-B2 OR CN-101511173-A OR HU-185803-B OR US-3776936-A OR US-3823161-A OR EP-0248466-B1 OR NO-834177-L OR CA-2280064-A1 OR TH-99780-B OR CN-101511178-A OR WO-2009027028-A2 OR GB-2452375-A OR US-8815774-B2 OR GB-2452376-A OR WO-2010022917-A2 OR US-4551447-A OR US-20110150957-A1 OR KR-20110096534-A OR US-4537780-A OR US-4086351-A OR NO-20012631-L OR EP-0215509-A2 OR JP-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN))	OR	ON	ON	2025/06/03 11:04 AM

		2770862-B2 OR US-4536497-A).did.					
L57	39	(L56 L55) AND (preservative biocide (octyl NEAR isothiazol$3) di$1chloro$1octyl$1isothiazolinone octhilinone "DCOI" "DCOIT" (halogenated NEAR isothiazolinone))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2025/06/03 11:04 AM
L58	32	(Artificial Intelligence) More like doc: US-20240342946-A1 Text: (DE-68904828-T2 OR US-5200188-A OR WO-2011162359-A1 OR US-12082583-B2 OR US-20240342946-A1 OR EP-4380364-A1 OR CA-3225114-A1 OR AU-2022324117-A1 OR WO-2023015302-A1 OR WO-2023015305-A1 OR AU-2022323327-A1 OR EP-4380365-A1 OR CA-3225112-A1 OR US-20240342947-A1 OR JP-3825868-B2 OR CA-3056939-A1 OR US-20170320230-A1 OR CN-114206112-B OR AU-2015215849-B2 OR JP-H10258403-A).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2025/06/03 11:14 AM
L59	28	("4496613" | "4542146" | "4954338" | "5013748" | "5536305" | "5827522" | "5874025" | "5880143" | "6274199" | "6348089" | "6423307" | "6464764" | "6558685" | "6641927" | "6686056" | "7297193" | "20030060504" | "20030108759" | "20040011244" | "20050132926" | "20060057300" |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2025/06/03 11:14 AM

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		"20080187669").pn. OR ("7850771").urpn. AND (PGPB | USPT | USOC).dbnm.					
L60	46	(Artificial Intelligence) More like doc: US-7850771-B2 Text: (US-4542146-A OR US-4954338-A OR FR-2626740-B1 OR DE-3918978-A1 OR US-5536305-A OR DE-4441672-A1 OR DE-19513903-A1 OR US-5827522-A OR US-6348089-B1 OR DE-19834028-A1 OR US-6274199-B1 OR EP-1249165-B1 OR EP-1509580-B1 OR CA-2580079-A1 OR AU-2006243369-A1 OR CA-2573902-C OR US-7850771-B2 OR US-20060057300-A1 OR AU-2005284978-A1 OR WO-2006031743-A2).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2025/06/03 11:14 AM
L61	15	("5023309" | "5478866" | "6437020" | "6610282" | "7740906" | "7959723" | "9273210" | "9402860" | "20020115765" | "20030018760" | "20060240263" | "20060276468" | "20110098417" | "20150274876" | "20210112812").pn. OR ("12082583").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2025/06/03 11:15 AM
L62	38	(Artificial Intelligence) More like doc: US-12082583-B2 Text: (US-20060276468-A1 OR JP-5046635-B2 OR WO-2010148450-A1 OR EP-2691431-B1 OR CN-104520345-B OR US-12082583-B2 OR US-20210112812-A1 OR EP-3599858-A1 OR ES-2992042-T3 OR WO-2018183615-A1	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO;	OR	ON	ON	2025/06/03 11:15 AM

