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Adiponitrile

<https://emhub1.energy.gov/pacteel/search#111-69-3>

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https://commonchemistry.cas.org/detail?cas_rn=111-69-3

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Adiponitrile

<https://pubchem.ncbi.nlm.nih.gov/substance/?source=chemidplus&sourceid=0000111693>

Hexanedinitrile, hydrogenated, high-boiling fraction

<https://pubchem.ncbi.nlm.nih.gov/substance/?source=chemidplus&sourceid=0068411905>

ChemIDplus Chemical Information Classification

<https://pubchem.ncbi.nlm.nih.gov/source/chemidplus>

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ADIPONITRILE

<https://dtp.cancer.gov/dtpstandard/servlet/dwindex?searchtype=NSC&outputformat=html&searchlist=7617>

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Hexanedinitrile

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

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EPA TSCA Classification

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

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Hexanedinitrile

<https://comptox.epa.gov/dashboard/DTXSID3021936>

CompTox Chemicals Dashboard Chemical Lists

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

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https://iris.epa.gov/ChemicalLanding/&substance_nmbr=515

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https://cfpub.epa.gov/ncea/pprtv/chemicalLanding.cfm?pprtv_sub_id=1557

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Adiponitrile

<https://chem.echa.europa.eu/100.003.543>

Adiponitrile (EC: 203-896-3)

<https://chem.echa.europa.eu/substance-search?searchText=203-896-3>

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ADIPONITRILE

<https://gsrs.ncats.nih.gov/ginas/app/beta/substances/SYT33B891I>

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https://www.nlm.nih.gov/web_policies.html

ADIPONITRILE

<https://pubchem.ncbi.nlm.nih.gov/source/hsdb/627>

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<https://www.epa.govt.nz/industry-areas/hazardous-substances/guidance-for-importers-and-manufacturers/hazardous-substances-databases/>

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<https://www.nj.gov/nj/legal.html>

adiponitrile

<https://www.nj.gov/health/eoh/rtkweb/documents/fs/0027.pdf>

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ADIPONITRILE

<https://www.osha.gov/chemicaldata/129>

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<https://rais.ornl.gov/>

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

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<https://www.cdc.gov/niosh-rtecs/AV280DE8.html>

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<https://www.cdc.gov/niosh/npg/npgd0015.html>

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<https://pubchem.ncbi.nlm.nih.gov/erg/>

22. US Code of Federal Regulations, Hazardous Materials, 49 CFR Part 172

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<https://www.ecfr.gov/current/title-49/subtitle-B/chapter-I/subchapter-C/part-172/subpart-B/section-172.101>

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<https://haz-map.com/About>

Adiponitrile

<https://haz-map.com/Agents/160>

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<https://t3db.ca/downloads>

Adiponitrile

<http://www.t3db.ca/toxins/T3D1689>

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CHEMBL2132938

<https://www.ebi.ac.uk/chembl/explore/compound/CHEMBL2132938>

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<https://www.crystallography.net/cod/2020899.html>

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https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search

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

28. NITE-CMC

Adiponitrile - FY2009 (Revised classification)

<https://www.chem-info.nite.go.jp/chem/english/ghs/09-mhlw-2059e.html>

Adiponitrile - FY2006 (New/original classification)

<https://www.chem-info.nite.go.jp/chem/english/ghs/06-imcg-0005e.html>

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<https://pubchem.ncbi.nlm.nih.gov/substance/589867>

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1,4-BUTANEDICARBONITRILE

https://massbank.eu/MassBank/search?inchi_key=BTGRAWJCKBQKAO-UHFFFAOYSA-N

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<https://www.hmdb.ca/citing>

Adiponitrile

<http://www.hmdb.ca/metabolites/HMDB0248015>

HMDB0248015_nmr_one_2155

<https://hmdb.ca/metabolites/HMDB0248015#spectra>

32. SpectraBase

ADIPONITRILE

<https://spectrabase.com/spectrum/6nyDBtrMBID>

ADIPONITRILE

<https://spectrabase.com/spectrum/4GbFEJkOIIno>

HEXANEDINITRILE

<https://spectrabase.com/spectrum/Z4HI7vAxxN>

ADIPONITRILE

<https://spectrabase.com/spectrum/JrOvGN25pfW>

Adiponitrile

<https://spectrabase.com/spectrum/J75L6AakPuJ>

1,4-Dicyanobutane

<https://spectrabase.com/spectrum/Gg8x1Y7zhDH>

Adiponitrile

<https://spectrabase.com/spectrum/D2eZQ12FYkI>

33. Japan Chemical Substance Dictionary (Nikkaji)

http://jglobal.jst.go.jp/en/redirect?Nikkaji_No=J2.456B

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<https://mona.fiehnlab.ucdavis.edu/documentation/license>

1,4-BUTANEDICARBONITRILE

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

[query=exists\(compound.metaData.name:%27InChIKey%27%20and%20compound.metaData.value:%27BTGRAWJCKBQ KAO-UHFFFAOYSA-N%27\)](#)

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106/108

<https://www.nist.gov/srd/public-law>

Hexanedinitrile

<http://www.nist.gov/srd/nist1a.cfm>

36. Springer Nature

<https://pubchem.ncbi.nlm.nih.gov/substance/341151380>

37. SpringerMaterials

hexanedinitrile

https://materials.springer.com/substanceprofile/docs/smsid_bohrfgfycqwosrfu

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adiponitrile

<https://www.wikidata.org/wiki/Q84062>

40. Wikipedia

Adiponitrile

<https://en.wikipedia.org/wiki/Adiponitrile>

41. PubChem

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

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<https://id.nlm.nih.gov/mesh/M0111245.html>

MeSH Tree

<https://www.nlm.nih.gov/mesh/meshhome.html>

43. GHS Classification (UNECE)

GHS Classification

<https://unece.org/about-ghs>

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NORMAN Suspect List Exchange Classification

<https://www.norman-network.com/nds/SLE/>

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<https://www.epa.gov/privacy/privacy-act-laws-policies-and-resources>

EPA SRS List Classification

<https://maldi.nist.gov>

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MolGenie Organic Chemistry Ontology

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

47. PATENTSCOPE (WIPO)

SID 403031314

<https://pubchem.ncbi.nlm.nih.gov/substance/403031314>

COMPOUND

Succinonitrile

Cite

Download

PubChem CID

8062

Structure



Primary Hazards

[Laboratory Chemical Safety Summary \(LCSS\) Datasheet](#)

Molecular Formula

C₄H₄N₂
CNCH₂CH₂CN

Synonyms

SUCCINONITRILE
Butanedinitrile
110-61-2
1,2-Dicyanoethane
Deprelin

[View More...](#)

Molecular Weight

80.09 g/mol

Computed by PubChem 2.2 (PubChem release 2025.09.15)

Dates

Create: 2005-03-26
Modify: 2026-06-13

Description

Succinonitrile appears as colorless to light brown crystals. Colorless waxy solid melting at 57 °C. Highly toxic.

► [CAMEO Chemicals](#)

Succinonitrile is a chemical compound of [cyanide](#).

► [Toxin and Toxin Target Database \(T3DB\)](#)

structure

► [Medical Subject Headings \(MeSH\)](#)

Contents

Title and Summary**1 Structures****2 Names and Identifiers****3 Chemical and Physical Properties****4 Spectral Information****5 Related Records****6 Chemical Vendors****7 Drug and Medication Information****8 Pharmacology and Biochemistry****9 Use and Manufacturing****10 Identification****11 Safety and Hazards****12 Toxicity****13 Literature****14 Patents****15 Interactions and Pathways****16 Biological Test Results**

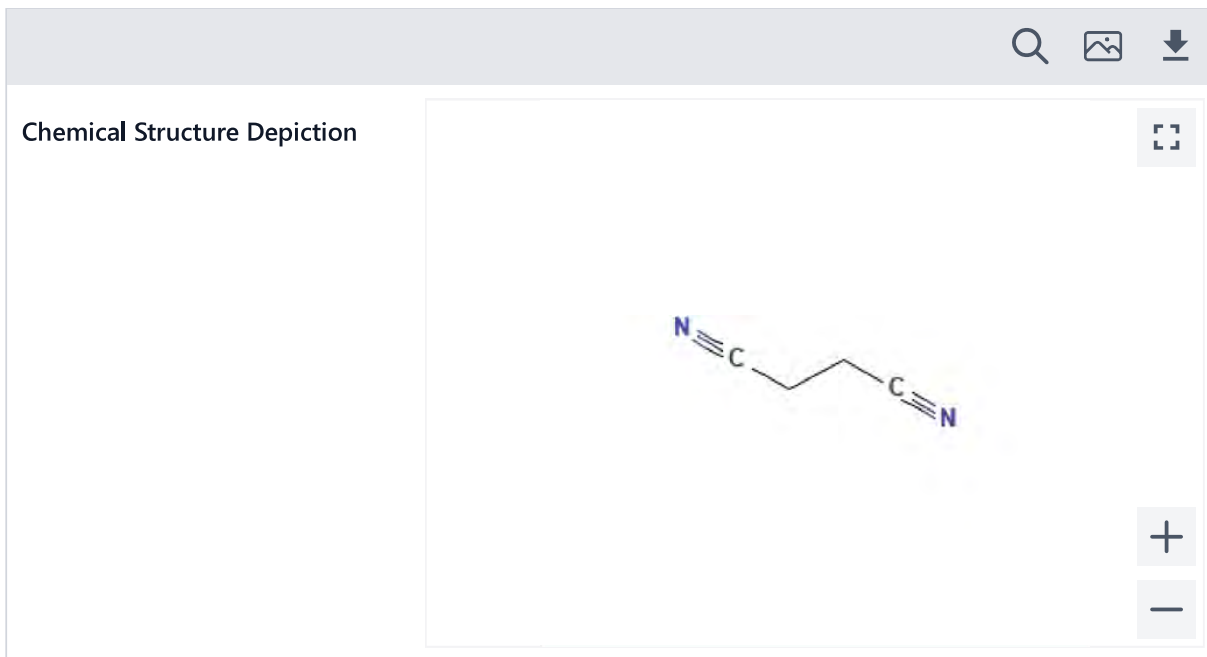
17 Classification

18 Information Sources

1 Structures



1.1 2D Structure



► PubChem

1.2 3D Conformer



[► PubChem](#)

1.3 Crystal Structures



1 of 4 items		View All
CCDC Number	702139	
Associated Article	DOI:10.1002/zaac.200800404	
Crystal Structure Data	DOI:10.5517/ccrkmnk	
Crystal Structure Depiction		

[► The Cambridge Structural Database](#)

2 Names and Identifiers



2.1 Computed Descriptors



2.1.1 IUPAC Name



butanedinitrile

Computed by Lexichem TK 2.9.3 (PubChem release 2025.09.15)

► [PubChem](#)

2.1.2 InChI



InChI=1S/C₄H₄N₂/c5-3-1-2-4-6/h1-2H2

Computed by InChI 1.07.4 (PubChem release 2025.09.15)

► [PubChem](#)

2.1.3 InChIKey



IAHFWCOBPZCAEA-UHFFFAOYSA-N

Computed by InChI 1.07.4 (PubChem release 2025.09.15)

► [PubChem](#)

2.1.4 SMILES



C(CC#N)C#N

Computed by OEChem 4.2.0 (PubChem release 2025.09.15)

► [PubChem](#)

2.2 Molecular Formula



C₄H₄N₂

Computed by PubChem 2.2 (PubChem release 2025.09.15)

► [Australian Industrial Chemicals Introduction Scheme \(AICIS\)](#); [CAMEO Chemicals](#); [PubChem](#)

C₄H₄N₂

CNCH₂CH₂CN

► [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

2.3 Other Identifiers



2.3.1 CAS



110-61-2

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

2.3.2 Deprecated CAS



191362-21-7

- ▶ ChemIDplus; EPA Chemicals under the TSCA

2.3.3 European Community (EC) Number



203-783-9

- ▶ European Chemicals Agency (ECHA)

2.3.4 UNII



1R479O92DO

- ▶ FDA Global Substance Registration System (GSRS)

2.3.5 UN Number



3276

- ▶ ILO-WHO International Chemical Safety Cards (ICSCs)

