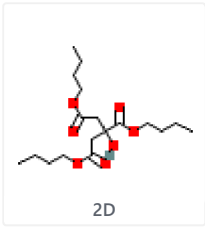




**COVID-19 is an emerging, rapidly evolving situation.**Get the latest public health information from CDC: <https://www.coronavirus.gov>.Get the latest research from NIH: <https://www.nih.gov/coronavirus>.

COMPOUND SUMMARY

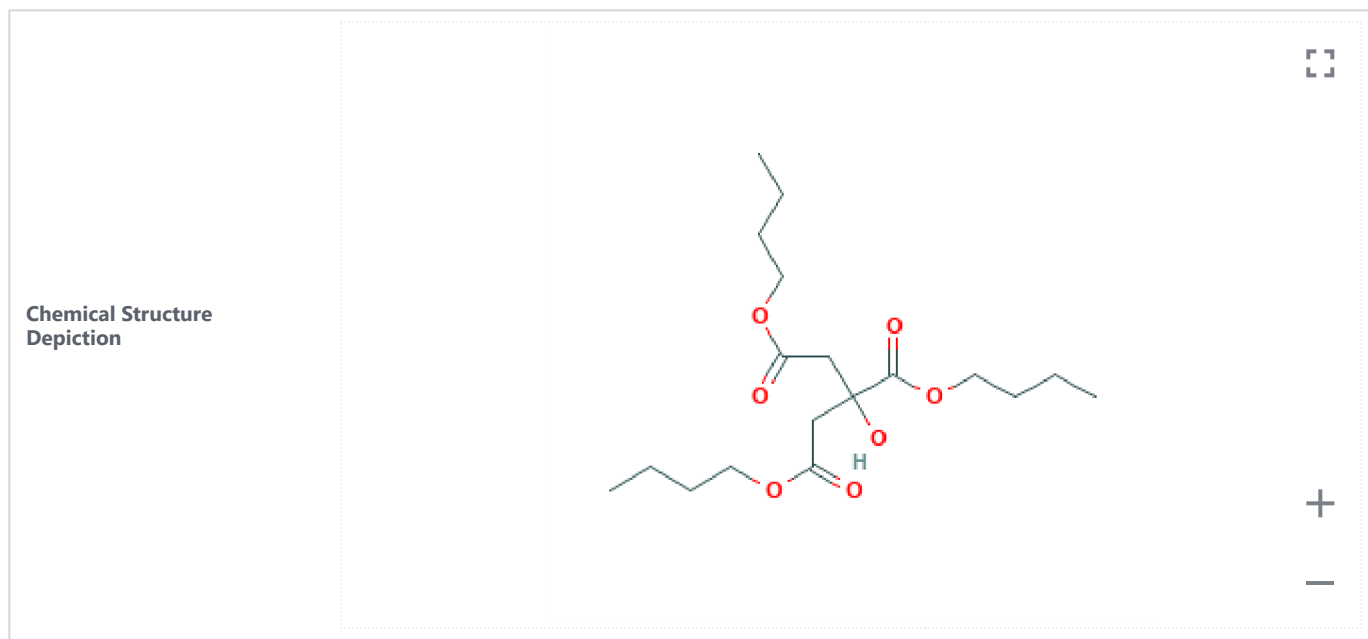
Tributyl citrate

| | |
|--------------------------|--|
| PubChem CID | 6507 |
| Structure |  2D Find Similar Structures |
| Chemical Safety |   Corrosive Environmental Hazard Laboratory Chemical Safety Summary (LCSS) Datasheet |
| Molecular Formula | $C_{18}H_{32}O_7$ |
| Synonyms | TRIBUTYL CITRATE 77-94-1 Butyl citrate tributyl 2-hydroxypropane-1,2,3-tricarboxylate Tri-n-butyl citrate <input type="button" value="More..."/> |
| Molecular Weight | 360.4 g/mol |
| Dates | Modify 2020-12-26 Create 2005-03-26 |

1 Structures



1.1 2D Structure



► [PubChem](#)

1.2 3D Status



Conformer generation is disallowed since too flexible

► [PubChem](#)