		OR CN-114845547-B OR EP-3599858-B1 OR CA-3058624-A1 OR CN-114845547-A OR US-20210339425-A1 OR DE-112019004378-T5 OR EP-3869959-A1 OR BR-112021005973-A2 OR US-11930817-B2 OR US-20210337785-A1).did.	JPO; DERWENT; IBM_TDB)				
L63	17	("3281318" | "4085251" | "4143010" | "4950329" | "5635217" | "5853766" | "6274199" | "6441016" | "6664327" | "7176171" | "20060057300").pn. OR ("7297193").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2025/06/03 11:16 AM
L64	42	(Artificial Intelligence) More like doc: US-7297193-B1 Text: (US-3281318-A OR US-4085251-A OR US-4143010-A OR JP-S5699265-A OR CA-1207952-A OR JP-S61115975-A OR CA-1276338-C OR US-4950329-A OR CA-2040279-C OR DE-4112652-A1 OR DE-19829037-A1 OR US-6274199-B1 OR GB-0008659-D0 OR DE-10034619-A1 OR EP-1223202-B1 OR WO-03097763-A1 OR RU-2007144308-A OR US-7297193-B1 OR JP-2007216680-A OR NZ-552647-A).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2025/06/03 11:16 AM
L65	156	(L58 L59 L60 L61 L62 L63 L64) AND (preservative biocide (octyl NEAR isothiazol$3) di$1chloro$1octyl$1isothiazolinone octhilinone "DCOI" "DCOIT" (halogenated NEAR isothiazolinone))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN,	OR	ON	ON	2025/06/03 11:16 AM

			WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L66	3224081	(preservative biocide (octyl NEAR isothiazol$3) di$1chloro$1octyl$1isothiazolinone octhilinone "DCOI" "DCOIT" (halogenated NEAR isothiazolinone))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2025/06/03 11:28 AM
L67	37123	L66 AND (B27K3/343 A01N43/80 B27K3/40 C09D5/14 C09D125/14 C09D167/08 C09D191/08 B27K2200/10 B27K2200/30 B27K2240/20 B27K2240/50 B27K3/00 B27K3/34 B27K5/00 A01N43/00 C09D191/00 C09D191/06).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2025/06/03 11:28 AM
L68	6624	L67 AND (wax$2 SAME (paraffin olefin petroleum carnauba poly$2ethylene slack silicone poly$1propylene "PTFE" synthetic poly$1tetra$1fluoro$1ethylene))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2025/06/03 11:30 AM
L69	1523	L68 AND ((preservative biocide (octyl NEAR isothiazol$3) di$1chloro$1octyl$1isothiazolinone octhilinone	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA,	OR	ON	ON	2025/06/03 11:30 AM

Viance Exhibit 1004, Part 2 of 2
Viance v. Koppers Performance Chemicals
PGR2026-00023
Page 180 of 204

		"DCOI" "DCOIT" (halogenated NEAR isothiazolinone))).clm.	EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L70	39	L68 AND ((preservative biocide (octyl NEAR isothiazol$3) di$1chloro$1octyl$1isothiazolinone octhilinone "DCOI" "DCOIT" (halogenated NEAR isothiazolinone))).clm.	(USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2025/06/03 11:32 AM
L71	1701	L68 AND (((preservative biocide (octyl NEAR isothiazol$3) di$1chloro$1octyl$1isothiazolinone octhilinone "DCOI" "DCOIT" (halogenated NEAR isothiazolinone))) SAME (wax$2 SAME (paraffin olefin petroleum carnauba poly$2ethylene slack silicone poly$1propylene "PTFE" synthetic poly$1tetra$1fluoro$1ethylene)))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2025/06/03 11:33 AM
L72	645	L69 AND (((preservative biocide (octyl NEAR isothiazol$3) di$1chloro$1octyl$1isothiazolinone octhilinone "DCOI" "DCOIT" (halogenated NEAR isothiazolinone))) SAME (wax$2 SAME (paraffin olefin petroleum carnauba poly$2ethylene slack silicone poly$1propylene "PTFE" synthetic poly$1tetra$1fluoro$1ethylene)))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2025/06/03 11:34 AM
L73	188	L72 AND	(US-PGPUB; USPAT;	OR	ON	ON	2025/06/03

Viance Exhibit 1004, Part 2 of 2
Viance v. Koppers Performance Chemicals
PGR2026-00023
Page 181 of 204

		(((preservative biocide (octyl NEAR isothiazol$3) di$1chloro$1octyl$1isothiazolinone octhilinone "DCOI" "DCOIT" (halogenated NEAR isothiazolinone))) SAME (wax$2 SAME (paraffin olefin petroleum carnauba poly$2ethylene slack silicone poly$1propylene "PTFE" synthetic poly$1tetra$1fluoro$1ethylene))).clm.	USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				11:34 AM

