SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Trade name	:	Vitamin K1
Substance name	:	2-Methyl-3-(3,7,11,15-tetramethylhexadec-2-enyl)-1,4-naphthoquinone
CAS-No.	:	81818-54-4

1.2 Relevant identified uses of the substance or mixture and uses advised against

Use of the Substance/Mixture	:	For the fortification of foods, Ingredient for pharmaceutical products

1.3 Details of the supplier of the safety data sheet

Company	:	DSM Nutritional Products Europe Ltd PO Box 2676 CH-4002 Basel
Telephone	:	+41618157777
Telefax	:	+41618157770
E-mail address of person responsible for the SDS	:	sds.nutritionalproducts@dsm.com

1.4 Emergency telephone number

+41 848 00 11 77 (Carechem 24 International)

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification (REGULATION (EC) No 1272/2008)

Skin sensitisation, Sub-category 1B	H317: May cause an allergic skin reaction.
Long-term (chronic) aquatic hazard, Category 3	H412: Harmful to aquatic life with long lasting effects.

2.2 Label elements

Labelling (REGULATION (EC) No 1272/2008)

Hazard pictograms :

Signal word	:	Warning	
Hazard statements	:	H317	May cause an allergic skin reaction.
		H412	Harmful to aquatic life with long lasting effects.
Precautionary statements	:	**Prevention:**	
		P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
		P273	Avoid release to the environment.
		P280	Wear protective gloves.
		Response:	
		P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
		P362 + P364	Take off contaminated clothing and wash it

before reuse.

Disposal:
P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Other hazards

None known.

SECTION 3: Composition/information on ingredients

Synonyms : phytomenadione (all-rac)

Brief description of the product : Substance

Molecular formula : C31 H46 O2

3.1 Substances

Hazardous components

Chemical name	CAS-No. EC-No.	Concentration (% w/w)
2-methyl-3-(3,7,11,15-tetramethylhexadec-2-enyl)-1,4-naphthoquinone	81818-54-4 279-833-9	>= 90 - <= 100
menadione	58-27-5 200-372-6	>= 0.025 - < 0.1

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice : Move out of dangerous area.
Show this safety data sheet to the doctor in attendance.

If inhaled : Move to fresh air.
Consult a physician after significant exposure.

In case of skin contact : Take off contaminated clothing and shoes immediately.
Wash off with soap and plenty of water.
If symptoms persist, call a physician.

In case of eye contact : Flush eyes with water as a precaution.
Remove contact lenses.
Protect unharmed eye.
Keep eye wide open while rinsing.
If eye irritation persists, consult a specialist.

If swallowed : Rinse mouth with water.
Do not give milk or alcoholic beverages.
Never give anything by mouth to an unconscious person.
Obtain medical attention.

4.2 Most important symptoms and effects, both acute and delayed

Symptoms : No specific symptoms known.

4.3 Indication of any immediate medical attention and special treatment needed

Treatment : Treat symptomatically.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media	:	Alcohol-resistant foam Dry chemical Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable extinguishing media	:	High volume water jet

5.2 Special hazards arising from the substance or mixture

Specific hazards during fire-fighting	:	None known.

5.3 Advice for firefighters

Special protective equipment for firefighters	:	In the event of fire, wear self-contained breathing apparatus.
Further information	:	Collect contaminated fire extinguishing water separately. This must not be discharged into drains. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Personal precautions	:	Use personal protective equipment. Ensure adequate ventilation.

6.2 Environmental precautions

Environmental precautions	:	Try to prevent the material from entering drains or water courses.

6.3 Methods and material for containment and cleaning up

Methods for cleaning up	:	Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For personal protection see section 8.
For disposal considerations see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling	:	Avoid contact with skin and eyes. For personal protection see section 8. Dispose of rinse water in accordance with local and national regulations. Smoking, eating and drinking should be prohibited in the application area.

Advice on protection against fire and explosion	:	Take necessary action to avoid static electricity discharge. Product will burn under fire conditions.
Hygiene measures	:	Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of work-day.