2.3.6 AIDS Number



018446

- ▶ NIAID ChemDB

2.3.7 ChEMBL ID



CHEMBL1562258

► ChEMBL

2.3.8 DSSTox Substance ID**DTXSID9026059**

► EPA DSSTox

2.3.9 HMDB ID**HMDB0258544**

► Human Metabolome Database (HMDB)

2.3.10 ICSC Number**1497**

► ILO-WHO International Chemical Safety Cards (ICSCs)

2.3.11 Nikkaji Number**J2.450C**

► Japan Chemical Substance Dictionary (Nikkaji)

2.3.12 NSC Number**NSC4852**

► DTP/NCI

2.3.13 RTECS Number**WN3850000**

- [The National Institute for Occupational Safety and Health \(NIOSH\)](#)

2.3.14 Wikidata



[Q3502773](#)

- [Wikidata](#)

2.3.15 Wikipedia



[Succinonitrile](#)

- [Wikipedia](#)

2.4 Synonyms



2.4.1 MeSH Entry Terms



succinonitrile

- [Medical Subject Headings \(MeSH\)](#)

2.4.2 Depositor-Supplied Synonyms



SUCCINONITRILE	Suxil	sym-Dicyanoethane	1,2-dicyano-ethan	Ethane,2-dicy
Butanedinitrile	1,4-Butanedinitrile	USAF A-9442	NSC 4852	Succinonitrile
110-61-2	Succinil	Ethane, 1,2-dicyano-	MFCD00001949	NCCH2CH2CN
1,2-Dicyanoethane	Disuxyl	Dicyanoethane	Sukcinonitril [Czech]	WLN: NC2CN
Deprelin	Evanex	DTXSID9026059	CCRIS 4720	ethane-1,2-di
Succinodinitrile	s-Dicyanoethane	1R479O92DO	HSDB 7190	EC 203-783-9
Dinile	Succinic acid nitrile	NSC-4852	EINECS 203-783-9	SUCCINONITR
Ethylene cyanide	Succinic dinitrile	DTXCID706059	BRN 1098380	SCHEMBL563
Ethylene dicyanide	Succinic acid dinitrile	RefChem:186355	UNII-1R479O92DO	SCHEMBL677
Dician	Sukcinonitril	203-783-9	AI3-06591	SUCCINONITR

- [PubChem](#)

3 Chemical and Physical Properties



3.1 Computed Properties



Property Name	Property Value	Reference
Molecular Weight	80.09 g/mol	Computed by PubChem 2.2 (PubChem release 2025.09.15)
XLogP3	-1	Computed by XLogP3 3.0 (PubChem release 2025.09.15)
Hydrogen Bond Donor Count	0	Computed by Cactvs 3.4.8.24 (PubChem release 2025.09.15)
Hydrogen Bond Acceptor Count	2	Computed by Cactvs 3.4.8.24 (PubChem release 2025.09.15)
Rotatable Bond Count	1	Computed by Cactvs 3.4.8.24 (PubChem release 2025.09.15)
Exact Mass	80.037448136 Da	Computed by PubChem 2.2 (PubChem release 2025.09.15)
Monoisotopic Mass	80.037448136 Da	Computed by PubChem 2.2 (PubChem release 2025.09.15)
Topological Polar Surface Area	47.6 Å ²	Computed by Cactvs 3.4.8.24 (PubChem release 2025.09.15)
Heavy Atom Count	6	Computed by PubChem
Formal Charge	0	Computed by PubChem
Complexity	92	Computed by Cactvs 3.4.8.24 (PubChem release 2025.09.15)
Isotope Atom Count	0	Computed by PubChem
Defined Atom Stereocenter Count	0	Computed by PubChem
Undefined Atom Stereocenter Count	0	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 2025.09.15)

► [PubChem](#)

3.2 Experimental Properties



3.2.1 Physical Description



Succinonitrile appears as colorless to light brown crystals. Colorless waxy solid melting at 57 °C. Highly toxic.

► [CAMEO Chemicals](#)

Colorless, odorless, waxy solid; Note: Forms [cyanide](#) in the body; [NIOSH]

► [Haz-Map, Information on Hazardous Chemicals and Occupational Diseases](#)

COLOURLESS WAXY CRYSTALS.

► [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

Colorless, odorless, waxy solid. [Note: Forms [cyanide](#) in the body.]

► [The National Institute for Occupational Safety and Health \(NIOSH\)](#)

3.2.2 Color / Form



Colorless waxy solid

Lewis, R.J., Sr (Ed.). Hawley's Condensed Chemical Dictionary. 13th ed. New York, NY: John Wiley & Sons, Inc. 1997., p. 467

► [Hazardous Substances Data Bank \(HSDB\)](#)

3.2.3 Odor



Odorless

NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases. U.S. Department of Health & Human Services, Public Health Service, Center for Disease Control & Prevention. DHHS (NIOSH) Publication No. 2001-145 (CD-ROM) August 2001.

► [Hazardous Substances Data Bank \(HSDB\)](#)

3.2.4 Boiling Point



509 to 513 °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](#)

266 °C

Lide, DR (ed.). CRC Handbook of Chemistry and Physics. 81st Edition. CRC Press LLC, Boca Raton: FL 2000, p. 3-92

► [Hazardous Substances Data Bank \(HSDB\)](#)

Boiling point: 185 °C @ 60 mm Hg; 158-160 @ 20 mm Hg

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. 13th Edition, Whitehouse Station, NJ: Merck and Co., Inc., 2001., p. 1580

► [Hazardous Substances Data Bank \(HSDB\)](#)

265 °C

► [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

509 °F

► [The National Institute for Occupational Safety and Health \(NIOSH\)](#)

3.2.5 Melting Point



135 to 136 °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](#)

54.5 °C

Lide, DR (ed.). *CRC Handbook of Chemistry and Physics. 81st Edition.* CRC Press LLC, Boca Raton: FL 2000, p. 3-92

► [Hazardous Substances Data Bank \(HSDB\)](#)

54 °C

► [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

134 °F

► [The National Institute for Occupational Safety and Health \(NIOSH\)](#)

3.2.6 Flash Point



270 °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](#)

132 °C

► [Haz-Map, Information on Hazardous Chemicals and Occupational Diseases; ILO-WHO Internation...](#)

270 °F (132 °C) (closed cup)

Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 325-104

► [Hazardous Substances Data Bank \(HSDB\)](#)

270 °F

► [The National Institute for Occupational Safety and Health \(NIOSH\)](#)

3.2.7 Solubility



50 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**

Soluble in **acetone**, **chloroform**, **dioxane**; slightly soluble in **ethanol**, **benzene**, ether, **carbon sulfide**

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. 13th Edition, Whitehouse Station, NJ: Merck and Co., Inc., 2001., p. 1580

► **Hazardous Substances Data Bank (HSDB)**

In **water**, 126.9 g/L @ 20 °C

Yalkowsky, S.H., He, Yan., Handbook of Aqueous Solubility Data: An Extensive Compilation of Aqueous Solubility Data for Organic Compounds Extracted from the AQUASOL dATABASE. CRC Press LLC, Boca Raton, FL. 2003., p. 82

► **Hazardous Substances Data Bank (HSDB)**

Solubility in **water**, g/100ml at 20 °C: 13

► **ILO-WHO International Chemical Safety Cards (ICSCs)**

13%

► **The National Institute for Occupational Safety and Health (NIOSH)**

3.2.8 Density



1.023 at 113 °F (NTP, 1992) - Denser than **water**; will sink

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**

0.9867 g/cu cm @ 60 °C

Lide, DR (ed.). CRC Handbook of Chemistry and Physics. 81st Edition. CRC Press LLC, Boca Raton: FL 2000, p. 3-92

► **Hazardous Substances Data Bank (HSDB)**

1.02 g/cm³

► **ILO-WHO International Chemical Safety Cards (ICSCs)**

0.99

- ▶ [The National Institute for Occupational Safety and Health \(NIOSH\)](#)

3.2.9 Vapor Density



2.1 (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](#)

2.8 (Air=1)

Clayton, G.D., F.E. Clayton (eds.) Patty's Industrial Hygiene and Toxicology. Volumes 2A, 2B, 2C, 2D, 2E, 2F: Toxicology, 4th ed. New York, NY: John Wiley & Sons Inc., 1993-1994., p. 7D 3151

- ▶ [Hazardous Substances Data Bank \(HSDB\)](#)

Relative vapor density (air = 1): 2.1

- ▶ [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

3.2.10 Vapor Pressure



2 mmHg at 392 °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](#)

0.00778 [mmHg]

- ▶ [Haz-Map, Information on Hazardous Chemicals and Occupational Diseases](#)

1.0382 Pa (0.00778 mm Hg) @ 298.29 K (25.14 °C) (solid)

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 \(HSDB\)](#)

(212 °F): 2 mmHg

- ▶ [The National Institute for Occupational Safety and Health \(NIOSH\)](#)

3.2.11 LogP



log Kow = -0.99

[PMID:4026577](#)

Tanii H, Hashimoto K; Arch Toxicol 57: 88-93 (1985)

- ▶ [Hazardous Substances Data Bank \(HSDB\)](#)

-0.99

- ▶ [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

3.2.12 Henry's Law Constant



Henry's Law constant = 6.5X10⁻⁹ atm-cu m/mol @ 25 °C /Estimated/

US EPA; Estimation Programs Interface (EPI). ver. 3.10. U.S. EPA version for Windows. Washington, DC: U.S. EPA (2001). Available from, as of Mar 1, 2004: <https://www.epa.gov/oppt/exposure/pubs/episuite.dll>

- ▶ [Hazardous Substances Data Bank \(HSDB\)](#)

3.2.13 Decomposition



After vacuum distillation of several tons of the nitrile at 150 C, lack of a receiver necessitated hot storage of the product at 80 C for 46 hours, and the drainage line blocked with solid. Though the bulk of the material was still liquid, heating to 195 C did not clear the line, and shortly afterwards decomposition occurred. It was subsequently found that the distillation residue had also decomposed at 175 C, 2 hours after distillation ended. Differential thermal analysis showed that the nitrile is unusual in that no heat is evolved during the induction period of around 33 hours/200 C, or 1.5 hours/280 C, and the rapid onset and narrow peak width suggested a self-accelerating decomposition process, with Q = 700 J/g. No stabilising additives period for the nitrile to 20 percent of its value, while 1 percent of [potassium cyanide](#) reduced it to 2 percent.

Bretherick, L. *Handbook of Reactive Chemical Hazards*. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 425

- ▶ [Hazardous Substances Data Bank \(HSDB\)](#)

May be heated to 200 °C for 72 hr without decomposition.

O'Neil, M.J. (ed.). *The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals*. 13th Edition, Whitehouse Station, NJ: Merck and Co., Inc., 2001., p. 1580

► [Hazardous Substances Data Bank \(HSDB\)](#)

3.2.14 Viscosity



0.002008 kg/m-sec @ 75 °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. 585

► [Hazardous Substances Data Bank \(HSDB\)](#)

3.2.15 Heat of Combustion



-2,285.38 kJ/mol

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. 585

► [Hazardous Substances Data Bank \(HSDB\)](#)

3.2.16 Heat of Vaporization



48.5 kJ/mol @ 266.0 °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. 585

► [Hazardous Substances Data Bank \(HSDB\)](#)

3.2.17 Surface Tension



0.04678 cu m/s @ 60 °C; 0.04572 cu m/s @ 70 °C; 0.04462cu m/s @ 80 °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. 585

► [Hazardous Substances Data Bank \(HSDB\)](#)

3.2.18 Odor Threshold



Odor perception threshold is 21 mg/L. Taste perception threshold is 200 mg/L.