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N6	607600	(preservative biocide (octyl NEAR isothiazol$3) di$1chloro$1octyl$1isothiazolinone octhilinone "DCOI" "DCOIT" (halogenated NEAR isothiazolinone))	(US-PGPUB; USPAT)	OR	ON	ON	2025/06/03 11:28 AM
N7	5163	N6 AND (B27K3/343 A01N43/80 B27K3/40 C09D5/14 C09D125/14 C09D167/08 C09D191/08 B27K2200/10 B27K2200/30 B27K2240/20 B27K2240/50 B27K3/00 B27K3/34 B27K5/00 A01N43/00 C09D191/00 C09D191/06).cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2025/06/03 11:28 AM
N8	1258	N7 AND (wax$2 SAME (paraffin olefin petroleum carnauba poly$2ethylene slack silicone poly$1propylene "PTFE" synthetic poly$1tetra$1fluoro$1ethylene))	(US-PGPUB; USPAT)	OR	ON	ON	2025/06/03 11:31 AM
N9	287	N8 AND ((preservative biocide (octyl NEAR isothiazol$3) di$1chloro$1octyl$1isot	(US-PGPUB; USPAT)	OR	ON	ON	2025/06/03 11:32 AM

		hiazolinone octhilinone "DCOI" "DCOIT" (halogenated NEAR isothiazolinone))).clm.					

Bibliographic Data

Application No: 19/072,608

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☐ No ☐ Met After Allowance

Verified and Acknowledged: /MARITES A GUINO-OUZZLE/ (Examiner's Signature) | Initials

Title: WOOD PRESERVATIVE COMPOSITION COMPRISING 4,5-DICHLORO-2-OCTYLISOTHIAZOL-3(2H)-ONE, A METHOD TREATING A WOOD SUBSTRATE THEREWITH, AND A WOOD PRODUCT PRODUCED THEREFROM

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
03/06/2025	106	1731	210189PCTUSCON
RULE			

APPLICANTS

KOPPERS PERFORMANCE CHEMICALS, INC., Pittsburgh, PA, UNITED STATES

INVENTORS

Min Kuang, Peachtree City, GA, UNITED STATES

Jun Zhang, Peachtree City, GA, UNITED STATES

CONTINUING DATA

This application is a CON of 18294852 02/02/2024

18294852 is a 371 of PCT/US2022/074619 08/05/2022

PCT/US2022/074619 has PRO of 63229817 08/05/2021

FOREIGN APPLICATIONS

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$8,665

CCD view for WO2022US74623

#	CC	Cat.	Citation details	Claims
1	*US*		**Application N° US202218294852** (US18294852) - 5 August 2022	
2	*US*		**Application N° US202218294874** (US18294874) - 5 August 2022	
3	*MX*		**Application N° MX20240001629** (MX2024001629) - 5 August 2022	
4	*MX*		**Application N° MX20240001628** (MX2024001628) - 5 August 2022	
5	*CL*		**Application N° CL20240000261** (CL2024000261) - 29 January 2024	
6	*CL*		**Application N° CL20240000269** (CL2024000269) - 29 January 2024	
7	*BR*		**Application N° BR20241102282** (BR112024002282) - 5 August 2022	
8	*AU*		**Application N° AU20220324117** (AU2022324117) - 5 August 2022	
9	*AU*		**Application N° AU20220323327** (AU2022323327) - 5 August 2022	
10	*CA*		**Application N° CA20223225112** (CA3225112) - 5 August 2022	
11	*CA*		**Application N° CA20223225114** (CA3225114) - 5 August 2022	
12	*EP*		***Application N° EP20220761916*** *(EP22761916.0) - 5 August 2022*	
13	*EP*		***Application N° EP20220761914*** *(EP22761914.5) - 5 August 2022*	
14	*WO*		**Application N° WO2022US74619** (WOUS2022/074619) - 5 August 2022	
			International Search Report	
		X	EP2586840 A1 (CHUGOKU MARINE PAINTS [JP]) - 1 May 2013	
		XI	WO2018183615 A1 (DOW GLOBAL TECHNOLOGIES LLC [US], et al) - 4 October 2018	
15	*WO*		**Application N° WO2022US74623** (WOUS2022/074623) - 5 August 2022	
			International Search Report	
		Y	EP0349786 B1 (ICHIKAWA GOSEI CHEMICAL CO., LTD) - 10 February 1993	
		Y	US5200186 A (ROHM & HAAS [US]) - 6 April 1993	