7.2 Conditions for safe storage, including any incompatibilities

Requirements for storage areas and containers	:	Keep under inert gas. To maintain product quality, do not store in heat or direct sunlight. Keep container tightly closed and dry.

7.3 Specific end use(s)

Specific use(s)	:	Not applicable

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational Exposure Limits

Components	CAS-No.	Value type (Form of exposure)	Control parame-ters	Basis
2-methyl-3-(3,7,11,15-tetramethylhexadec-2-enyl)-1,4-naphthoquinone	81818-54-4	TWA	1 mg/m3	DSM Internal Limit

8.2 Exposure controls

Personal protective equipment

Eye protection	:	Safety glasses with side-shields
Hand protection	:	Consider the hazard characteristics of this product and any special workplace conditions when selecting the appropriate type of protective gloves. Glove material: for example nitrile rubber
Skin and body protection	:	Choose body protection according to the amount and concen-tration of the dangerous substance at the work place.
Respiratory protection	:	In the case of vapour formation use a respirator with an ap-proved filter.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance	:	viscous, oily liquid
Colour	:	yellow
Odour	:	odourless
Odour Threshold	:	No information available.
pH	:	No data available

Melting point/range	:	ca. -20 °C
Boiling point/boiling range	:	No data available
Flash point	:	273 °C (ISO 2719)
Evaporation rate	:	not determined
Lower explosion limit	:	not determined
Upper explosion limit	:	not determined
Vapour pressure	:	not determined
Relative vapour density	:	not determined
Density	:	0.97 g/cm3
Water solubility	:	ca. 0.0004 mg/l (25 °C; calculated value) insoluble
Solubility in other solvents	:	Sodium hydroxide solution 0.1 N: < 500 mg/l (ca. 22 °C) Hydrochloric acid 0.1 N: < 500 mg/l (ca. 22 °C) Glycerol: < 500 mg/l (ca. 22 °C) Dimethyl sulfoxide: 4.5 g/l (ca. 22 °C) Methanol: 11 g/l (ca. 22 °C) Acetonitrile: 15 g/l (ca. 22 °C) Ethanol: 75 g/l (ca. 22 °C) Diethylether: > 1,000 g/l (ca. 22 °C) Dichloromethane: > 1,000 g/l (ca. 22 °C) Acetone: > 1,000 g/l (ca. 22 °C) Hexane: > 1,000 g/l (ca. 22 °C)
Partition coefficient: n-octanol/water	:	log Pow ca. 11.71 (calculated value)
Ignition temperature	:	370 °C (1,014 hPa, DIN 51794)
Thermal decomposition	:	Decomposes on heating. Potential for exothermic hazard
Viscosity, dynamic	:	not determined
Explosive properties	:	Not explosive
Oxidizing properties	:	No data available

9.2 Other information

Refractive index	:	1.523 - 1.526 (589 nm, 25 °C)
Molecular weight	:	450.68 g/mol

SECTION 10: Stability and reactivity

10.1 Reactivity

No hazards to be specially mentioned.

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

Possible incompatibility with materials listed under section 10.5.

10.4 Conditions to avoid

Exposure to light.
Exposure to air.

Heat

10.5 Incompatible materials

Bases
Oxidizing agents
Reducing agents

10.6 Hazardous decomposition products

Carbon monoxide, carbon dioxide and unburned hydrocarbons (smoke).

