



Leader in 1,4-Dioxane Free
Surfactants



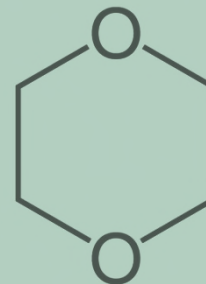


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1,4-Dioxane

Chemical formula: $C_4H_8O_2$



1,4-Dioxane Background



- 1,4-Dioxane is a useful synthetic compound with numerous commercial and industrial applications.
- But it can also be formed as a trace by-product during the manufacture of ethoxylated surfactants, and thus can be present as a trace impurity in shampoos, shower gels, etc and in household cleaning products.
- Classified as a probable human carcinogen:
 - EPA: As "likely to be carcinogenic to humans" by all routes of exposure
 - EU: As a Class 1B Carcinogen
- Properties:
 - Colourless liquid (Mpt. 12°C/ Bpt. 101°C)
 - completely miscible in water
 - Mild, ether-like odour

1,4-Dioxane Background



- Short-lived in the atmosphere, may leach readily from soil to groundwater, migrates rapidly in groundwater and is relatively resistant to biodegradation in the subsurface.
- Found as a contaminant at USA former industrial and military facilities because of its widespread use as a stabilizer in certain chlorinated solvents, paint strippers, greases and waxes.
- Environmental Protection Agency (USA) found levels of c. 1 ppb 1,4-Dioxane in New York ground water – highest levels in Long Island.



1,4-Dioxane

Regulatory Status

Regulatory Status

USA

■ EPA - NO ISSUE with 1,4-Dioxane at the current levels

■ New York State

- 1,4-Dioxane in ground water at high levels.
- Carcinogen and persistent.
- Difficult and expensive to remove: < 1 ppb wanted - investing \$27million to remove it.

■ NY Senate Bill S4389B December 2019 - New York Governor signed off

“An act to amend the environmental conservation law, in relation to prohibiting household cleansing products, cosmetic products and personal care products that contain 1,4-Dioxane”

NY Bill 1,4-Dioxane Limit Restrictions Summarized

Personal Care and Household Cleaning products	2 ppm by Dec 31, 2022 1 ppm by Dec 31, 2023	2025: Department of Environmental Conservation in consultation with the Department of Health can determine, by rule, if the 'trace concentration threshold shall be lowered to better protect human health and the environment'
Cosmetic products	10 ppm by Dec 31, 2022	

Regulatory Status Cont.

■ USA

- California have the Proposition 65 list and the 'Cleaning product right to know Act':
 - Manufacturers of cleaning products need to declare intentionally added ingredients and non-functional constituents at >100ppm. 1,4-Dioxane is specifically set at >10ppm.
 - Cosmetics: Exempt
- California (and others) looking at NY bills for the future, likely to follow.

■ EU and UN

- **EU 1223/2009 (cosmetic regulations)**
 - Annex II - prohibited substance in cosmetics products
 - Article 17 - allowed at technically unavoidable levels
- **SCCS Opinion 2015 and ICCR Working Group 2017**
 - Phase 1: ≤25 ppm in finished products
 - Phase 2: ≤10 ppm in finished cosmetic products over a 'suitable transition period'
 - No formal date has been agreed

■ ASEAN

- Cosmetic limits; 25ppm - June 19, 2020, 10ppm - June 19, 2023

Regulatory Status Cont.

Timeline Summary



The EU has not set a definitive timeline.



1,4-Dioxane Free Innospec Solutions

Innospec: Leader in 1,4-Dioxane free surfactants



- At Innospec we understand the impact of the impending regulatory restrictions on our portfolio.
- Meeting the requirements of new regulations is a challenge we successfully meet.
- Formulators will need to re-evaluate their ingredient choices to comply with the changing regulations.
- Our technical experts can help you to navigate the regulations, providing solutions for your new formulations.
- With our portfolio of 1,4-Dioxane free ingredients we can support you in reformulating products to comply with the new regulations.
- We have a broad range of ingredients for Personal Care and Home Care formulations which have been analyzed to show they are 1,4-Dioxane free*.

*Any 1,4-dioxane present is at < 1 ppm.