June 3, 2025

9:33 AM	Reference Advanced Search: 1 Field Author Name: **Kuang, Min** Sort by: Publication Date: Newest (414 Results)
9:34 AM	Filtered Reference by: Publication Year: **Selected 1981-2021** (327 Results)
9:35 AM	Filtered Reference by: Search Within Results: octylisothiazolone (0 Results)
9:35 AM	Filtered Reference by: Removed Search Within Results: octylisothiazolone (327 Results)
9:35 AM	Filtered Reference by: Search Within Results: DCOI (0 Results)
9:36 AM	Filtered Reference by: Removed Search Within Results: DCOI (327 Results)
9:36 AM	Filtered Reference by: Search Within Results: wood preservative (1 Result)
9:41 AM	Get Substances from References Sort by: Relevance

	(87 Results)
9:42 AM	Reference Advanced Search: 1 Field Author Name: **Zhang, Jun** Sort by: Publication Date: Newest (64K Results)
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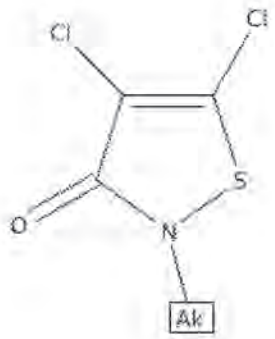
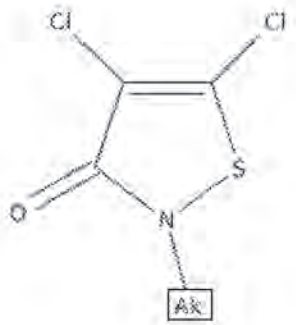
9:43 AM	Filtered Reference by: Search Within Results: wood preservative (38 Results)
9:44 AM	Get Substances from References Sort by: Relevance (1,054 Results)
9:50 AM	Filtered Substance by: Substance Class: **Selected Organic/Inorganic Small Molecule** (776 Results)
9:50 AM	Filtered Substance by: Substance Class: **Deselected Organic/Inorganic Small Molecule** (1,054 Results)
9:54 AM	Filtered Substance by: Search Within Results: Substructure (2 Results)



9:54 AM	Get References from Substances Sort by: Publication Date: Newest (1,882 Results)
9:55 AM	Filtered Reference by: Publication Year: **Selected 1977-2021** (1,551 Results)
9:55 AM	Filtered Reference by: Search Within Results: wood preservation (239 Results)
9:55 AM	Filtered Reference by: Search Within Results: wax (16 Results)
10:27 AM	Markush As Drawn Structure Search Sort by: Relevance (340 Results)



10:28 AM	Filtered Markush by: Structure Match: **Selected Substructure** (348 Results)
10:29 AM	Filtered Markush by: CA Section: **Selected Agrochemical Bioregulators** **Selected Heterocyclic Compounds (More Than One Hetero Atom)** **Selected Coatings, Inks, and Related Products** (213 Results)
10:29 AM	Get References from Markushs Sort by: Publication Date: Newest (200 Results)
10:29 AM	Filtered Reference by: Publication Year: **Selected 1978-2021** (199 Results)
10:29 AM	Filtered Reference by: Search Within Results: wax (1 Result)
10:47 AM	Substance Advanced Search: 1 Field

Patent Identifier: **WO 2023015305**

Sort by: Relevance
(12 Results)

10:47 AM	Get References from Substances Sort by: Publication Date: Newest (1,882 Results)
10:47 AM	Filtered Reference by: Publication Year: **Selected 1977-2021** (1,551 Results)
10:48 AM	Filtered Reference by: Search Within Results: wax (62 Results)

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Application	Document	Mailroom Date	Attorney Docket No.
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
19/072,608	03/06/2025	Min Kuang	210189PCTUSCON