Sheftel, V.O.; Indirect Food Additives and Polymers. Migration and Toxicology. Lewis Publishers, Boca Raton, FL. 2000., p. 1023

► [Hazardous Substances Data Bank \(HSDB\)](#)

3.2.19 Refractive Index



Index of refraction: 1.4173 D/ 60 °C

Lide, DR (ed.). CRC Handbook of Chemistry and Physics. 81st Edition. CRC Press LLC, Boca Raton: FL 2000, p. 3-92

► [Hazardous Substances Data Bank \(HSDB\)](#)

3.2.20 Other Experimental Properties



Enthalpy of formation: 139.7 kJ/mol (liquid), 209.7 kJ/mol (gas); molar heat capacity: 145.6 J/K mol

Lide, DR (ed.). CRC Handbook of Chemistry and Physics. 81st Edition. CRC Press LLC, Boca Raton: FL 2000, p. 5-35

► [Hazardous Substances Data Bank \(HSDB\)](#)

Enthalpy of fusion: 3.70 kJ/mol @ 57.98 °C

Lide, DR (ed.). CRC Handbook of Chemistry and Physics. 81st Edition. CRC Press LLC, Boca Raton: FL 2000, p. 6-129

► [Hazardous Substances Data Bank \(HSDB\)](#)

Relative permittivity: 62.6 @ 298.2 K

Lide, DR (ed.). CRC Handbook of Chemistry and Physics. 81st Edition. CRC Press LLC, Boca Raton: FL 2000, p. 6-154

► [Hazardous Substances Data Bank \(HSDB\)](#)

Conversion factor: 1 ppm = 3.28 mg/cu m; vapor pressure 2 mm Hg @ 212 °F (100 °C)

NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases. U.S. Department of Health & Human Services, Public Health Service, Center for Disease Control & Prevention. DHHS (NIOSH) Publication No. 2001-145 (CD-ROM) August 2001.

► [Hazardous Substances Data Bank \(HSDB\)](#)

Hydroxyl radical reaction rate constant = 4.3X10⁻¹⁴ cu cm/molecule-sec @ 25 °C /Estimated/

US EPA; Estimation Programs Interface (EPI). ver. 3.10. U.S. EPA version for Windows. Washington, DC: U.S. EPA (2001). Available from, as of Mar 1, 2004: <https://www.epa.gov/oppt/exposure/pubs/episuite.html>

► [Hazardous Substances Data Bank \(HSDB\)](#)

3.3 SpringerMaterials Properties



Schoenflies notation	Diffusion of impurities	Melting temperature	Preexpo
Activation energy	Diffusive flux	Migration energy	Quadrup
Boiling point	Formula unit	Molecular structure	Refractiv
Chemical bond	Fusion entropy	Nuclear magnetic resonance	Self-diff
Chemical diffusion	Fusion temperature	Nuclear quadrupole resonance spectroscopy	Space gr
Creep	Grain size	Optical coefficient	Spin-latt
Crystal structure	Heat of sublimation	Partial pressure	Surface v
Density	Impurity concentration	Phase transition	Tracer di
Dielectric constant	Internuclear distance	Phonon wavenumber	Transitio
Diffusion	Isotope mass-effect	Point group	Tricritica

► [SpringerMaterials](#)

3.4 Chemical Classes



Nitrogen Compounds -> Nitriles

► [Haz-Map, Information on Hazardous Chemicals and Occupational Diseases](#)

4 Spectral Information



4.1 1D NMR Spectra



1 of 2 items	
1D NMR Spectra	¹ H NMR: 10167 (Sadtler Research Laboratories Spectral Collection)

► [Hazardous Substances Data Bank \(HSDB\)](#)

2 of 2 items	
--------------	--

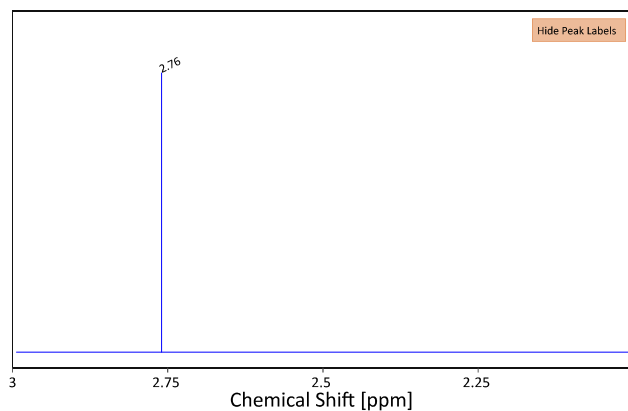
1D NMR Spectra

[NMRShiftDB Link](#)[► NMRShiftDB](#)4.1.1 ¹H NMR Spectra

1 of 2 items

Spectra ID	2144
Instrument Type	JEOL
Frequency	300 MHz
Solvent	CDCl ₃
Shifts [ppm]:Intensity	2.76:1000.00

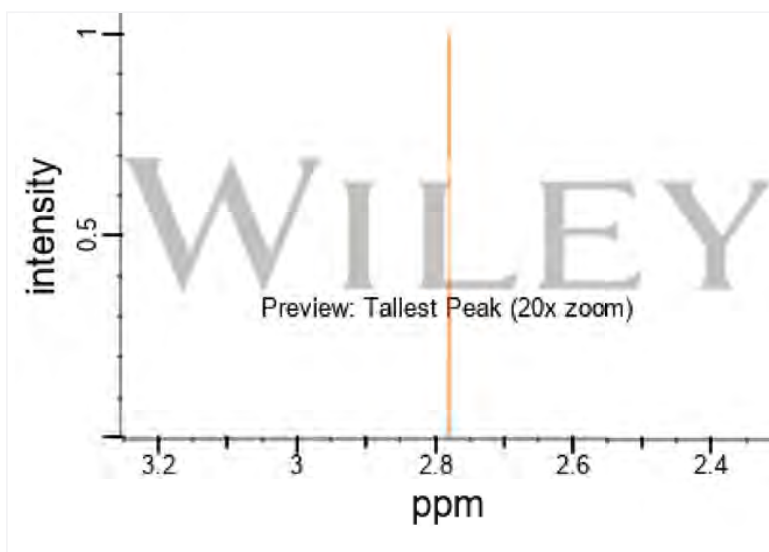
Thumbnail

[► Human Metabolome Database \(HMDB\)](#)

2 of 2 items

Instrument Name	Varian A-60
Copyright	Copyright © 2009-2025 John Wiley & Sons, Inc. All Rights Reserved.

Thumbnail

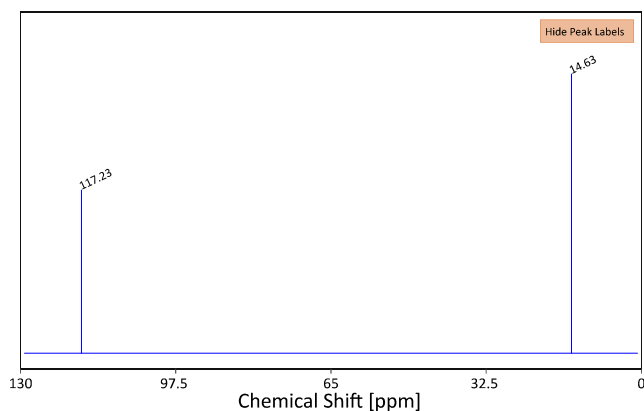
[► SpectraBase](#)

4.1.2 13C NMR Spectra



1 of 2 items	
Spectra ID	3451
Instrument Type	Varian
Frequency	25.16 MHz
Solvent	CDCl ₃
Shifts [ppm]:Intensity	14.63:1000.00, 117.23:585.00

Thumbnail



► [Human Metabolome Database \(HMDB\)](#)

2 of 2 items

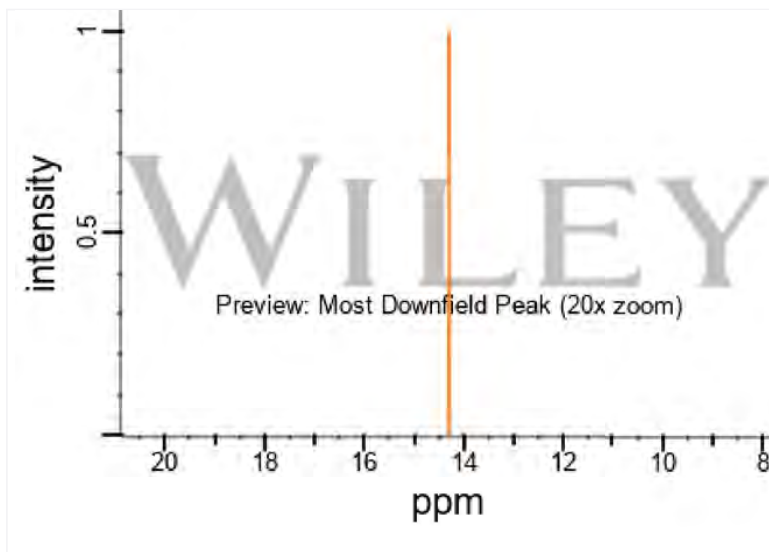
Source of Sample

Aldrich Chemical Company, Inc., Milwaukee, Wisconsin

Copyright

Copyright © 1980, 1981-2025 John Wiley & Sons, Inc. All Rights Reserved.

Thumbnail



► [SpectraBase](#)

4.2 Mass Spectrometry

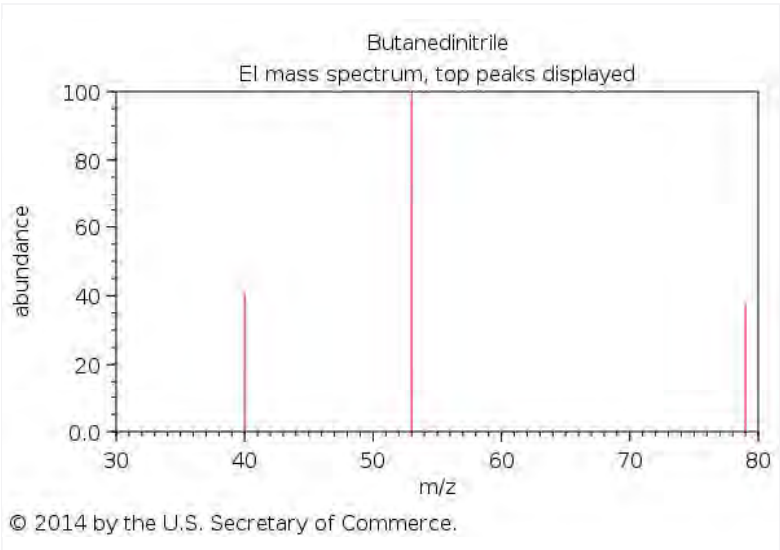


4.2.1 GC-MS



1 of 5 items		View All
MoNA ID	JP002890	
MS Category	Experimental	
MS Type	GC-MS	
MS Level	MS1	
Instrument	Unknown	
Instrument Type	EI-B	
Ionization Mode	positive	
Top 5 Peaks	53 99.99 40 52.63 79 40.28 44 33.77 18 33.70	
SPLASH	splash10-0ufu-9100000000-be8dd1d9da4b1e490786	
Thumbnail		
License	CC BY-NC-SA	

► [MassBank of North America \(MoNA\)](#)

2 of 5 items		View All 
NIST Number	341643	
Library	Main library	
Total Peaks	33	
m/z Top Peak	53	
m/z 2nd Highest	40	
m/z 3rd Highest	79	
Thumbnail	 Butanedinitrile EI mass spectrum, top peaks displayed abundance m/z © 2014 by the U.S. Secretary of Commerce.	