Innospec 1,4-Dioxane Free Surfactants*

Product Tradename	INCI name
Empicol® AL30/AV	Ammonium Lauryl Sulphate
Empicol® CED5	Laureth-5 Carboxylic Acid
Empicol® C grades	Sodium Coco-Sulfate
Empicol® L grades	Sodium Lauryl Sulfate
Empicol® SDD/O	Didodium Laureth Sulfosuccinate
Empigen® CDL 60/P	Sodium Lauroamphoacetate
Empigen® CDR 60	Sodium Cocoamphoacetate
Empigen® BB	Lauryl Betaine
Empigen® BB/HP	Lauryl Betaine
Empigen® CBET	Coco-Betaine
Empigen® BS/FA	Cocamidopropyl Betaine
Empigen® BS/O	Cocamidopropyl Betaine
Empigen® BS/H50	Cocamidopropyl Betaine
Empigen® OB	Lauramine Oxide
Empilan® 2502	Cocamide DEA
Empilan® CIS	Cocamide MIPA
Empilan® CME/T	Cocamide MEA
Empilan® EGDS/A	Glycol Stearate
Empilan® EGMS	Glycol Cetearate
Iselux®	Sodium Lauryl Methyl Isethionate
Iselux® CO	Sodium Lauryl Methyl Isethionate

*Any 1,4-dioxane present is at < 1 ppm.

Innospec 1,4-Dioxane Free Surfactants* Cont.

Product Tradename	INCI name
Iselux® LQ CLR	Sodium Lauroyl Methyl Isethionate
Iselux® LQ CLR-SB	Sodium Lauroyl Methyl Isethionate
Iselux® SCMI	Sodium Cocoyl Methyl Isethionate
Iselux® Ultra Mild	Sodium Lauroyl Methyl Isethionate
Nansa® LSS 38	Sodium C14-16 Olefin Sulfonate
Nansa® LSS 38 AS	Sodium C14-16 Olefin Sulfonate
Nansa® LSS 38 AV	Sodium C14-16 Olefin Sulfonate
Pureact I-78 grades	Sodium Cocoyl Isethionate
Pureact I-80P	Sodium Cocoyl Isethionate
Pureact I-85 grades	Sodium Cocoyl Isethionate
Pureact SLI	Sodium Lauroyl Isethionate
Pureact LAA	Sodium Lauroamphoacetate
Pureact MS-CG	Sodium Methyl Oleoyl Taurate
Pureact SCG	Sodium Cocoyl Glycinate
Pureact SLG	Sodium Lauroyl Glycinate
Pureact TR-L90	Sodium Methyl Lauroyl Taurate
Pureact WS Conc	Sodium Methyl Cocoyl Taurate
Pureact WS-70	Sodium Methyl Cocoyl Taurate
Pureact WSP	Sodium Methyl Cocoyl Taurate
Pureact Gluco C	Coco-glucoside
Pureact Gluco D	Decyl glucoside
Pureac Gluco L	Lauryl glucoside

*Any 1,4-dioxane present is at < 1 ppm.

Innospec 1,4-Dioxane Free Surfactants* Cont.

Aquanates - Mild Surfactants for Hard Surface, Dish, Hand Soap, Laundry Detergents

Product Tradename	INCI name
Aquanate MOT 30	Sodium Methyl Oleoyl Taurate
Aquanate XHL-UM	Anionic surfactant, amphoteric surfactant and non-ionic surfactants
Aquanate XHL-SFSB	Anionic surfactants and amphoteric surfactant
Aquanate COT 30	Sodium Methyl Cocoyl Taurate
Aquanate COT 20	Sodium Methyl Cocoyl Taurate
Aquanate COT 75	Sodium Methyl Cocoyl Taurate
Aquanate LQ	Sodium Lauroyl Methyl Isethionate
Aquanate FK	Sodium Lauroyl Methyl Isethionate
Aquanate GLT	Sodium Lauroyl Glutamate
Aquanate XHL-BB	Anionic surfactants and amphoteric surfactant

*Any 1,4-dioxane present is at < 1 ppm.

Innospec 1,4-Dioxane Free Surfactants* Cont.

EMPILAN® AP – Alkyl polyglucosides - mild Surfactants for Hard Surface, Dish, Hand Soap, Laundry Detergents

Product Tradename	INCI name
Empilan® APL 50	Lauryl Glucoside
Empilan® APD 50	Decyl Glucoside
Empilan® APC 50	Coco-Glucoside

*Any 1,4-dioxane present is at < 1 ppm.



1,4-Dioxane free Formulations for Home and Personal Care

Innospec solutions for sustainable and safer formulations in Home Care and Personal Care.

Our formulations designed with ingredients containing < 1ppm 1,4-Dioxane.

Formulation

1,4-Dioxane free and sulfate free Shampoo with essential and natural oils

Clear high foaming sulfate free shampoo, with Iselux LQ-CLR SB, Pureact WS Conc and Pureact Gluco L to give a high viscosity, naturally derived shampoo with excellent flash foam and conditioning.