2 Names and Identifiers



2.1 Computed Descriptors



2.1.1 IUPAC Name



tributyl 2-hydroxypropane-1,2,3-tricarboxylate

Computed by LexiChem 2.6.6 (PubChem release 2019.06.18)

[▶ PubChem](#)

2.1.2 InChI



InChI=1S/C18H32O7/c1-4-7-10-23-15(19)13-18(22,17(21)25-12-9-6-3)14-16(20)24-11-8-5-2/h22H,4-14H2,1-3H3

Computed by InChI 1.0.5 (PubChem release 2019.06.18)

[▶ PubChem](#)

2.1.3 InChI Key



ZFOZVQLOBQUTQQ-UHFFFAOYSA-N

Computed by InChI 1.0.5 (PubChem release 2019.06.18)

[▶ PubChem](#)

2.1.4 Canonical SMILES



CCCCOC(=O)CC(CC(=O)OCCCC)(C(=O)OCCCC)O

Computed by OEChem 2.1.5 (PubChem release 2019.06.18)

[▶ PubChem](#)

2.2 Molecular Formula



C18H32O7

Computed by PubChem 2.1 (PubChem release 2019.06.18)

[▶ PubChem](#)

2.3 Other Identifiers



2.3.1 CAS



77-94-1

[▶ ChemIDplus; DTP/NCI; EPA Chemicals under the TSCA; EPA DSSTox; European Chemicals Agency \(ECHA\)](#)

2.3.2 Deprecated CAS



611199-02-1

▶ ChemIDplus

2.3.3 European Community (EC) Number



201-071-2

▶ European Chemicals Agency (ECHA)

2.3.4 NSC Number



8491

▶ DTP/NCI

2.3.5 UNII



827D5B1B6S

▶ FDA/SPL Indexing Data

2.3.6 DSSTox Substance ID



DTXSID5051442

▶ EPA DSSTox

2.3.7 Wikipedia



Tributyl citrate

▶ Wikipedia

2.4 Synonyms



2.4.1 MeSH Entry Terms



citric acid tributyl ester
tributyl citrate
tributyl citric acid

▶ MeSH

2.4.2 Depositor-Supplied Synonyms



| | | |
|--|---|---------------|
| TRIBUTYL CITRATE | EINECS 201-071-2 | Citric acid t |
| 77-94-1 | BRN 1806072 | Tributyl citr |
| Butyl citrate | Citric acid tri-n-butyl ester | ACMC-1BC |
| tributyl 2-hydroxypropane-1,2,3-tricarboxylate | AI3-00394 | EC 201-071- |
| Tri-n-butyl citrate | 2-Hydroxy-1,2,3-propanetricarboxylic acid, tributyl ester | SCHEMBL2 |
| Citroflex 4 | Tributyl 2-hydroxy-1,2,3-propanetricarboxylate | KSC489Q5I |

| | | |
|---|---|----------------|
| n-Butyl citrate | 827D5B1B6S | Tributyl citri |
| Citric acid, tributyl ester | 1,2,3-Propanetricarboxylic acid, 2-hydroxy-, 1,2,3-tributyl ester | CHEMBL21I |
| 1,2,3-Propanetricarboxylic acid, 2-hydroxy-, tributyl ester | Tributyl citrate, 99+% | DTXSID505 |
| Butyl citrate (VAN) | 2-HYDROXY-1,2,3-PROPANETRICARBOXYLIC ACIDTRIBUTYL ESTER | CTK3I9853 |
| NSC 8491 | Citric Acid Tributyl Ester | KS-00000K |
| UNII-827D5B1B6S | C18H32O7 | NSC8491 |