► [NIST Mass Spectrometry Data Center](#)

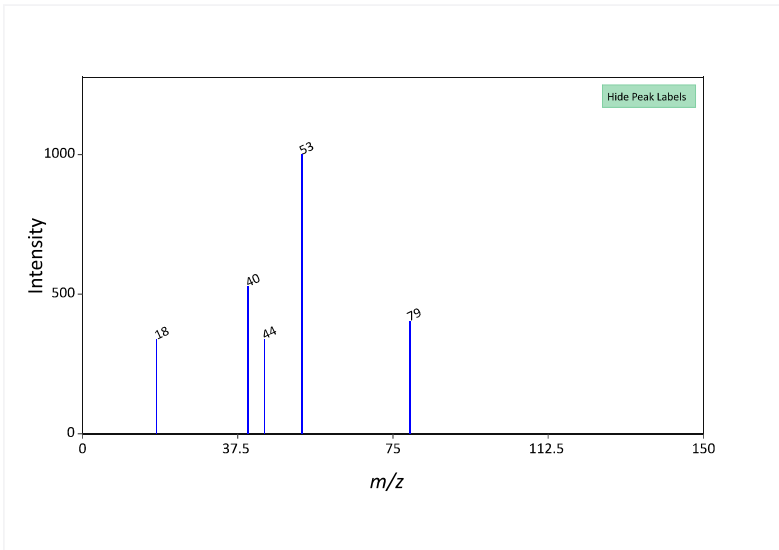
4.2.2 Other MS



1 of 2 items	
Other MS	MASS: 50489 (NIST/EPA/MCMD Mass Spectral Database 1990 version)

► [Hazardous Substances Data Bank \(HSDB\)](#)

2 of 2 items	
Accession ID	MSBNK-Fac_Eng_Univ_Tokyo-JP002890
Authors	MASS SPECTROSCOPY SOC. OF JAPAN (MSSJ)

Instrument	Unknown
Instrument Type	EI-B
MS Level	MS
Ionization Mode	POSITIVE
Top 5 Peaks	53 999 40 526 79 403 44 338 18 337
SPLASH	splash10-0ufu-9100000000-be8dd1d9da4b1e490786
Thumbnail	
License	CC BY-NC-SA

► [MassBank Europe](#)

4.3 IR Spectra



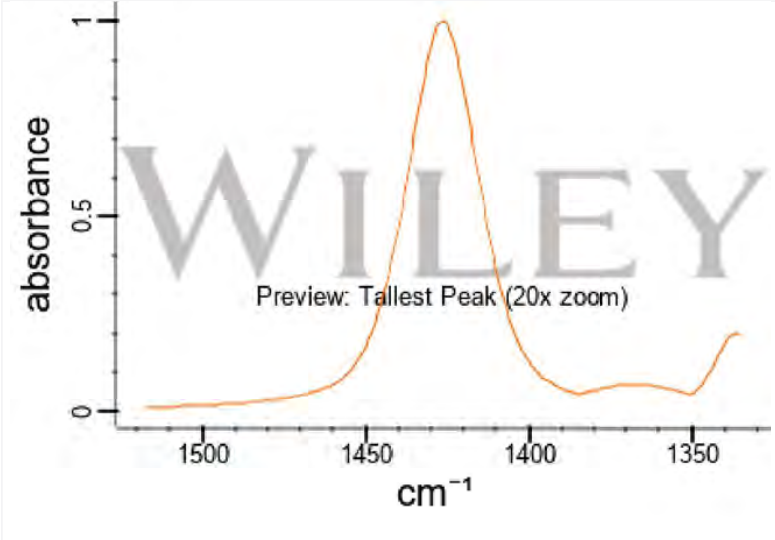
IR Spectra

IR: 500 (Sadtler Research Laboratories IR prism collection)

► [Hazardous Substances Data Bank \(HSDB\)](#)

4.3.1 FTIR Spectra



Instrument Name	Bruker IFS 85
Technique	Film
Source of Sample	Merck-Schuchardt Hohenbrunn
Copyright	Copyright © 1989, 1990-2025 Wiley-VCH GmbH. All Rights Reserved.
Thumbnail	

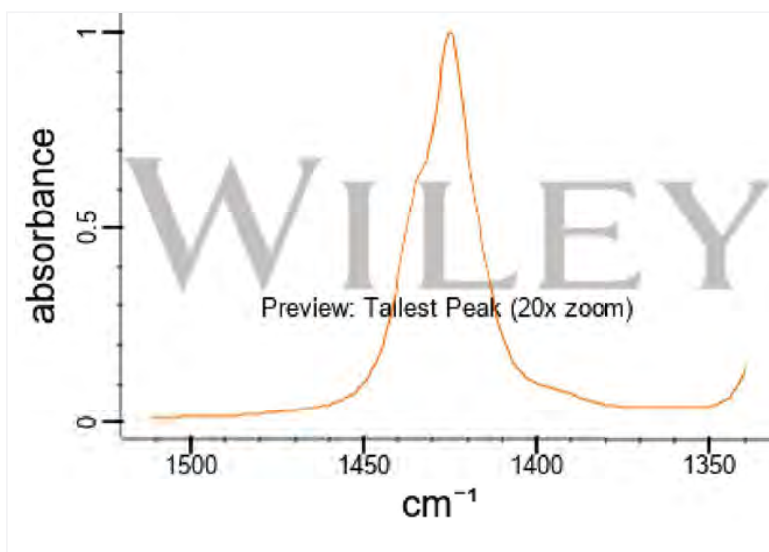
► [SpectraBase](#)

4.3.2 ATR-IR Spectra



Technique	ATR-Film
Copyright	Copyright © 1980, 1981-2025 John Wiley & Sons, Inc. All Rights Reserved.

Thumbnail

[► SpectraBase](#)

4.3.3 Vapor Phase IR Spectra

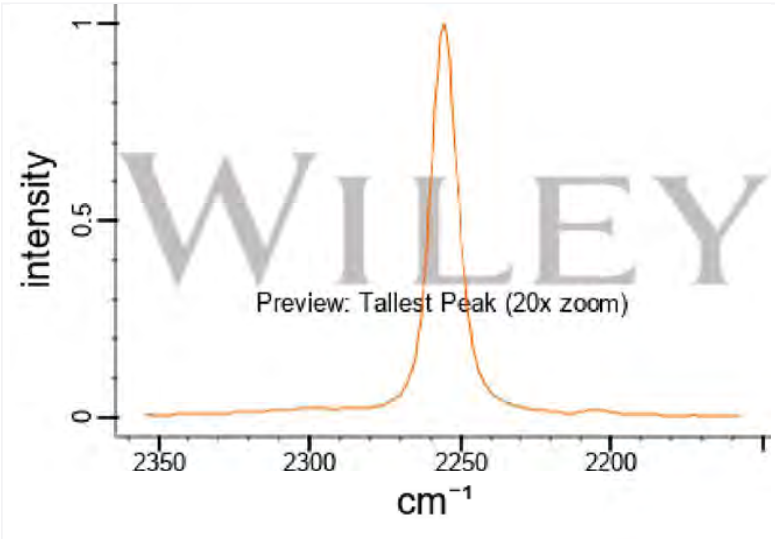


Instrument Name	DIGILAB FTS-14
Technique	Vapor Phase
Copyright	Copyright © 1980, 1981-2025 John Wiley & Sons, Inc. All Rights Reserved.
Thumbnail	Vapor phase IR spectrum of Succinonitrile (CNCH₂CH₂CN) showing absorbance versus wavenumber (cm⁻¹). The x-axis ranges from 1500 to 1400 cm⁻¹, and the y-axis ranges from 0 to 1. A broad, prominent peak is observed at approximately 1430 cm⁻¹, reaching an absorbance of 1.0. The spectrum is overlaid with a large 'WILEY' watermark. Text on the plot reads 'Preview: Tallest Peak (20x zoom)'.

[► SpectraBase](#)

4.4 Raman Spectra



Catalog Number	160962
Copyright	Copyright © 2017-2025 Sigma-Aldrich Co. LLC. - Database Compilation Copyright © 2017-2025 John Wiley & Sons, Inc. All Rights Reserved.
Thumbnail	

► [SpectraBase](#)

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 [the neighbor discontinuation help page](#) 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	9
-------------------------	---

Same Parent, Connectivity Count	18
Same Parent, Exact Count	10
Mixtures, Components, and Neutralized Forms Count	77
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



500829773

► [PubChem](#)

5.3.2 Related Substances



All Count	261
Same Count	145
Mixture Count	116

► [PubChem](#)

5.3.3 Substances by Category



► PubChem

5.4 Entrez Crosslinks



PubMed Count	38
--------------	----

► PubChem

6 Chemical Vendors



► PubChem

7 Drug and Medication Information



7.1 Reported Fatal Dose



227 to 300 milligrams for an adult human (cyanide salts). (T86)

► [Toxin and Toxin Target Database \(T3DB\)](#)

8 Pharmacology and Biochemistry



8.1 Absorption, Distribution and Excretion



...The excretion of succinonitrile and its metabolites in urine and feces of mice, following a single injection of succinonitrile /was reported/. The cumulative excretion of succinonitrile and metabolites in urine and feces measured 60% by 24 hours and 83% by 72 hours. In the first multiple-dose experiment in which mice received three doses of unlabeled succinonitrile and one dose of radioactive succinonitrile, 52% of the radioactivity was excreted in urine in 24 hours. In the second multiple-dose experiment, in which mice received four doses of radioactive succinonitrile, 50% of the radioactivity was excreted in each 24 hr period.

U.S Department of Health, Education, and Welfare. Public Health Service. Center for Disease Control. National Institute for Occupational Safety and Health; NIOSH Criteria for a Recommended Standard - Occupational Exposure to Nitriles p.59 (September 1978) DHEW (NIOSH) Pub #78-212

► [Hazardous Substances Data Bank \(HSDB\)](#)

...The fate of ¹⁴C-labeled succinonitrile in male mice /was investigated/. ...A mean of 53% of the total succinonitrile injected ip in each animal in single and multiple dose studies was eliminated in the first 24 hours post-treatment and 88% of this eliminated succinonitrile was excreted as metabolites. In a single dose study, 7% of the ¹⁴C-labeled succinonitrile was excreted as [thiocyanate](#) and 36% as intermediate metabolites in 24 hours. In the multiple dose study, 18% [thiocyanate](#) and 24% intermediate metabolites were excreted.

U.S Department of Health, Education, and Welfare. Public Health Service. Center for Disease Control. National Institute for Occupational Safety and Health; NIOSH Criteria for a Recommended Standard - Occupational Exposure to Nitriles p.59 (September 1978) DHEW (NIOSH) Pub #78-212

► [Hazardous Substances Data Bank \(HSDB\)](#)

8.2 Metabolism / Metabolites



/A study/... determined that rats and rabbits converted about 60% of the succinonitrile to [cyanide](#).

Bingham, E.; Cochrissen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. V4 1420

► [Hazardous Substances Data Bank \(HSDB\)](#)

...The release of **cyanide** from succinonitrile in rats and rabbits in vivo and in vitro /was investigated/. In the in vivo studies, male rabbits weighing 2-3 kg and male rats weighing 400-450 g were administered succinonitrile in iv doses of 25-40 mg/kg and 25-50 mg/kg, respectively. Levels of **cyanide** and **thiocyanate** were determined in samples of urine from rabbits and rats. The total number of rats that were studied was not mentioned. In the in vitro studies, levels of **cyanide** and **thiocyanate** were determined in liver slices and homogenates of rat or rabbit liver or with isolated mitochondrial, microsomal, and soluble fractions. Samples (0.1-2.0 mL) of filtered 24 hr urine output were collected from groups of two rats and from each rabbit pre- and post-administration with succinonitrile to determine **thiocyanate** concentrations. In another study, rats were pretreated with 2 mL/kg of **carbon tetrachloride** sc 48 hr prior to succinonitrile administration. Filtered urine samples were collected, and **cyanide** concentrations were determined colorimetrically. ...A sixfold increase in urinary **thiocyanate** following iv-injected doses of 25 mg/kg of succinonitrile /was found/ compared with the controls. Forty-eight to 120 hours postadministration of succinonitrile, **thiocyanate** levels approached control values. Pretreatment of rats by sc injection of 2 mL/kg **carbon tetrachloride** inhibited urinary **thiocyanate** excretion. Urinary excretion of **cyanide** increased over fivefold 48 hours posttreatment with succinonitrile. The values at 72-120 hours posttreatment approached normal values. ...Rat and rabbit liver slices catalyzed the release of **cyanide** from succinonitrile. However, 0.1-2.0 mg/g of Triton-X-100 strongly inhibited **cyanide** release from succinonitrile in rat liver slices. Liver slices of rats pretreated with **carbon tetrachloride** did not release detectable amounts of **cyanide** for succinonitrile. .../It was/ concluded that rabbits and rats converted about 60% of the administered succinonitrile to **cyanide**, which was excreted as **thiocyanate**. The release of **cyanide** was inhibited by **carbon tetrachloride** and Triton-X-100. The authors also postulated that disruption of the liver cells, as by centrifugation to separate their contents, depressed or eliminated their ability to liberate **cyanide** ions or to form **thiocyanate**. The authors proposed that cellular membranes contain enzymes or enzyme complexes that are responsible for the conversion of succinonitrile to **cyanide**, which is excreted as **thiocyanate**. However, following homogenization, these enzyme or enzyme complexes may be destroyed or damaged by homogenization.