	INCI ingredients	Trade name (supplier)	% w/w
A.	Argania Spinosa Oil	Argan Oil (Organic) Naissance	0.10
	Polyglyceryl-6 Caprylate, Polyglyceryl-3 Cocoate, Polyglyceryl-4 Caprate, Polyglyceryl-6 Ricinoleate	Tego Solv 61 (Evonik)	1.60
	Aqua		q.s. to 100
B.	Sodium Lauroyl Methyl Isethionate,	Iselux® LQ-CLR SB (Innospec)	9.30
C.	Sodium Methyl Cocoyl Taurate	Pureact WS Conc (Innospec)	15.00
	Lauryl-glucoside	Pureact Gluco L (Innospec)	4.00
D.	Cocamidopropyl Betaine	EMPIGEN® BS/FA (Innospec)	12.00
E.	Sodium Benzoate		0.50
	Sodium Anisate, Sodium Leuvinatate, Glycerin	Dermosoff® 1388 ECO (Dr Straetmans)	2.00
F.	Aqua		20.00
	Guar Hydroxypropyltrimonium Chloride	Jaguar Excel (Rhodia)	0.20
	Citric Acid		Trace
G.	Essential Oils	Rosemary, Thyme, Lavender	0.20 0.15 0.15
	Caprylyl/Capryl Glucoside, Aqua, Sodium Cocoyl Glutamate, Polyglyceryl-5 Oleate, Glyceryl Caprylate, Citric Acid	Symbiosolv Clear (Dr Straetmans)	2.00
H.	Citric Acid		q.s to pH 5.0-5.5
I.	Cocamidopropyl Betaine	EMPIGEN® BS/FA (Innospec)	q.s to 5,000-8,000cps

Formulation

1,4-Dioxane free and sulfate free Shampoo with essential and natural oils

Preparation Procedure

1. Blend argan oil with the Tego Solv 61 until uniform;
2. Heat water to 45-50°C and add slowly drop-wise to argan oil and emulsifier until clear emulsion formed **(A)**;
3. Add Iselux[®] LQ-CLR SB and mix until clear and uniform **(B)**;
4. Sequentially add Pureact WS conc and Pureact Gluco L and mix until clear and uniform, Remove from heat **(C)**;
5. NB- (Pureact WS Conc, and Pureact Gluco L, have specific handling guidelines to ensure homogeneity before use: Pureact WS Conc should be heated to 50-65°C and mixed. Pureact Gluco L should be heated to 40°C and mixed) Please refer to these handling guidelines);
6. Slowly add EMPIGEN[®] BS/FA and mix until uniform **(D)**;
7. When system below 40°C add preservatives **(E)** and mix until fully dissolved and clear;
8. Disperse Jaguar Excel by slowly adding to water with stirring when fully dispersed add trace amounts of citric acid to swell polymer viscosity will increase and become clear **(F)**. Slowly add **(F)** to main vessel with stirring mix until uniform and clear;
9. Premix essential oil blend in Symbio Solv Clear, emulsifier and then add to main system **(G)**;
10. Adjust pH to 5.0-5.5 with citric acid solution (50%w/w) **(H)**;
11. Add 0.25% w/w aliquots of EMPIGEN[®] BS/FA as required to modify until viscosity obtained **(I)**.

Properties	
Appearance:	Clear, Viscous Liquid
pH:	5.0 – 5.5
Viscosity:*	5,000-8,000cps
Stability:	3 months 45°C, 20°C, 5°C and 3 F/T Cycles
*Brookfield RV, #5, 20 rpm, 20°C	

Formulation

1,4-Dioxane free Shower Gel with orange and clove



Clear high foaming sulfate free shampoo, with Iselux LQ-CLR SB, Pureact WS Conc and Pureact Gluco L to give a high viscosity, naturally derived shampoo with excellent flash foam and conditioning.

INCI ingredients	Trade name (supplier)	% w/w
A. Aqua		q.s. to 100
Decyl Glucoside (and) Sodium Lauroyl Lactylate	Pureact 138 (Innospec)	3.00
B. Sodium Coco-Sulfate	EMPICOL® CZ/N (Innospec)	8.00
C. Coco Betaine	EMPIGEN® CBET (Innospec)	6.00
D. Citrus Nobilis (Orange) Peel Oil, Citrus Sinesis (Sweet Orange) Peel Oil, Boswellia Carterii (Frankincense) oil, Eugenia Carophyllus (Clove) oil	Festive Essential Oil (Miaroma)	0.50
Glycerin	Glicerina 99.5 (SABO S.P.A)	2.00
E. Sodium Benzoate		0.50
Potassium Sorbate		0.40
F. Citric Acid (50% w/w)		q.s. to pH (4.7-5.2)
G. Sodium Chloride		q.s. to 5,000-8,000cps