CONFIRMATION NO. 6883

26285
K&L GATES LLP-Pittsburgh
210 SIXTH AVENUE
PITTSBURGH, PA 15222-2613

PUBLICATION NOTICE

OC000000090449409

Date Mailed: 06/20/2025

Title:WOOD PRESERVATIVE COMPOSITION COMPRISING 4,5-DICHLORO-2-OCTYLISOTHIAZOL-3(2H)-ONE, A METHOD TREATING A WOOD SUBSTRATE THEREWITH, AND A WOOD PRODUCT PRODUCED THEREFROM

Publication No.US-2025-0196393-A1
Publication Date:06/19/2025

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be viewed using the USPTO's publicly available Searchable Databases via the Patent Public Search tool at www.uspto.gov. The direct link to access the Patent Public Search tool is currently https://ppubs.uspto.gov/pubwebapp/static/pages/ppubsbasic.html.

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UNITED STATES

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19072608	NTC.PUB	06/20/2025	210189PCTUSCON

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ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
19/072,608	**06/24/2025 03:03:34 PM Z ET**	**210189PCTUSCON**

Title of Invention

WOOD PRESERVATIVE COMPOSITION COMPRISING 4,5-DICHLORO-2-OCTYLISOTHIAZOL-3(2H)-ONE, A METHOD TREATING A WOOD SUBSTRATE THEREWITH, AND A WOOD PRODUCT PRODUCED THEREFROM

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	6883	FILED BY	Jessica Brandenburg
PATENT CENTER #	71053351	AUTHORIZED BY	William Kuss
CUSTOMER #	26285	FILING DATE	03/06/2025
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Min Kuang

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
DA / 021818	**E20256NF04585509**	**Jessica Brandenburg**

PRE-AUTHORIZED ACCOUNT	PRE-AUTHORIZED CATEGORY
021818	**37 CFR 1.16 (National application filing, search, and examination fees); 37 CFR 1.17 (Patent application and reexamination processing fees); 37 CFR 1.19 (Document supply fees); 37 CFR 1.20 (Post Issuance fees); 37 CFR 1.21 (Miscellaneous fees and charges)**

FEE CODE	DESCRIPTION	ITEM PRICE($)	QUANTITY	ITEM TOTAL($)
1501	UTILITY ISSUE FEE	1290.00	1	1290.00
			TOTAL AMOUNT:	**$1,290.00**

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
19/072,608	**06/24/2025 03:03:34 PM Z ET**	**210189PCTUSCON**

Title of Invention

WOOD PRESERVATIVE COMPOSITION COMPRISING 4,5-DICHLORO-2-OCTYLISOTHIAZOL-3(2H)-ONE, A METHOD TREATING A WOOD SUBSTRATE THEREWITH, AND A WOOD PRODUCT PRODUCED THEREFROM

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	6883	FILED BY	Jessica Brandenburg
PATENT CENTER #	71053351	FILING DATE	03/06/2025
CUSTOMER #	26285	FIRST NAMED INVENTOR	Min Kuang
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	William Kuss

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
Issue_Fee_Transmittal_6-24-25.pdf	1	Issue Fee Payment (PTO-85B)	1703 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
Issue_Fee_Transmittal_6-24-25.pdf	7E78A52B4B103F39940BCF528E35685317D07C47F9D539C62B9F1C2E6EABE68761A35BDAA5196369BE6420D7EB4BC9FF1425FF91CB8079BD979B3FB7C5285FD4

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PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via the USPTO patent electronic filing system.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

26285 7590 06/18/2025
K&L GATES LLP-Pittsburgh
210 SIXTH AVENUE
PITTSBURGH, PA 15222-2613

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via the USPTO patent electronic filing system or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)

(Signature)

(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
19/072,608	03/06/2025	Min Kuang	210189PCTUSCON	6883

TITLE OF INVENTION: WOOD PRESERVATIVE COMPOSITION COMPRISING 4,5-DICHLORO-2-OCTYLISOTHIAZOL-3(2H)-ONE, A METHOD TREATING A WOOD SUBSTRATE THEREWITH, AND A WOOD PRODUCT PRODUCED THEREFROM

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1290	$0.00	$0.00	$1290	09/18/2025

EXAMINER	ART UNIT	CLASS-SUBCLASS
GUINO-O UZZLE, MARITES A	1731	106-018290

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 K&L Gates LLP
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: KOPPERS PERFORMANCE CHEMICALS, INC.