U.S Department of Health, Education, and Welfare. Public Health Service. Center for Disease Control. National Institute for Occupational Safety and Health; NIOSH Criteria for a Recommended Standard - Occupational Exposure to Nitriles p.58 (September 1978) DHEW (NIOSH) Pub #78-212

► **Hazardous Substances Data Bank (HSDB)**

/One study/ ...concluded that succinonitrile was either excreted unmetabolized or was metabolized to **cyanide** and excreted as **thiocyanate** in mice within 24 hours posttreatment. The authors postulated that the high percentage of metabolites excreted in 24 hr urine samples may be due to the presence of two reactive centres in the succinonitrile molecule, resulting in the formation of two intermediate metabolites, diethylene cyanohydrin and **cynoacetic acid**.

U.S Department of Health, Education, and Welfare. Public Health Service. Center for Disease Control. National Institute for Occupational Safety and Health; NIOSH Criteria for a Recommended Standard - Occupational Exposure to Nitriles p.58 (September 1978) DHEW (NIOSH) Pub #78-212

► [Hazardous Substances Data Bank \(HSDB\)](#)

The liberation of **cyanide** from succinonitrile has been studied to obtain information on the cellular systems responsible for the release of this metabolite. sing isolated endoplasmic reticulum preparations a complex between succinonitrile and cyt. P450 has been detected. This finding together with the inhibition of **cyanide** liberation by **SKF-525A** in liver slices indicates that the endoplasmic reticulum is involved in the early stages of succinonitrile metabolism. The decreased metabolism of succinonitrile which was observed after addition of inhibitors of oxidative phosphorylation indicates that an energy-dependent mitochondrial step might be involved in the subsequent steps. ...**Cyanide** liberation from succinonitrile is a multistep process in which the mitochondrial membrane and the endoplasmic reticulum are involved.

PMID:7274308

Floreani M et al; Eur J Drug Metab Pharmacokinet 6 (2): 135-40 (1981)

► [Hazardous Substances Data Bank \(HSDB\)](#)

Organic nitriles are converted into **cyanide** ions through the action of cytochrome P450 enzymes in the liver. **Cyanide** is rapidly absorbed and distributed throughout the body. **Cyanide** is mainly metabolized into **thiocyanate** by either rhodanese or **3-mercaptopyruvate sulfur** transferase. **Cyanide** metabolites are excreted in the urine. (L96)

► [Toxin and Toxin Target Database \(T3DB\)](#)

8.3 Biological Half-Life



...The half-life of iv succinonitrile was calculated in both dogs and men to be about 21 hr.

Lodi F et al; Farmaco Ed Prat 28: 105-114 (1973)

► [Hazardous Substances Data Bank \(HSDB\)](#)

9 Use and Manufacturing



9.1 Uses



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 to make plastics and [nitron](#) fibers; [HSDB]

► [Haz-Map, Information on Hazardous Chemicals and Occupational Diseases](#)

Used in the production of plastics and [nitron](#) fibers.

Sheftel, V.O.; Indirect Food Additives and Polymers. Migration and Toxicology. Lewis Publishers, Boca Raton, FL. 2000., p. 1023

► [Hazardous Substances Data Bank \(HSDB\)](#)

9.2 Methods of Manufacturing



Interaction of [ethylene dibromide](#) and [potassium cyanide](#) in the presence of alcohol.

Lewis, R.J., Sr (Ed.). Hawley's Condensed Chemical Dictionary. 13th ed. New York, NY: John Wiley & Sons, Inc. 1997., p. 467

► [Hazardous Substances Data Bank \(HSDB\)](#)

Succinonitrile is obtained by addition of [hydrogen cyanide](#) to [acrylonitrile](#).

Ullmann's Encyclopedia of Industrial Chemistry. 6th ed. Vol 1: Federal Republic of Germany: Wiley-VCH Verlag GmbH & Co. 2003 to Present, p. V23 79 (2003)

► [Hazardous Substances Data Bank \(HSDB\)](#)

9.3 Formulations / Preparations



Trade names: deprelin, dinile, Suxil

Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. V4 1419

► [Hazardous Substances Data Bank \(HSDB\)](#)

9.4 General Manufacturing Information



EPA TSCA Commercial Activity Status

Butanedinitrile: ACTIVE

► [EPA Chemicals under the TSCA](#)

10 Identification



10.1 Analytic Laboratory Methods



... A colorimetric method for analyzing /air/ samples of succinonitrile, utilizing the pink-violet reaction products of succinonitrile nitro derivatives with alkali in a [toluene-acetone](#) medium followed by acidification of the solution. This method is sensitive to less than a microgram of succinonitrile in the final solution and provides a stable color for up to 30 minutes; however, nitro and halogenated aromatic hydrocarbons interfere with the determination.

U.S Department of Health, Education, and Welfare. Public Health Service. Center for Disease Control. National Institute for Occupational Safety and Health; NIOSH Criteria for a Recommended Standard - Occupational Exposure to Nitriles p.76 (September 1978) DHEW (NIOSH) Pub #78-212

► [Hazardous Substances Data Bank \(HSDB\)](#)

A mixture of [acrylonitrile](#), [propionitrile](#), [butyronitrile](#), succinonitrile, and [adiponitrile](#) in an aqueous solution containing [hydrochloric acid](#) and [potassium chloride](#) was successfully analyzed by gas chromatography using a hot wire detector. However, gas chromatographic methods do not provide for specific determination of nitriles, and substances with similar retention times may interfere. In the absence of interfering substances, nitriles may be separated and determined by comparison with appropriate standards.

U.S Department of Health, Education, and Welfare. Public Health Service. Center for Disease Control. National Institute for Occupational Safety and Health; NIOSH Criteria for a Recommended Standard - Occupational Exposure to Nitriles p.77 (September 1978) DHEW (NIOSH) Pub #78-212

11 Safety and Hazards



11.1 Hazards Identification



11.1.1 GHS Classification



Pictogram(s)	   Acute Toxic Irritant Environmental Hazard
Signal	<u>Danger</u>
GHS Hazard Statements	H302 (95%): Harmful if swallowed [<u>Warning</u> Acute toxicity, oral] H311 (36.2%): Toxic in contact with skin [<u>Danger</u> Acute toxicity, dermal] H315 (53.8%): Causes skin irritation [<u>Warning</u> Skin corrosion/irritation] H319 (53.8%): Causes serious eye irritation [<u>Warning</u> Serious eye damage/eye irritation] H335 (53.8%): May cause respiratory irritation [<u>Warning</u> Specific target organ toxicity, single exposure; Respiratory tract irritation] H400 (35%): Very toxic to aquatic life [<u>Warning</u> Hazardous to the aquatic environment, acute hazard] H410 (35%): Very toxic to aquatic life with long lasting effects [<u>Warning</u> Hazardous to the aquatic environment, long-term hazard]
Precautionary Statement Codes	P261, P262, P264, P264+P265, P270, P271, P273, P280, P301+P317, P302+P352, P304+P340, P305+P351+P338, P316, P319, P321, P330, P332+P317, P337+P317, P361+P364, P362+P364, P391, P403+P233, P405, and P501

ECHA C&L Notifications Summary

Aggregated GHS information provided per 80 reports by companies from 12 notifications to the ECHA C&L Inventory. Each notification may be associated with multiple companies.

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 \(ECHA\)](#)

11.1.2 Hazard Classes and Categories



Acute Tox. 4 (95%)

Acute Tox. 3 (36.2%)

Skin Irrit. 2 (53.8%)

Eye Irrit. 2 (53.8%)

STOT SE 3 (53.8%)

Aquatic Acute 1 (35%)

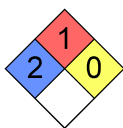
Aquatic Chronic 1 (35%)

► [European Chemicals Agency \(ECHA\)](#)

11.1.3 NFPA Hazard Classification



NFPA 704 Diamond



2-1-0

NFPA Health Rating

2 - Materials that, under emergency conditions, can cause temporary incapacitation or residual injury.

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 \(HSDB\)](#)

11.1.4 Health Hazards



Excerpt from NIOSH Pocket Guide for Succinonitrile:

Exposure Routes: Inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms: Irritation eyes, skin, respiratory system; headache, dizziness, lassitude (weakness, exhaustion), confusion, convulsions; blurred vision; dyspnea (breathing difficulty); abdominal pain, nausea, vomiting

Target Organs: Eyes, skin, respiratory system, central nervous system, cardiovascular system (NIOSH, 2024)

► [CAMEO Chemicals](#)

11.1.5 Fire Hazards



This compound 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. Gives off irritating or toxic fumes (or gases) in a fire.

► [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

11.1.6 Hazards Summary



Irritating to the eyes, skin, and respiratory tract; [Merck Index] See Nitriles.

Merck Index - O'Neil MJ, Heckelman PE, Dobbelaar PH, Roman KJ (eds). The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, 15th Ed. Cambridge, UK: The Royal Society of Chemistry, 2013.

► [Haz-Map, Information on Hazardous Chemicals and Occupational Diseases](#)

11.1.7 Skin, Eye, and Respiratory Irritations



Potential symptoms of overexposure are irritation of eyes, skin, respiratory system...

O'Neil, M.J. (ed.). *The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals*. 13th Edition, Whitehouse Station, NJ: Merck and Co., Inc., 2001., p. 1580

► [Hazardous Substances Data Bank \(HSDB\)](#)

11.2 Safety and Hazard Properties



11.2.1 Flammable Limits



Flammability

Combustible Solid

► [The National Institute for Occupational Safety and Health \(NIOSH\)](#)

11.2.2 NIOSH Recommendations



Recommended Exposure Limit: 10 Hr Time-Weighted Avg: 6 ppm (20 mg/cu m).

NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases. U.S. Department of Health & Human Services, Public Health Service, Center for Disease Control & Prevention. DHHS (NIOSH) Publication No. 2001-145 (CD-ROM) August 2001.

► [Hazardous Substances Data Bank \(HSDB\)](#)

11.3 First Aid Measures



Inhalation First Aid

Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.

► [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

Skin First Aid

Rinse skin with plenty of [water](#) or shower.

► [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

Eye First Aid

First rinse with plenty of [water](#) for several minutes (remove contact lenses if easily possible), then refer for medical attention.

► [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

Ingestion First Aid

Rinse mouth. Give a slurry of activated **charcoal** in **water** to drink. Do NOT induce vomiting. Refer for medical attention .

► **ILO-WHO International Chemical Safety Cards (ICSCs)**

11.3.1 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**

(General first aid procedures)

Eye: Irrigate immediately - If this chemical contacts the eyes, immediately wash (irrigate) the eyes with large amounts of **water**, occasionally lifting the lower and upper lids. Get medical attention immediately.

Skin: **Water** wash immediately - If this chemical contacts the skin, immediately wash the contaminated skin with **water**. If this chemical penetrates the clothing, immediately remove the clothing and wash the skin with **water**. If symptoms occur after washing, get medical attention immediately.

Breathing: Respiratory support

Swallow: Medical attention immediately - If this chemical has been swallowed, get medical attention immediately.

► [The National Institute for Occupational Safety and Health \(NIOSH\)](#)

11.4 Fire Fighting



Fires involving this compound can be controlled with dry chemical, **carbon dioxide** or **Halon** extinguishers. (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](#)

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

► [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

11.5 Accidental Release Measures



11.5.1 Isolation and Evacuation



Excerpt from ERG Guide 151 [Substances - Toxic (Non-Combustible)]:

IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

SPILL: Increase the immediate precautionary measure distance, in the downwind direction, as necessary.

FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

2024 Emergency Response Guidebook, <https://www.phmsa.dot.gov/training/hazmat/erg/emergency-response-guidebook-erg>

► [CAMEO Chemicals](#)

11.5.2 Spillage Disposal



Ventilation. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Personal protection: particulate filter respirator adapted to the airborne concentration of the substance.

► [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

11.5.3 Disposal Methods



SRP: The most favorable course of action is to use an alternative chemical product with less inherent propensity for occupational exposure 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, aquatic, and plant life; and conformance with environmental and public health regulations.