► PubChem

3 Chemical and Physical Properties



3.1 Computed Properties



| Property Name | Property Value | Reference |
|-----------------------------------|---------------------|--|
| Molecular Weight | 360.4 g/mol | Computed by PubChem 2.1 (PubChem release 2019.06.18) |
| XLogP3-AA | 2.7 | Computed by XLogP3 3.0 (PubChem release 2019.06.18) |
| Hydrogen Bond Donor Count | 1 | Computed by Cactvs 3.4.6.11 (PubChem release 2019.06.18) |
| Hydrogen Bond Acceptor Count | 7 | Computed by Cactvs 3.4.6.11 (PubChem release 2019.06.18) |
| Rotatable Bond Count | 17 | Computed by Cactvs 3.4.6.11 (PubChem release 2019.06.18) |
| Exact Mass | 360.214803 g/mol | Computed by PubChem 2.1 (PubChem release 2019.06.18) |
| Monoisotopic Mass | 360.214803 g/mol | Computed by PubChem 2.1 (PubChem release 2019.06.18) |
| Topological Polar Surface Area | 99.1 Å ² | Computed by Cactvs 3.4.6.11 (PubChem release 2019.06.18) |
| Heavy Atom Count | 25 | Computed by PubChem |
| Formal Charge | 0 | Computed by PubChem |
| Complexity | 382 | Computed by Cactvs 3.4.6.11 (PubChem release 2019.06.18) |
| 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 2019.01.04) |

► [PubChem](#)

3.2 Experimental Properties



3.2.1 Physical Description



Liquid

► [EPA Chemicals under the TSCA](#)

3.2.2 Melting Point



-20.0 °C

► [EPA DSSTox](#)

3.2.3 Kovats Retention Index



| | |
|--------------------|------------|
| Standard non-polar | 2150, 2150 |
|--------------------|------------|

► [NIST Mass Spectrometry Data Center](#)

4 Spectral Information



4.1 1D NMR Spectra



| | |
|----------------|---------------------------------|
| 1D NMR Spectra | NMRShiftDB Link |
|----------------|---------------------------------|

▶ [NMRShiftDB](#)

4.1.1 1H NMR Spectra



| | |
|-------------------------|--|
| Instrument Name | BRUKER AC-300 |
| Source of Sample | Tokyo Kasei Kogyo Company, Ltd., Tokyo, Japan |
| Copyright | Copyright © 1991-2020 John Wiley & Sons, Inc. All Rights Reserved. |
| Thumbnail | |

▶ [SpectraBase](#)

| | |
|-------------------------|--|
| Instrument Name | Varian A-60 |
| Source of Sample | Eastman Kodak Company, Distillation Products Industries, Rochester, New York |
| Copyright | Copyright © 2009-2020 John Wiley & Sons, Inc. All Rights Reserved. |
| Thumbnail | |

► SpectraBase

4.1.2 ¹³C NMR Spectra



| | |
|-------------------------|--|
| Source of Sample | Eastman Organic Chemicals, Rochester, New York |
| Copyright | Copyright © 1980, 1981-2020 John Wiley & Sons, Inc. All Rights Reserved. |
| Thumbnail | |

► SpectraBase

| | |
|------------------------|--|
| Instrument Name | Varian HA-100 |
| Copyright | Copyright © 2002-2020 Wiley-VCH Verlag GmbH & Co. KGaA. All Rights Reserved. |
| Thumbnail | |

► SpectraBase

4.2 Mass Spectrometry

Showing 2 of 4 [View More](#)

| | |
|---------------------------|---|
| Technique | GC/MS |
| Source of Spectrum | DigiLab GmbH (C) 2020 |
| Copyright | Database Compilation Copyright © 2020 Wiley-VCH Verlag GmbH & Co. KGaA. Copyright © 2020 DigiLab GmbH. All Rights Reserved. |
| Thumbnail | |

[▶ SpectraBase](#)

| | |
|---------------------------|---|
| Source of Spectrum | W6-32487-0-0 |
| Copyright | Copyright © 2020 John Wiley & Sons, Inc. All Rights Reserved. |
| Thumbnail | |

[▶ SpectraBase](#)

4.2.1 GC-MS



Showing 2 of 8 [View More](#) 

| | |
|------------------------|---|
| MoNA ID | JP001727 |
| MS Category | Experimental |
| MS Type | GC-MS |
| MS Level | MS1 |
| Instrument | Unknown |
| Instrument Type | EI-B |
| Ionization Mode | positive |
| Splash | splash10-0550-1920000000-d02631bec8719bddba2a |
| Thumbnail | |
| Submitter | University of Tokyo Team, Faculty of Engineering, University of Tokyo |