Formulation

1,4-Dioxane free Shower Gel with orange and clove



Preparation Procedure

1. Charge aqua into mixing vessel and heat to 30-40°C **(A)**;
2. Add Pureact 138 and mix until uniform **(B)**;
3. Slowly add EMPICOL® CZ/N and mix until fully dissolved;
4. Slowly add EMPIGEN® CBET and mix until fully uniform and clear **(C)**;
5. Remove vessel from heat;
6. Combine essential oils and glycerin then add to main vessel, when <35°C and mix until clear and uniform **(D)**;
7. Add preservatives and mix until clear and uniform **(E)**;
8. Adjust pH to 4.7-5.2 with citric acid solution **(F)**;
9. Add 0.2% aliquots of sodium chloride until desired viscosity obtained **(G)**.

Properties	
Appearance:	Crystal Clear, Viscous liquid
pH:	4.7 – 5.2
Viscosity:*	5,000 – 8,000 cps
Stability:	Passed 12 weeks 45°C, 20°C and 5°C and 3 F/T cycles
*Brookfield DV-E @ 20rpm, 20°C, #5 spindle	

Good for you

Consumers are looking for the COSMOS label when selecting their next product. This shampoo has it all – it is crystal clear, provides creamy foam, contains COSMOS approved ingredients and provides great conditioning properties. It is enriched with glycerin, orange and clove oils, to leave skin feeling soft and smelling fresh.

Good to formulate

The ingredients used to create this shampoo provide excellent viscosity build and clarity at low pH for organic acid preservation. Pureact 138, EMPICOL® CZ/N and EMPIGEN® BS/FA-MB are all COSMOS approved ingredients from Innospec. Pureact 138 is a 100% naturally derived, sulfate-free surfactant blend that offers ease-of-use when formulating.

Tips and tricks for usage

Massage a small dose onto wet hair and lather up. Rinse thoroughly. Only small amount needed for luxury lather.

Formulation

1,4-Dioxane free Universal Cleaner NaClO Based High Concentrate

Clear high foaming liquid with ca. 25% of total active. This high concentrated multisurface cleaner has been carefully formulated to be diluted and used as refill for spray mousses. The diluted solution gives good overall performance characteristics both in terms of wetting, detergency, flash foam and foam stability, using primary anionic surfactants. The inclusion of Alkyl Dimethylamine Oxide aids thickening and foam boosting properties.

INCI ingredients	Trade name (supplier)	% w/w	Concentration
NaOH	Sodium Hydroxide	6.90	50%
NaClO (13% Cl ₂)	Sodium Hypochlorite	52.63	13% Cl ₂
NANSA® PC 38/F	Potassium cocoate	2.07	35%
EMPIGEN® OD	C12-18 Alkyl dimethylamine Oxide	11.40	30%
EMPICOL® LV 840	Sodium Octyl Sulfate	27	39%

Preparation Procedure

1. Add the ingredients to the water in the given order with constant stirring;
2. Add the perfume and preservative to order.

Properties	
Appearance at 20°C:	Clear Pale Yellow Liquid
pH (5%):	ca. 12.0

Formulation

1,4-dioxane free 2 in 1 mild dishwash liquid

This mild dishwash has been created with EMPICOL® XHL 140, an efficient performance concentrate with very good emulsification power. This formulation promises high volume and dense creamy, stable foam also in hard water. It is so mild on the skin that it can be used also as liquid hand soap. The product is a clear, pale yellow, viscous liquid with ca. 15% of solid content. Claims supported: Label-free; Sulfate-free.

INCI ingredients	Trade name (supplier)	% w/w	Concentration
Water		to 100	
Sodium Chloride		0.7	
EMPICOL® XHL 140	Mild Concentrated Detergent Base	30.0	50% as solids
Citric Acid/ Sodium Hydroxide		q.s. for pH	
Preservative, Dye and Perfume		q.s.	

Preparation Procedure

1. Dissolve the sodium chloride in water;
2. Add the EMPICOL® XHL 140 slowly with stirring until a homogeneous solution is obtained. The rate of dissolution can be increased if the water temperature is raised to approximately 40°C;
3. After ensuring the temperature is less than 35°C add the perfume, dye and preservative to order;
4. If required adjust the pH with citric acid/sodium hydroxide.

Properties	
Appearance at 25°C:	Clear, pale yellow, viscous liquid
pH (5%):	ca. 6.0 - 7.0
Viscosity at 25°C	ca. 700 – 800 cP



Thank you

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homecare@innospecinc.com