► [Hazardous Substances Data Bank \(HSDB\)](#)

11.5.4 Preventive Measures



SRP: Contaminated protective clothing should be segregated in such a manner so that there is no direct personal contact by personnel who handle, dispose, or clean the clothing. Quality assurance to ascertain the completeness of the cleaning procedures should be implemented before the decontaminated protective clothing is returned for reuse by the workers. Contaminated clothing should not be taken home at end of shift, but should remain at employee's place of work for cleaning.

► [Hazardous Substances Data Bank \(HSDB\)](#)

SRP: The scientific literature for the use of contact lenses in industry is conflicting. The benefit 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 \(HSDB\)](#)

Adequate precautions should be taken against skin or eye contact.

Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. V4 1420

► [Hazardous Substances Data Bank \(HSDB\)](#)

The worker should immediately wash the skin when it becomes contaminated.

NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases. U.S. Department of Health & Human Services, Public Health Service, Center for Disease Control & Prevention. DHHS (NIOSH) Publication No. 2001-145 (CD-ROM) August 2001.

► [Hazardous Substances Data Bank \(HSDB\)](#)

For more Preventive Measures (Complete) data for SUCCINONITRILE (6 total), please visit the [HSDB record page](#).

► [Hazardous Substances Data Bank \(HSDB\)](#)

11.6 Handling and Storage



11.6.1 Nonfire Spill Response



SMALL SPILLS AND LEAKAGE: Should a spill occur while you are handling this chemical, you should dampen the solid spill material with alcohol, then transfer the dampened material to a suitable container. Use absorbent paper dampened with alcohol to pick up any remaining material. Seal the absorbent paper, and any of your clothes, which may be contaminated, in a vapor-tight plastic bag for eventual disposal. Solvent wash all contaminated surfaces with alcohol followed by washing with a strong soap and [water](#) solution. Do not reenter the contaminate area until the Safety Officer (or other responsible person) has verified that the area has been properly cleaned.

STORAGE PRECAUTIONS: You should store this material in a refrigerator. (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](#)

11.6.2 Safe Storage



Separated from strong oxidants, strong bases, strong acids, strong reducing agents and food and feedstuffs. Well closed.

- ▶ [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

11.7 Exposure Control and Personal Protection



11.7.1 Recommended Exposure Limit (REL)



TWA 6 ppm (20 mg/m³)

- ▶ [The National Institute for Occupational Safety and Health \(NIOSH\)](#)

11.7.2 Permissible Exposure Limit (PEL)



none

- ▶ [The National Institute for Occupational Safety and Health \(NIOSH\)](#)

11.7.3 Immediately Dangerous to Life or Health (IDLH)



N.D.

See: [IDLH INDEX](#)

- ▶ [The National Institute for Occupational Safety and Health \(NIOSH\)](#)

11.7.4 Inhalation Risk



Evaporation at 20 °C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

- ▶ [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

11.7.5 Effects of Short Term Exposure



The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the cellular respiration (inhibition). This may result in convulsions and respiratory failure. The effects may be delayed. Exposure at high levels could cause death.

► [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

11.7.6 Personal Protective Equipment (PPE)



Excerpt from NIOSH Pocket Guide for Succinonitrile:

Skin: PREVENT SKIN CONTACT - Wear appropriate personal protective clothing to prevent skin contact.

Eyes: PREVENT EYE CONTACT - Wear appropriate eye protection to prevent eye contact.

Wash skin: WHEN CONTAMINATED - The worker should immediately wash the skin when it becomes contaminated.

Remove: WHEN WET OR CONTAMINATED - Work clothing that becomes wet or significantly contaminated should be removed and replaced.

Change: DAILY - Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premises.

Provide: EYEWASH - Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substances; this is irrespective of the recommendation involving the wearing of eye protection. (NIOSH, 2024)

► [CAMEO Chemicals](#)

Respirator Recommendations: Up to 60 ppm: (Assigned protection factor = 10) Any supplied-air respirator.

NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases. U.S. Department of Health & Human Services, Public Health Service, Center for Disease Control & Prevention. DHHS (NIOSH) Publication No. 2001-145 (CD-ROM) August 2001.

► [Hazardous Substances Data Bank \(HSDB\)](#)

Respirator Recommendations: Up to 150 ppm: (Assigned protection factor = 25) Any supplied-air respirator operated in a continuous-flow mode.

NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases. U.S. Department of Health & Human Services, Public Health Service, Center for Disease Control & Prevention. DHHS (NIOSH) Publication No. 2001-145 (CD-ROM) August 2001.

► [Hazardous Substances Data Bank \(HSDB\)](#)

Respirator Recommendations: Up to 250 ppm: (Assigned protection factor = 50) Any self-contained breathing apparatus with a full facepiece/(Assigned protection factor = 50) Any supplied-air respirator with a full facepiece.

NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases. U.S. Department of Health & Human Services, Public Health Service, Center for Disease Control & Prevention. DHHS (NIOSH) Publication No. 2001-145 (CD-ROM) August 2001.

► [Hazardous Substances Data Bank \(HSDB\)](#)

Respirator Recommendations: Emergency or planned entry into unknown concentrations or IDLH conditions: (Assigned protection factor = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(Assigned protection factor = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus.

NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases. U.S. Department of Health & Human Services, Public Health Service, Center for Disease Control & Prevention. DHHS (NIOSH) Publication No. 2001-145 (CD-ROM) August 2001.

► [Hazardous Substances Data Bank \(HSDB\)](#)

For more Personal Protective Equipment (PPE) (Complete) data for SUCCINONITRILE (8 total), please visit the [HSDB record page](#).

► [Hazardous Substances Data Bank \(HSDB\)](#)

11.7.7 Respirator Recommendations



NIOSH

Up to 60 ppm:

(APF = 10) Any supplied-air respirator

Up to 150 ppm:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

Up to 250 ppm:

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection

- ▶ [The National Institute for Occupational Safety and Health \(NIOSH\)](#)

11.7.8 Fire Prevention



NO open flames.

- ▶ [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

11.7.9 Exposure Prevention



PREVENT DISPERSION OF DUST!

- ▶ [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

11.7.10 Inhalation Prevention



Use local exhaust or breathing protection.

- ▶ [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

11.7.11 Skin Prevention



Protective gloves.

- ▶ [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

11.7.12 Eye Prevention



Wear safety goggles.

► [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

11.7.13 Ingestion Prevention



Do not eat, drink, or smoke during work. Wash hands before eating.

► [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

11.8 Stability and Reactivity



11.8.1 Air and Water Reactions



Soluble in [water](#) [Hawley].

► [CAMEO Chemicals](#)

11.8.2 Reactive Group



Nitriles

► [CAMEO Chemicals](#)

11.8.3 Reactivity Profile



SUCCINONITRILE is incompatible with acids and oxidizing agents (such as peroxides and epoxides). Can react violently with strong oxidizing acids. Is hydrolyzed exothermically in both aqueous acid and base to give carboxylic acids (or salts of carboxylic acids). Can react vigorously with reducing agents.

► [CAMEO Chemicals](#)

11.8.4 Hazardous Reactivities and Incompatibilities



Oxidizers

NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases. U.S. Department of Health & Human Services, Public Health Service, Center for Disease Control & Prevention. DHHS (NIOSH) Publication No. 2001-145 (CD-ROM) August 2001.

► [Hazardous Substances Data Bank \(HSDB\)](#)

11.9 Transport Information



11.9.1 DOT Label



Poison

► [CAMEO Chemicals](#)

11.9.2 Packaging and Labelling



Do not transport with food and feedstuffs.

► [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

11.9.3 UN Classification



UN Hazard Class: 6.1; UN Pack Group: III

► [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

11.10 Regulatory Information



The Australian Inventory of Industrial Chemicals

Chemical: Butanedinitrile

► [Australian Industrial Chemicals Introduction Scheme \(AICIS\)](#)

REACH Registered Substance

Status: Active Update: 25-11-2021 <https://echa.europa.eu/registration-dossier/-/registered-dossier/21898>

► [European Chemicals Agency \(ECHA\)](#)

New Zealand EPA Inventory of Chemical Status

Succinodinitrile: Does not have an individual approval but may be used under an appropriate group standard

► [New Zealand Environmental Protection Authority \(EPA\)](#)

11.10.1 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. Succinonitrile is produced, as an intermediate or a final product, by process units covered under this subpart.

40 CFR 60.489; U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of February 10, 2004: <https://www.ecfr.gov>

► [Hazardous Substances Data Bank \(HSDB\)](#)

12 Toxicity



12.1 Toxicological Information



12.1.1 Toxicity Summary



Organic nitriles decompose into **cyanide** ions both in vivo and in vitro. Consequently the primary mechanism of toxicity for organic nitriles is their production of toxic **cyanide** ions or **hydrogen cyanide**. **Cyanide** is an inhibitor of cytochrome c oxidase in the fourth complex of the electron transport chain (found in the membrane of the mitochondria of eukaryotic cells). It complexes with the **ferric iron** atom in this enzyme. The binding of **cyanide** to this cytochrome prevents transport of electrons from cytochrome c oxidase to **oxygen**. As a result, the electron transport chain is disrupted and the cell can no longer aerobically produce **ATP** for energy. Tissues that mainly depend on aerobic respiration, such as the central nervous system and the heart, are particularly affected. **Cyanide** is also known produce some of its toxic effects by binding to catalase, **glutathione** peroxidase, methemoglobin, **hydroxocobalamin**, phosphatase, tyrosinase, **ascorbic acid** oxidase, **xanthine** oxidase, succinic dehydrogenase, and Cu/Zn superoxide dismutase. **Cyanide** binds to the **ferric** ion of methemoglobin to form inactive cyanmethemoglobin. (L97)

► [Toxin and Toxin Target Database \(T3DB\)](#)

12.1.2 Carcinogen Classification



Carcinogen Classification

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

► [Toxin and Toxin Target Database \(T3DB\)](#)

12.1.3 Health Effects



Exposure to high levels of **cyanide** for a short time harms the brain and heart and can even cause coma, seizures, apnea, cardiac arrest and death. Chronic inhalation of **cyanide** causes breathing difficulties, chest pain, vomiting, blood changes, headaches, and enlargement of the thyroid gland. Skin contact with cyanide salts can irritate and produce sores. (L96, L97)

► [Toxin and Toxin Target Database \(T3DB\)](#)

12.1.4 Exposure Routes



The substance can be absorbed into the body by ingestion and by inhalation.

► [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

inhalation, skin absorption, ingestion, skin and/or eye contact

► [The National Institute for Occupational Safety and Health \(NIOSH\)](#)

Oral (L96) ; inhalation (L96) ; dermal (L96)

► [Toxin and Toxin Target Database \(T3DB\)](#)

12.1.5 Signs and Symptoms



Inhalation Exposure

Cough. Sore throat. Dizziness. Headache. Nausea. Convulsions.

► [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

Skin Exposure

Redness. Pain.

► [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

Ingestion Exposure

Abdominal pain. Diarrhoea. Headache. Nausea. Vomiting. Convulsions.