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

| | |
|------------------------|---|
| MoNA ID | JP001728 |
| MS Category | Experimental |
| MS Type | GC-MS |
| MS Level | MS1 |
| Instrument | Unknown |
| Instrument Type | CI-B |
| Ionization Mode | positive |
| Splash | splash10-08fr-0289000000-5f33fa6960e4a3c2ab6b |
| Thumbnail | |

| | |
|------------------|---|
| Submitter | University of Tokyo Team, Faculty of Engineering, University of Tokyo |
|------------------|---|

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

4.3 IR Spectra



4.3.1 FTIR Spectra



| | |
|---------------------------|--|
| Technique | CAPILLARY FILM |
| Source of Spectrum | SCHOLL |
| Source of Sample | Charles Pfizer & Company, Inc., New York, New York |
| Copyright | Copyright © 1980, 1981-2020 John Wiley & Sons, Inc. All Rights Reserved. |
| Thumbnail | |

► [SpectraBase](#)

| | |
|-------------------------|--|
| Technique | CAPILLARY CELL: NEAT |
| Source of Sample | Eastman Kodak Company, Distillation Products Industries, Rochester, New York |
| Copyright | Copyright © 1980, 1981-2020 John Wiley & Sons, Inc. All Rights Reserved. |
| Thumbnail | |

► [SpectraBase](#)

4.3.2 ATR-IR Spectra



| | |
|---------------------------|--|
| Instrument Name | Bio-Rad FTS |
| Technique | ATR-Neat (DurasamplIR II) |
| Source of Spectrum | Forensic Spectral Research |
| Source of Sample | Scientific Polymer Products, Inc. |
| Catalog Number | P-109 |
| Lot Number | 080706001 |
| Copyright | Copyright © 2012-2020 John Wiley & Sons, Inc. All Rights Reserved. |
| Thumbnail | |

► [SpectraBase](#)

4.3.3 Near IR Spectra



| | |
|---------------------------|---|
| Technique | NIR Path Length= 0.5/20 (20 = 4.5 mm) Spectrometer= INSTRUMENT PARAMETERS=INST=BRUKER,RSN=5032,REO=2,CNM=HEI,ZFF=2 Spectrometer= BRUKER IFS 88 |
| Source of Spectrum | Prof. Buback, University of Goettingen, Germany |
| Copyright | Copyright © 1989, 1990-2020 Wiley-VCH Verlag GmbH & Co. KGaA. All Rights Reserved. |
| Thumbnail | |

► SpectraBase

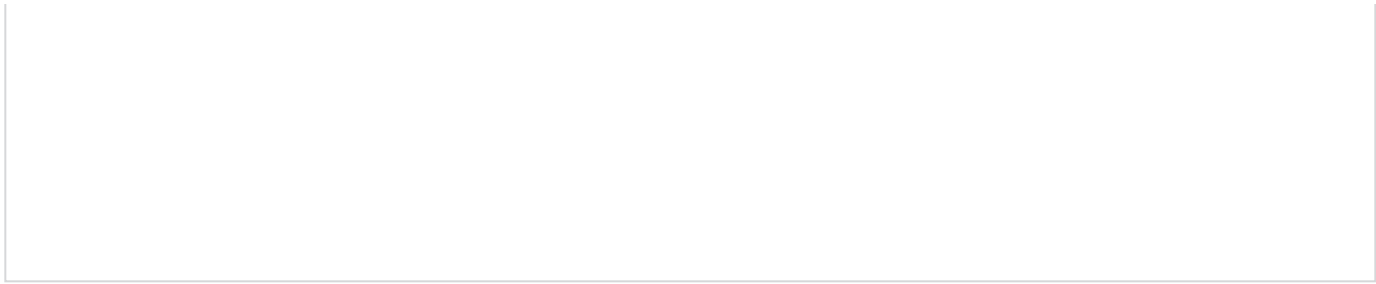
| | |
|---------------------------|---|
| Technique | NIR Path Length= 0.5/20 (20 = 4.5 mm) Spectrometer= INSTRUMENT PARAMETERS=INST=BRUKER,RSN=5032,REO=2,CNM=HEI,ZFF=2 Spectrometer= BRUKER IFS 88 |
| Source of Spectrum | Prof. Buback, University of Goettingen, Germany |
| Copyright | Copyright © 1989, 1990-2020 Wiley-VCH Verlag GmbH & Co. KGaA. All Rights Reserved. |
| Thumbnail | |