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Pittsburgh, PA

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required)

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

☒ Electronic Payment via the USPTO patent electronic filing system ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 02-1818

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

☐ Applicant asserting small entity status. See 37 CFR 1.27

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

☐ Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /William E. Kuss/ Date June 24, 2025

Typed or printed name William E. Kuss Registration No. 41,919

PTOL-85 Part B (11/23) Approved for use through 03/31/2026 OMB 0651-0033 U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
19/072,608	07/29/2025	12370716	210189PCTUSCON	6883

26285 7590 07/16/2025

K&L GATES LLP-Pittsburgh
210 SIXTH AVENUE
PITTSBURGH, PA 15222-2613

ISSUE NOTIFICATION

The projected patent number and issue date are specified above. The patent will issue electronically. The electronically issued patent is the official patent grant pursuant to 35 U.S.C. § 153. The patent may be accessed on or after the issue date through Patent Center at https://patentcenter.uspto.gov/. The patent will be available in both the public and the private sides of Patent Center. Further assistance in electronically accessing the patent, or about Patent Center, is available by calling the Patent Electronic Business Center at 1-888-217-9197.

The USPTO is implementing electronic patent issuance with a transition period, during which period the USPTO will mail a ceremonial paper copy of the electronic patent grant to the correspondence address of record. Additional copies of the patent (i.e., certified and presentation copies) may be ordered for a fee from the USPTO's Certified Copy Center at https://certifiedcopycenter.uspto.gov/index.html. The Certified Copy Center may be reached at (800)972-6382.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Center (https://patentcenter.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Patents Stakeholder Experience (OPSE), Stakeholder Support Division (SSD) at (571)-272-4200.

INVENTOR(s) (Please see PATENT CENTER site https://patentcenter.uspto.gov for additional inventors):

Min Kuang, Peachtree City, GA;
Jun Zhang, Peachtree City, GA;

APPLICANT(s) (Please see PATENT CENTER site https://patentcenter.uspto.gov for additional applicants):

KOPPERS PERFORMANCE CHEMICALS, INC., Pittsburgh, PA;

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TO: USpatentmail@klgates.com
FROM: noreply@uspto.gov
CC: patentcenter_eofficeaction@uspto.gov
SUBJECT: USPTO: Patent Electronic System - Correspondence Notification for Customer Number 26285

Mon Jul 21 15:58:57 EDT 2025

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Correspondence Address:

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Application	Document	Mailroom Date	Attorney Docket No.
19072608	ISSUE.NTF	07/16/2025	210189PCTUSCON

To view your correspondence online, please sign in to Patent Center and then select Workbench/View correspondence. To update your email address(es), select Manage/Manage customer numbers.

If you have any questions, please contact the Patent Electronic Business Center (EBC) at ebc@uspto.gov or 866-217-9197 Monday – Friday, 6 a.m. to midnight ET.

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Sincerely,

The Patent Center Team

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
19/072,608	03/06/2025	Min Kuang	210189PCTUSCON	6883

26285 7590 07/29/2025

K&L GATES LLP-Pittsburgh
210 SIXTH AVENUE
PITTSBURGH, PA 15222-2613

EXAMINER	
GUINO-O'UZZLE, MARITES A	

ART UNIT	PAPER NUMBER
1731	

NOTIFICATION DATE	DELIVERY MODE
07/29/2025	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

USpatentmail@klgates.com

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APPLICATION NO.	ISSUE DATE	PATENT NO.
19/072,608	29-Jul-2025	12370716

K&L GATES LLP-Pittsburgh
210 SIXTH AVENUE
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EGRANT NOTIFICATION

Your electronic patent grant (eGrant) is now available, which can be accessed via Patent Center at https://patentcenter.uspto.gov

The electronic patent grant is the official patent grant under 35 U.S.C. 153. For more information, please visit https://www.uspto.gov/electronicgrants

TO: USpatentmail@klgates.com
FROM: noreply@uspto.gov
CC: patentcenter_eofficeaction@uspto.gov
SUBJECT: USPTO: Patent Electronic System - eGrant Notification for Customer Number 26285

Tue Jul 29 06:01:16 EDT 2025

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Application	Patent	Document	Mailroom Date	Attorney Docket No.
19072608	12370716	EGRANT.NTF	07/29/2025	210189PCTUSCON

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