► [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

irritation eyes, skin, respiratory system; headache, dizziness, lassitude (weakness, exhaustion), confusion, convulsions; blurred vision; dyspnea (breathing difficulty); abdominal pain, nausea, vomiting

► [The National Institute for Occupational Safety and Health \(NIOSH\)](#)

Cyanide poisoning is identified by rapid, deep breathing and shortness of breath, general weakness, giddiness, headaches, vertigo, confusion, convulsions/seizures and eventually loss of consciousness. (L96, L97)

► [Toxin and Toxin Target Database \(T3DB\)](#)

12.1.6 Target Organs



Eyes, skin, respiratory system, central nervous system, cardiovascular system

► [The National Institute for Occupational Safety and Health \(NIOSH\)](#)

12.1.7 Adverse Effects



Other Poison - Chemical Asphyxiant

► [Haz-Map, Information on Hazardous Chemicals and Occupational Diseases](#)

12.1.8 Acute Effects



► ChemIDplus

12.1.9 Treatment



Antidotes to **cyanide** poisoning include **hydroxocobalamin** and **sodium nitrite**, which release the **cyanide** from the cytochrome system, and rhodanase, which is an enzyme occurring naturally in mammals that combines serum **cyanide** with **thiosulfate**, producing comparatively harmless **thiocyanate**. **Oxygen** therapy can also be administered. (L97)

► Toxin and Toxin Target Database (T3DB)

12.1.10 Antidote and Emergency Treatment



Basic treatment: Establish a patent airway. Suction if necessary. Watch for signs of respiratory insufficiency and assist ventilation if necessary. Administer **oxygen** by nonrebreather mask at 10 to 15 L/min. Administer **amyl nitrite** ampules as per protocol and physician order Monitor for shock and treat if necessary Monitor for pulmonary edema and treat if necessary Anticipate seizures and treat if necessary For eye contamination, flush eyes immediately with **water**. Irrigate each eye continuously with **normal saline** 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 /**Cyanide** and related compounds/

Bronstein, A.C., P.L. Currence; Emergency Care for Hazardous Materials Exposure. 2nd ed. St. Louis, MO. Mosby Lifeline. 1994., p. 387-8

► Hazardous Substances Data Bank (HSDB)

Advanced treatment: Consider orotracheal or nasotracheal intubation for airway control in the patient who is unconscious or in respiratory arrest. Positive pressure ventilation techniques with a bag valve mask device may be beneficial. Start an IV with D5W /SRP: "To keep open", minimal flow rate/. Use lactated Ringer's if signs of hypovolemia are present. Watch for signs of fluid overload. Administer **cyanide** antidote kit as per protocol and physician order Monitor and treat cardiac arrhythmias if necessary Consider vasopressors to treat hypotension without signs of hypovolemia Consider drug therapy for pulmonary edema

Treat seizures with [diazepam](#) Use [proparacaine hydrochloride](#) to assist eye irrigation
/Cyanide and related compounds/

Bronstein, A.C., P.L. Currence; Emergency Care for Hazardous Materials Exposure. 2nd ed. St. Louis, MO. Mosby Lifeline. 1994., p. 388

► [Hazardous Substances Data Bank \(HSDB\)](#)

12.1.11 Medical Surveillance



Medical surveillance should include pre-employment and periodic examinations focused on skin disorders and the cardiovascular, pulmonary and central nervous systems. A history of fainting spells or convulsive disorders might present an added risk for nitrile workers. /Nitriles/

International Labour Office. Encyclopaedia of Occupational Health and Safety. 4th edition, Volumes 1-4 1998. Geneva, Switzerland: International Labour Office, 1998., p. 104.134

► [Hazardous Substances Data Bank \(HSDB\)](#)

12.1.12 Human Toxicity Excerpts



/SIGNS AND SYMPTOMS/ Exposure to toxic nitriles may rapidly cause death by asphyxiation similar to that resulting from exposure to [hydrogen cyanide](#). Individuals who survived exposure to high concentrations of nitriles were said to have no evidence of residual physiological effects after the recovery from the acute episode; this has led to the opinion that the person either succumbs to the nitrile exposure or recovers completely. /Nitriles/

International Labour Office. Encyclopaedia of Occupational Health and Safety. 4th edition, Volumes 1-4 1998. Geneva, Switzerland: International Labour Office, 1998., p. 104.134

► [Hazardous Substances Data Bank \(HSDB\)](#)

/SIGNS AND SYMPTOMS/ Potential symptoms of overexposure are irritation of eyes, skin, respiratory system; headache, dizziness, weakness, giddiness, confusion, convulsions; blurred vision; dyspnea; abdominal pain, nausea, vomiting.

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. 13th Edition, Whitehouse Station, NJ: Merck and Co., Inc., 2001., p. 1580

► [Hazardous Substances Data Bank \(HSDB\)](#)

/CASE REPORTS/ A 53 yr old male with polyarthritis and chronic bronchitis had been treated for 3 weeks with anti-catarthral drugs, vitamins, and a daily intramuscular injection of 200 mg succinonitrile. Two hours after the last injection, the patient began vomiting and showed signs of psychomotor agitation and mental confusion accompanied by cold sweating. He was

admitted to a hospital with convulsions and mental disorientation. The patient died 2 hours after he was hospitalized during a convulsion. Autopsy showed pronounced visceral congestion and cerebral and pulmonary edema. Histological examination showed a massive and vacuolar hepatic degeneration and a significant nephrosis of the tubules. Because of the odor of bitter almonds when the skull was opened, a chemical analysis for cyanide compounds was conducted. Cyanide concentrations of 0.265 to 1.500 mg/100 mL, reported as potassium-cyanide, were found in the liver, brain, kidney, lungs, and urine. No evidence of cyanide was found in the blood or gastric contents. An ampule of the pharmaceutical product containing the succinonitrile was analyzed. No trace of cyanide was found. .../It was concluded/ that death was due to cyanide poisoning, the cyanide having accumulated in the body as a result of a metabolic disorder when succinonitrile was administered.

Marigo M et al; Medicina Legale e delle Assicurazioni 14: 1444-185 (1900)

► [Hazardous Substances Data Bank \(HSDB\)](#)

12.1.13 Non-Human Toxicity Excerpts



/LABORATORY ANIMALS: Acute Exposure/ The effects on the skin of rabbits of a 95% water solution were those of mild irritation. Continued contact of the solution with rabbit skin for 18 hr produced fatalities, indicating a probably hazard by skin absorption.

Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001), p. V4 1420

► [Hazardous Substances Data Bank \(HSDB\)](#)

/LABORATORY ANIMALS: Acute Exposure/ A 24 hr exposure of mice to vapor from a 95% solution caused no symptoms.

Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001), p. V4 1420

► [Hazardous Substances Data Bank \(HSDB\)](#)

/LABORATORY ANIMALS: Acute Exposure/ Administration of high doses is accompanied /by/ an increase in concentration of rhodanides in the urine. Animals exhibit general inhibition, impaired respiration, and exophthalmos with subsequent convulsions and death from respiratory arrest. Gross pathology examination revealed marked congestion in the brain and all visceral organs.

Sheftel, V.O.; Indirect Food Additives and Polymers. Migration and Toxicology. Lewis Publishers, Boca Raton, FL. 2000., p. 1023

► [Hazardous Substances Data Bank \(HSDB\)](#)

/LABORATORY ANIMALS: Subchronic or Prechronic Exposure/ Guinea pigs were gavaged with 1/5 and 1/20 LD50 (120 mg/kg bw) for 75 days. The treatment resulted in decreased CO2 expiration, leukopenia, reduced leukocyte phagocytic activity and an increase in the [ascorbic acid](#) contents in the liver, kidneys, and suprarenals. Gross pathology examination revealed parenchymatous dystrophy in the visceral organs, circulatory disturbances, and a reduction in the spleen relative weights.

Sheftel, V.O.; Indirect Food Additives and Polymers. Migration and Toxicology. Lewis Publishers, Boca Raton, FL. 2000., p. 1023

► [Hazardous Substances Data Bank \(HSDB\)](#)

For more Non-Human Toxicity Excerpts (Complete) data for SUCCINONITRILE (6 total), please visit the [HSDB record page](#).

► [Hazardous Substances Data Bank \(HSDB\)](#)

12.2 Toxicity Data



LCLo (rat) = 730 mg/m3/4h

► [Haz-Map, Information on Hazardous Chemicals and Occupational Diseases](#)

LD50: 450 mg/kg (Oral, Rat) (T29)

► [Toxin and Toxin Target Database \(T3DB\)](#)

12.2.1 NIOSH Toxicity Data



► [The National Institute for Occupational Safety and Health \(NIOSH\)](#)

12.2.2 Non-Human Toxicity Values



LD50 Rat oral 450 mg/kg

Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001), p. V4 1420

► [Hazardous Substances Data Bank \(HSDB\)](#)

12.3 Ecological Information



12.3.1 ICSC Environmental Data



Environmental effects from the substance have not been investigated adequately.

► [ILO-WHO International Chemical Safety Cards \(ICSCs\)](#)

12.3.2 Environmental Fate / Exposure Summary



Aliphatic nitriles such as succinonitrile are important starting materials for polymers, and the synthesis of pharmaceuticals and pesticides. Succinonitrile's production and use may result in its release to the environment through various waste streams. If released to air, a vapor pressure of 0.00778 mm Hg at 25 °C indicates succinonitrile will exist solely as a vapor in the ambient atmosphere. The reaction of vapor-phase succinonitrile with photochemically-produced **hydroxyl** radicals is not expected to be an important environmental fate process based on the estimated half-life for this reaction in air of 380 days. Succinonitrile is not expected to be susceptible to direct photolysis by sunlight, since it does not contain functional groups that are expected to absorb light with wavelengths >290 nm. If released to soil, succinonitrile is expected to have very high mobility based upon an estimated Koc of 28. Volatilization from moist soil surfaces is not expected to be an important fate process based upon an estimated Henry's Law constant of 5.1X10⁻⁹ atm-cu m/mole. Succinonitrile is not expected to volatilize from dry soil surfaces based upon its vapor pressure. In studies with activated sludge, biodegradation of 1.5-3.8% was observed after 6-24 hours. These studies suggest that succinonitrile may have been toxic to the microorganisms, since a high concentration of succinonitrile was used. If released into **water**, succinonitrile 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. An estimated BCF of 3 suggests the potential for

bioconcentration in aquatic organisms is low. Hydrolysis is not expected to be an important environmental fate process since this compound lacks functional groups that hydrolyze under environmental conditions. Occupational exposure to succinonitrile may occur through inhalation and dermal contact with this compound at workplaces where succinonitrile is produced or used. (SRC)

► [Hazardous Substances Data Bank \(HSDB\)](#)

12.3.3 Artificial Pollution Sources



Aliphatic nitriles, such as succinonitrile, are important starting materials for polymers, and the synthesis of pharmaceuticals and pesticides(1). Succinonitrile's production and use may result in its release to the environment through various waste streams(SRC).

(1) Pollak P et al; in *Ullmann's Encycl Indust Chem*. 5th ed. Gerhartz W, ed. Deerfield Beach, FL: VCH Pub, A17: 363-376 (1991)

► [Hazardous Substances Data Bank \(HSDB\)](#)

12.3.4 Environmental Fate



TERRESTRIAL FATE: Based on a classification scheme(1), an estimated Koc value of 28(SRC), determined from a structure estimation method(2), indicates that succinonitrile is expected to have very high mobility in soil(SRC). Volatilization of succinonitrile from moist soil surfaces is not expected to be an important fate process(SRC) given an estimated Henry's Law constant of 6.5X10⁻⁹ atm-cu m/mole(SRC), derived from its vapor pressure, 0.00778 mm Hg(3), and [water](#) solubility, 126.9 g/L(4). Succinonitrile is not expected to volatilize from dry soil surfaces(SRC) based upon a vapor pressure of 0.00778 mm Hg(3). In studies with activated sludge, biodegradation of 1.5-3.8% was observed after 6-24 hours(5). These studies suggest that succinonitrile may have been toxic to the microorganisms, since a high concentration of succinonitrile was used(5).

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

(2) Meylan WM et al; *Environ Sci Technol* 26: 1560-67 (1992)

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

(4) Yalkowsky SH, He Y, eds; *Handbook of Aqueous Solubility Data*. Boca Raton, FL: CRC Press LLC, p. 82 (2003)

(5) Malaney GW, Gerhold RM; *J Water Pollut Control Fed* 4: R18-R33 (1969)

► [Hazardous Substances Data Bank \(HSDB\)](#)

AQUATIC FATE: Based on a classification scheme(1), an estimated Koc value of 28(SRC), determined from a structure estimation method(2), indicates that succinonitrile 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 6.5X10⁻⁹ atm-cu m/mole(SRC), derived from its vapor pressure, 0.00778 mm Hg(4) and **water** solubility, 126.9 g/L(5). According to a classification scheme(6), an estimated BCF of 3(SRC), from its log Kow of -0.99(7) and a regression-derived equation(8), suggests the potential for bioconcentration in aquatic organisms is low(SRC). Hydrolysis is not expected to be an important environmental fate process since this compound lacks functional groups that hydrolyze under environmental conditions(9). In studies with activated sludge, biodegradation of 1.5-3.8% was observed after 6-24 hours(10). These studies suggest that succinonitrile may have been toxic to the microorganisms, since a high concentration of succinonitrile was used(10).