► SpectraBase

4.3.4 Vapor Phase IR Spectra



| | |
|------------------------|--|
| Instrument Name | DIGILAB FTS-14 |
| Technique | Vapor Phase |
| Copyright | Copyright © 1980, 1981-2020 John Wiley & Sons, Inc. All Rights Reserved. |
| Thumbnail | |



▶ [SpectraBase](#)

5 Related Records



5.1 Related Compounds with Annotation



▶ PubChem

5.2 Related Compounds



| | |
|---|-------------|
| Same Parent, Exact | 12 Records |
| Mixtures, Components, and Neutralized Forms | 22 Records |
| Similar Compounds | 768 Records |

▶ PubChem

5.3 Substances



5.3.1 Related Substances



| | |
|---------|-------------|
| All | 139 Records |
| Same | 114 Records |
| Mixture | 25 Records |

▶ PubChem

5.3.2 Substances by Category



▶ PubChem

5.4 Entrez Crosslinks



| | |
|-----------------|----------------------------|
| PubMed | 14 Records |
| Taxonomy | 1 Record |
| Gene | 2 Records |

▶ PubChem

6 Chemical Vendors



▶ PubChem

7 Food Additives and Ingredients



7.1 FDA Indirect Additives used in Food Contact Substances



| | |
|---|----------------------------------|
| Indirect Additives | TRIBUTYL CITRATE |
| Title 21 of the U.S. Code of Federal Regulations (21 CFR) | 175.105 |

▶ [FDA Center for Food Safety and Applied Nutrition \(CFSAN\)](#)

8 Use and Manufacturing



8.1 Use Classification



Cosmetics -> Film forming; Plasticiser; Solvent

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

▶ NORMAN Suspect List Exchange

8.2 Uses



EPA CPDat Chemical and Product Categories

▶ EPA Chemical and Products Database (CPDat)

8.2.1 Industry Uses



Plasticizers

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

▶ EPA Chemicals under the TSCA

8.2.2 Consumer Uses



Building/construction materials not covered elsewhere

Paints and coatings

Plastic and rubber products not covered elsewhere

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

▶ EPA Chemicals under the TSCA

8.3 U.S. Production



Aggregated Product Volume (EPA CDR 2016)

1,000,000 - 10,000,000 lb

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

▶ [EPA Chemicals under the TSCA](#)

8.4 General Manufacturing Information



Industry Processing Sectors

Paint and coating manufacturing
Photographic film paper, plate, and chemical manufacturing
Plastic material and resin manufacturing
Plastics product manufacturing

▶ [EPA Chemicals under the TSCA](#)

EPA TSCA Commercial Activity Status

1,2,3-Propanetricarboxylic acid, 2-hydroxy-, 1,2,3-tributyl ester: ACTIVE

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

▶ [EPA Chemicals under the TSCA](#)

9 Safety and Hazards




9.1 Hazards Identification



9.1.1 GHS Classification



| | |
|---|--|
| Pictogram(s) |  <p>Corrosive Environmental Hazard</p> |
| Signal | <u>Danger</u> |
| GHS Hazard Statements | H318 (85.57%): Causes serious eye damage [Danger Serious eye damage/eye irritation] H400 (14.43%): Very toxic to aquatic life [Warning Hazardous to the aquatic environment, acute hazard] |
| Precautionary Statement Codes | P273, P280, P305+P351+P338, P310, P391, and P501 (The corresponding statement to each P-code can be found at the GHS Classification page.) |
| ECHA C&L Notifications Summary | <p><i>Aggregated GHS information provided by 347 companies from 4 notifications to the ECHA C&L Inventory. Each notification may be associated with multiple companies.</i></p> <p><i>Reported as not meeting GHS hazard criteria by 250 of 347 companies. For more detailed information, please visit ECHA C&L website.</i></p> <p><i>Of the 2 notification(s) provided by 97 of 347 companies with hazard statement code(s).</i></p> <p><i>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.</i></p> |