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute oral toxicity	:	LD50 (Mouse): > 25,000 mg/kg
Skin irritation	:	No skin irritation (Mouse)
Eye irritation	:	No data available
Sensitisation	:	The product is a skin sensitiser, sub-category 1B. (Mouse, Local lymph node assay (LLNA), OECD Test Guideline 429)
Genotoxicity in vitro	:	not mutagenic, not genotoxic (Various test systems) In vitro tests did not show mutagenic effects
Carcinogenicity	:	No indication for carcinogenicity known.
Teratogenicity	:	not teratogenic not embryotoxic (several species)
STOT - single exposure (Acute exposure)	:	The substance or mixture is not classified as specific target organ toxicant, single exposure.
STOT - repeated exposure	:	This information is not available.
Experience with human exposure	:	RDA (Recommended Daily Allowance) 0.06 - 0.08 mg valid for adults only
Experience with human exposure: Skin contact	:	May cause skin discolorations.
Further information menadione	:	Exposure to this product may cause interaction to any person

being treated with a coagulation inhibitor (warfarin; coumarin base).

Aspiration toxicity : No aspiration toxicity classification

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish : Oncorhynchus mykiss (rainbow trout)
LC50 (96 h) > 100 mg/l
(OECD Test Guideline 203)
: LC0 (96 h) >= 100 mg/l

Toxicity to algae
menadione : Pseudokirchneriella subcapitata (green algae)
ErC50 (72 h) 0.064 mg/l
(OECD Test Guideline 201)
: NOEC (72 h) 0.0093 mg/l
(OECD Test Guideline 201)

12.2 Persistence and degradability

Biodegradability
menadione : Not inherently biodegradable.
0 % (28 d)
(OECD Test Guideline 302C)

No data is available on the product itself.

12.3 Bioaccumulative potential

Partition coefficient: n-octanol/water : log Pow ca. 11.71 (calculated value)

12.4 Mobility in soil

Distribution among environmental compartments : No data available

12.5 Results of PBT and vPvB assessment

Assessment : The substance does not fullfill the PBT criteria.

12.6 Other adverse effects

Additional ecological information : Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product : Discharge into the environment must be avoided.
Do not contaminate ponds, waterways or ditches with chemical or used container.

Do not dispose of waste into sewer.
Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging : Dispose of as unused product.
Do not re-use empty containers.

SECTION 14: Transport information

14.1 UN number

Not regulated as a dangerous good

14.2 UN proper shipping name

Not regulated as a dangerous good

14.3 Transport hazard class(es)

Not regulated as a dangerous good

14.4 Packing group

Not regulated as a dangerous good

14.5 Environmental hazards

Not regulated as a dangerous good

14.6 Special precautions for user

Remarks : Not classified as dangerous in the meaning of transport regulations.

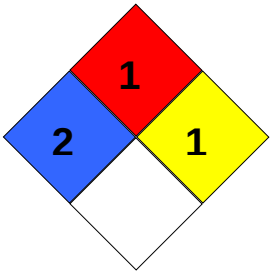
14.7 Transport in bulk according to Annex II of Marpol and the IBC Code

Not applicable for product as supplied.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

NFPA Classification : Health hazard: 2
Fire Hazard: 1
Reactivity Hazard: 1



15.2 Chemical safety assessment

A Chemical Safety Assessment is not required for this substance when it is used in the specified applications.

SECTION 16: Other information

Full text of other abbreviations

ADN - European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways; ADR - European Agreement concerning the International Carriage of Dangerous Goods by Road; AICS - Australian Inventory of Chemical Substances; ASTM - American Society for the Testing of Materials; bw - Body weight; CLP - Classification Labelling Packaging Regula-

tion; Regulation (EC) No 1272/2008; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECHA - European Chemicals Agency; EC-Number - European Community number; ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RID - Regulations concerning the International Carriage of Dangerous Goods by Rail; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; SVHC - Substance of Very High Concern; TCSI - Taiwan Chemical Substance Inventory; TRGS - Technical Rule for Hazardous Substances; TSCA - Toxic Substances Control Act (United States); UN - United Nations; vPvB - Very Persistent and Very Bioaccumulative

DNEL - Derived No-Effect Level; NFPA - National Fire Protection Association (USA); PNEC - Predicted No-Effect Concentration; STEL - Short term exposure limit; TLV-C - Ceiling Limit Value; TWA - Time Weighted Average; WEL - Workplace Exposure Limit.

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

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