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

(2) Meylan WM et al; *Environ Sci Technol* 26: 1560-67 (1992)

(3) Lyman WJ et al; *Handbook of Chemical Property Estimation Methods*. Washington, DC: Amer Chem Soc pp. 4-9, 15-1 to 15-29 (1990)

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

(5) Yalkowsky SH, He Y, eds; *Handbook of Aqueous Solubility Data*. Boca Raton, FL: CRC Press LLC, p. 82 (2003)

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

(7) Tanii H, Hashimoto K; *Arch Toxicol* 57: 88-93 (1985)

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

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

(10) Malaney GW, Gerhold RM; *J Water Pollut Control Fed* 4: R18-R33 (1969)

► **Hazardous Substances Data Bank (HSDB)**

ATMOSPHERIC FATE: According to a model of gas/particle partitioning of semivolatile organic compounds in the atmosphere(1), succinonitrile, which has a vapor pressure of 0.00778 mm Hg at 25 °C(2), is expected to exist solely as a vapor in the ambient atmosphere. The reaction of vapor-phase succinonitrile with photochemically-produced **hydroxyl** radicals is not expected to be an important environmental fate based on the estimated half-life for this reaction in air of 380 days, calculated from its rate constant of 4.3X10⁻¹⁴ cu cm/molecule-sec at 25 deg (SRC) that was derived using a structure estimation method(3). Succinonitrile is not expected to be susceptible to direct photolysis by sunlight, since it does not contain functional groups that are expected to absorb light with wavelengths >290 nm(SRC).

(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) Meylan WM, Howard PH; *Chemosphere* 26: 2293-99 (1993)

► [Hazardous Substances Data Bank \(HSDB\)](#)

12.3.5 Environmental Biodegradation



The test concentration of succinonitrile at 500 ppm was found to be toxic to microorganisms in sludges from 3 municipal treatment plants and inhibited biodegradation as determined using Warburg constant-volume respirometers(1). Succinonitrile (500 mg/L) reached 1.5, 2.4, and 3.8% of the theoretical **oxygen** demand after 6, 12, and 24 hours in a study using a Warburg respirometer and activated sludge solids (2,500 mg/L)(2). A mixed microbial culture isolated from an environment contaminated with organic cyanides and polychlorinated biphenyls was found to utilize nitriles, including succinonitrile, as growth substrates(3). *Aeromonas* sp. BN 7013 was isolated from a soil sample and was found to utilize succinonitrile as a sole source of **nitrogen**(4). A variant yeast strain, *Candida famata*, isolated from **gold** mine effluent was able to grow on various nitrile compounds, including succinonitrile, as a sole source of **nitrogen**, after acclimatization(5). *Pseudomonas putida*, a bacterium isolated from soil that can utilize high concentrations of **acetonitrile** as a sole source of **carbon** and **nitrogen**, could also utilize various nitriles, including succinonitrile(6).

(1) Lutin PA; *J Water Pollut Control Fed* 42: 1632-1642 (1970)

(2) Malaney GW, Gerhold RM; *J Water Pollut Control Fed* 4: R18-R33 (1969)

(3) Chapatwala KD et al; *Environ Toxicol Chem* 11: 1145-51 (1992)

(4) Kuwahara M et al; *Hakkokogaku Kaishi* 58: 441-8 (1980)

(5) Linardi VR et al; *FEMS Microbiol Lett* 144: 67-71 (1996)

(6) Nawaz MS et al; *Appl Environ Microbiol* 55: 2267-74 (1989)

► [Hazardous Substances Data Bank \(HSDB\)](#)

12.3.6 Environmental Abiotic Degradation



The rate constant for the vapor-phase reaction of succinonitrile with photochemically-produced **hydroxyl** radicals has been estimated as 4.3×10^{-14} cu cm/molecule-sec at 25 °C(SRC) using a structure estimation method(1). This corresponds to an atmospheric half-life of about 380 days at an atmospheric concentration of 5×10^5 **hydroxyl** radicals per cu cm(1). Hydrolysis is not expected to be an important environmental fate process since this compound lacks functional groups that hydrolyze under environmental conditions(2). Succinonitrile is not

expected to be susceptible to direct photolysis by sunlight, since it does not contain functional groups that are expected to absorb light with wavelengths >290 nm(SRC).

(1) Meylan WM, Howard PH; *Chemosphere* 26: 2293-99 (1993)

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

► [Hazardous Substances Data Bank \(HSDB\)](#)

12.3.7 Environmental Bioconcentration



An estimated BCF of 3 was calculated for succinonitrile(SRC), using a log Kow of -0.99(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) Tanii H, Hashimoto K; *Arch Toxicol* 57: 88-93 (1985)

(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 \(HSDB\)](#)

12.3.8 Soil Adsorption / Mobility



Using a structure estimation method based on molecular connectivity indices(1), the Koc for succinonitrile can be estimated to be 28(SRC). According to a classification scheme(2), this estimated Koc value suggests that succinonitrile is expected to have very high mobility in soil.

(1) Meylan WM et al; *Environ Sci Technol* 26: 1560-67 (1992)

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

► [Hazardous Substances Data Bank \(HSDB\)](#)

12.3.9 Volatilization from Water / Soil



The Henry's Law constant for succinonitrile is estimated as 6.5×10^{-9} atm-cu m/mole(SRC) derived from its vapor pressure, 0.00778 mm Hg(1), and [water](#) solubility, 126.9 g/L(2). This Henry's Law constant indicates that succinonitrile is expected to be essentially nonvolatile from [water](#) surfaces(3). Succinonitrile's estimated Henry's Law constant indicates that volatilization from moist soil surfaces is not expected to occur(SRC). Succinonitrile 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, eds; *Handbook of Aqueous Solubility Data*. Boca Raton, FL: CRC Press LLC, p. 82 (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 \(HSDB\)](#)

12.3.10 Probable Routes of Human Exposure



NIOSH (NOES Survey 1981-1983) has statistically estimated that 1,440 workers are potentially exposed to succinonitrile in the US(1). Occupational exposure to succinonitrile may occur through inhalation and dermal contact with this compound at workplaces where succinonitrile is produced or used(SRC).

(1) NIOSH; *National Occupational Exposure Survey (NOES) (1983)*

► [Hazardous Substances Data Bank \(HSDB\)](#)

13 Literature



13.1 Consolidated References



► [PubChem](#)

13.2 NLM Curated PubMed Citations





► Medical Subject Headings (MeSH)

13.3 Springer Nature References



► Springer Nature

13.4 Thieme References



► Thieme Chemistry

13.5 Wiley References



► Wiley

13.6 Nature Journal References



Patel et al. Common origins of RNA, protein and lipid precursors in a cyanosulfidic protometabolism. *Nature Chemistry*, doi: 10.1038/nchem.2202, published online 16 March 2015 <http://www.nature.com/nchem>

► Nature Chemistry

Zadlo-Dobrowolska et al. Computational synthesis design for controlled degradation and revalorization. Nature Synthesis, DOI: 10.1038/s44160-024-00497-6, published online 12 April 2024

► Nature Synthesis

13.7 Chemical Co-Occurrences in Literature



► PubChem

13.8 Chemical-Gene Co-Occurrences in Literature



[▶ PubChem](#)

13.9 Chemical-Disease Co-Occurrences in Literature

[▶ PubChem](#)

13.10 Chemical-Organism Co-Occurrences in Literature

[▶ PubChem](#)

14 Patents



14.1 Depositor-Supplied Patent Identifiers



► PubChem

[Link to all deposited patent identifiers](#)

► PubChem

14.2 WIPO PATENTSCOPE



Patents are available for this chemical structure:

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

► PATENTSCOPE (WIPO)

14.3 Chemical Co-Occurrences in Patents



► PubChem

14.4 Chemical-Disease Co-Occurrences in Patents



► PubChem

14.5 Chemical-Gene Co-Occurrences in Patents



► PubChem

14.6 Chemical-Organism Co-Occurrences in Patents



► PubChem

15 Interactions and Pathways



15.1 Chemical-Target Interactions



► [Toxin and Toxin Target Database \(T3DB\)](#)

16 Biological Test Results



16.1 BioAssay Results



► [PubChem](#)

17 Classification



17.1 MeSH Tree



► Medical Subject Headings (MeSH)

17.2 ChemIDplus



► ChemIDplus

17.3 CAMEO Chemicals



► CAMEO Chemicals

17.4 UN GHS Classification



► GHS Classification (UNECE)

17.5 EPA CPDat Classification



► EPA Chemical and Products Database (CPDat)

17.6 NORMAN Suspect List Exchange Classification



► NORMAN Suspect List Exchange

17.7 EPA DSSTox Classification



► EPA DSSTox

17.8 EPA TSCA and CDR Classification





► EPA Chemicals under the TSCA

17.9 EPA Substance Registry Services Tree



► EPA Substance Registry Services

17.10 MolGenie Organic Chemistry Ontology



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17.11 Chemicals in PubChem from Regulatory Sources



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Succinonitrile

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Succinonitrile (EC: 203-783-9)

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HMDB0258544_nmr_one_2144

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<https://spectrabase.com/spectrum/EU2aKA5QAye>

BUTANEDINITRILE

<https://spectrabase.com/spectrum/C7SVXDpJ5zt>

SUCCINONITRILE

<https://spectrabase.com/spectrum/LE91OKc3mS7>

Succinonitrile

<https://spectrabase.com/spectrum/3RgWz2WxTnX>

Succinonitrile

<https://spectrabase.com/spectrum/Gf34jPUpuCp>

Butanodinitrile

<https://spectrabase.com/spectrum/LdEarZCo7q5>

24. Japan Chemical Substance Dictionary (Nikkaji)

http://jglobal.jst.go.jp/en/redirect?Nikkaji_No=J2.450C

25. MassBank of North America (MoNA)

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<https://mona.fiehnlab.ucdavis.edu/documentation/license>

SUCCINONITRILE

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

*query=exists(compound.metaData.name:%27InChIKey%27%20and%20compound.metaData.value:%27IAHFWCOBPZC
AEA-UHFFFAOYSA-N%27)*

26. NIST Mass Spectrometry Data Center

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Data covered by the Standard Reference Data Act of 1968 as amended.

<https://www.nist.gov/srd/public-law>

Butanedinitrile

<http://www.nist.gov/srd/nist1a.cfm>

27. Nature Chemistry

<https://pubchem.ncbi.nlm.nih.gov/substance/242036131>

28. **Nature Synthesis**

<https://pubchem.ncbi.nlm.nih.gov/substance/518521658>

29. **Springer Nature**

<https://pubchem.ncbi.nlm.nih.gov/substance/341141807>

30. **SpringerMaterials**

1,2-dicyanoethane

https://materials.springer.com/substanceprofile/docs/smsid_bltssaowxuvidsr

31. **The Cambridge Structural Database**

<https://www.ccdc.cam.ac.uk/structures/Search?Ccdcid=702139>

<https://www.ccdc.cam.ac.uk/structures/Search?Ccdcid=815261>

<https://www.ccdc.cam.ac.uk/structures/Search?Ccdcid=815262>

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<https://pubchem.ncbi.nlm.nih.gov/substance/516655533>

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<https://www.wikidata.org/wiki/Q3502773>

34. **Wikipedia**

Succinonitrile

<https://en.wikipedia.org/wiki/Succinonitrile>

35. **Wiley**

<https://pubchem.ncbi.nlm.nih.gov/substance/386232736>

36. **Medical Subject Headings (MeSH)****LICENSE**

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succinonitrile

<https://id.nlm.nih.gov/mesh/M0055747.html>

MeSH Tree

<https://www.nlm.nih.gov/mesh/meshhome.html>

37. PubChem

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

38. **GHS Classification (UNECE)**

GHS Classification

<https://unece.org/about-ghs>

39. **NORMAN Suspect List Exchange**

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NORMAN Suspect List Exchange Classification

<https://www.norman-network.com/nds/SLE/>

40. **EPA Substance Registry Services**

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<https://www.epa.gov/privacy/privacy-act-laws-policies-and-resources>

EPA SRS List Classification

<https://maldi.nist.gov>

41. **MolGenie**

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MolGenie Organic Chemistry Ontology

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

42. **PATENTSCOPE (WIPO)**

SID 403031316

<https://pubchem.ncbi.nlm.nih.gov/substance/403031316>