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

9.1.2 Hazard Classes and Categories



Eye Dam. 1 (85.57%)

Aquatic Acute 1 (14.43%)

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

10 Toxicity



10.1 Toxicological Information



10.1.1 Acute Effects



► [ChemIDplus](#)

11 Literature



11.1 NLM Curated PubMed Citations



▶ PubChem

11.2 Springer Nature References



▶ Springer Nature

11.3 Thieme References



► Thieme Chemistry

11.4 Depositor Provided PubMed Citations



► PubChem

11.5 Chemical Co-Occurrences in Literature



▶ PubChem

11.6 Chemical-Gene Co-Occurrences in Literature



▶ PubChem

11.7 Chemical-Disease Co-Occurrences in Literature



▶ PubChem

12 Patents



12.1 Depositor-Supplied Patent Identifiers



▶ PubChem

[Link to all deposited patent identifiers](#)

▶ PubChem

12.2 WIPO PATENTSCOPE



Patents are available for this chemical structure:

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

▶ PATENTSCOPE (WIPO)

13 Biomolecular Interactions and Pathways



13.1 Chemical-Gene Interactions



13.1.1 CTD Chemical-Gene Interactions



► [Comparative Toxicogenomics Database \(CTD\)](#)

14 Classification



14.1 Ontologies



14.1.1 MeSH Tree



▶ Medical Subject Headings (MeSH)

14.1.2 ChemIDplus



▶ ChemIDplus

14.1.3 UN GHS Classification



- ▶ UN Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

14.1.4 EPA CPDat Classification



- ▶ EPA Chemical and Products Database (CPDat)

14.1.5 NORMAN Suspect List Exchange Classification



▶ NORMAN Suspect List Exchange

14.1.6 EPA DSSTox Classification



▶ EPA DSSTox

15 Information Sources



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1. ChemIDplus

LICENSE

<https://www.nlm.nih.gov/copyright.html>*Tributyl citrate*<https://chem.nlm.nih.gov/chemidplus/sid/0000077941>*ChemIDplus Chemical Information Classification*<https://chem.nlm.nih.gov/chemidplus/>

2. DTP/NCI

LICENSE

<https://www.cancer.gov/policies/copyright-reuse>*TRIBUTYL CITRATE*<https://dtp.cancer.gov/dtpstandard/servlet/dwindex?searchtype=NSC&outputformat=html&searchlist=8491>

3. EPA Chemicals under the TSCA

LICENSE

<https://www.epa.gov/privacy/privacy-act-laws-policies-and-resources>*1,2,3-Propanetricarboxylic acid, 2-hydroxy-, 1,2,3-tributyl ester*<https://www.epa.gov/chemicals-under-tsca>

4. EPA DSSTox

LICENSE

<https://www.epa.gov/privacy/privacy-act-laws-policies-and-resources>*Tributyl citrate*<https://comptox.epa.gov/dashboard/DTXSID5051442>*CompTox Chemicals Dashboard Chemical Lists*https://comptox.epa.gov/dashboard/chemical_lists/

5. European Chemicals Agency (ECHA)

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<https://echa.europa.eu/web/guest/legal-notice>*Tributyl citrate*<https://echa.europa.eu/substance-information/-/substanceinfo/100.000.975>*Tributyl citrate*<https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/107144>

6. Comparative Toxicogenomics Database (CTD)

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<http://ctdbase.org/about/legal.jsp><http://ctdbase.org/detail.go?type=chem&acc=C039783>

7. EPA Chemical and Products Database (CPDat)

LICENSE

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

tributyl citrate

<https://comptox.epa.gov/dashboard/DTXSID5051442#exposure>

EPA CPDat Classification

<https://www.epa.gov/chemical-research/chemical-and-products-database-cpdatt>

8. FDA Center for Food Safety and Applied Nutrition (CFSAN)

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<https://www.fda.gov/about-fda/about-website/website-policies#linking>

TRIBUTYL CITRATE

<https://www.cfsanappsexternal.fda.gov/scripts/fdcc/index.cfm?set=IndirectAdditives&id=TRIBUTYLCITRATE>

9. FDA/SPL Indexing Data

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<https://www.fda.gov/about-fda/about-website/website-policies#linking>

827D5B1B6S

<https://www.fda.gov/ForIndustry/DataStandards/SubstanceRegistrationSystem-UniqueIngredientIdentifierUNII/>

10. MassBank of North America (MoNA)

LICENSE

The content of the MoNA database is licensed under CC BY 4.0.

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

2-HYDROXY-1,2,3-PROPANETRICARBOXYLIC ACIDTRIBUTYL ESTER

<http://mona.fiehnlab.ucdavis.edu/spectra/browse?inchikey=ZFOZVQLOBQUTQQ-UHFFFAOYSA-N>

11. NIST Mass Spectrometry Data Center

Butyl citrate

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

12. NMRShiftDB

<https://pubchem.ncbi.nlm.nih.gov/substance/22389198>

13. NORMAN Suspect List Exchange

LICENSE

Data: CC-BY 4.0; Code (hosted by ECI, LCSB): Artistic-2.0

<https://creativecommons.org/licenses/by/4.0/>

NORMAN Suspect List Exchange Classification

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

14. SpectraBase

Tri-n-butyl citrate

<https://spectrabase.com/spectrum/7UX6ln5wypW>

CITRIC ACID, TRIBUTYL ESTER

<https://spectrabase.com/spectrum/DYVDEB7qFq>

citric acid, tributyl ester

<https://spectrabase.com/spectrum/3CQnS3dDxYs>

TRI-n-BUTYL CITRATE

<https://spectrabase.com/spectrum/5d1oHsVV6pc>

CITRIC ACID, TRIBUTYL ESTER

<https://spectrabase.com/spectrum/Gkljr7i0Ts5>

CITRIC ACID, TRIBUTYL ESTER

<https://spectrabase.com/spectrum/C2Jcz5Q6l8y>

Citric acid, tributyl ester

<https://spectrabase.com/spectrum/9960EJs0peE>

CITRIC ACID, TRIBUTYL ESTER

<https://spectrabase.com/spectrum/3vcsf6VjC2>

1,2,3-Propanetricarboxylic acid, 2-hydroxy-, tributyl ester

<https://spectrabase.com/spectrum/DI2kNuTnQxS>

1,2,3-Propanetricarboxylic acid, 2-hydroxy-, tributyl ester

<https://spectrabase.com/spectrum/6oNy2IiJVAT>

Butyl citrate

<https://spectrabase.com/spectrum/1Ld2ebsJHmK>

1,2,3-Propanetricarboxylic acid, 2-hydroxy-, tributyl ester

<https://spectrabase.com/spectrum/LqC0kGyoMBk>

1,2,3-Propanetricarboxylic acid, 2-hydroxy-, tributyl ester

<https://spectrabase.com/spectrum/JlI7Lg2NSTU>

1,2,3-Propanetricarboxylic acid, 2-hydroxy-, tributyl ester

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

15. Springer Nature

<https://pubchem.ncbi.nlm.nih.gov/substance/341143976>

16. Thieme Chemistry

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17. Wikipedia

tributyl citrate

<https://de.wikipedia.org/wiki/Citronens%C3%A4uretri-n-butylester>

18. PubChem

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

19. MeSH

tributyl citrate

<https://www.ncbi.nlm.nih.gov/mesh/67039783>

20. Medical Subject Headings (MeSH)

MeSH Tree

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

21. UN Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

GHS Classification Tree

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

22. PATENTSCOPE (WIPO)

SID 403393119

<https://pubchem.ncbi.nlm.nih.gov/substance/403393119>