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Raw material name: Polyglyceryl-4 Oleate

INCI name: Polyglyceryl-4 Oleate

CAS: 9007-48-1

Chemical classification: Glycerol ester, i.e. a polyglycerol ester of a fatty acid

Functional category: Surfactant; emulsifier; skin-conditioning agent; emollient

IUPAC name: 1,2,3-Propanetriol, homopolymer, (Z)-, 9-octadecenoate

Description: Polyglyceryl-4 Oleate is a mild, non-ionic emulsifier and surfactant frequently used in natural cosmetic formulations and products intended for sensitive and reactive skin. It is obtained by esterification of polyglycerol, composed of four linked glycerol units, with oleic acid, an unsaturated fatty acid present in numerous plant oils, including olive, sunflower and safflower oils. The resulting molecule has a pronounced amphiphilic character, allowing it to interact with both aqueous and oil phases, thereby enabling emulsion stabilisation and the dispersion of lipophilic components. In cosmetic products, Polyglyceryl-4 Oleate is used primarily as an emulsifier in water-in-oil (W/O) formulations, but it may also function as a mild surfactant and co-emulsifier in skin-cleansing preparations. It is particularly suitable for formulations in which good skin tolerance is important, including cleansing lotions and milks, children's cosmetics, preparations for sensitive and dry skin, and natural formulations without aggressive surfactants. Due to its mild action and good emollient properties, it helps maintain a pleasant skin feel after application, without pronounced tightness or dryness. In appropriately formulated products, it may also be used in preparations intended for reactive and acne-prone skin. Polyglyceryl-4 Oleate contributes to the formation of fine, stable emulsions with a smooth texture and pleasant sensory profile. It can improve the dispersion of oils and other lipophilic components, thereby supporting formulation homogeneity. It is stable under moderate pH conditions and suitable for formulations that do not require intensive heat processing. Its use contributes to skin softness and smoothness without a pronounced sticky or heavy, greasy feel.

Physicochemical properties: Polyglyceryl-4 Oleate is a viscous liquid ranging from pale yellow to golden brown, with a mild odour. It is soluble in oils and dispersible in water. With an HLB value between 4 and 6, it is suitable for water-in-oil emulsions. It is stable within a pH range of 4 to 8 and can be used without heating. Due to its plant-derived raw-material basis and the absence of PEG, it is suitable for natural and vegan cosmetic concepts, subject to the certification status of the specific commercial

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grade. It is chemically stable and biodegradable. Store in a dry, dark place at temperatures up to 25 °C.

Benefits:

- Enables stable combination of the aqueous and oil phases, helping prevent emulsion separation.
- Improves product texture, making it smooth, silky and pleasant to apply.
- Supports a pleasant moisturised skin feel through the formation of a stable emulsion.
- May act as a mild surfactant, helping remove impurities and excess sebum without disrupting the skin's natural barrier.
- Softens the skin and improves after-use feel, leaving it smooth and moisturised.

Directions for use: Polyglyceryl-4 Oleate is used as a primary emulsifier in water-in-oil formulations, where its lipophilic nature and low HLB value are optimally utilised to stabilise systems in which the oil phase is continuous. During formulation, it is generally added to the oil phase before combining it with the aqueous component. As it does not require high processing temperatures, it can also be used in sensitive, cold-process formulations. Typical use levels in emulsions range from 2% to 6%, depending on the desired texture, the proportion of the oil phase and the presence of additional emulsifiers or co-emulsifiers. In skin-cleansing products, it may be used at lower concentrations as a mild surfactant that helps dissolve and remove lipophilic impurities while preserving the skin barrier. Its compatibility with natural oils and high level of skin tolerance make it suitable for formulations intended for sensitive, dry and reactive skin, as well as products developed within natural and vegan concepts.

Natural or synthetic ingredient: Polyglyceryl-4 Oleate is a processed ingredient of natural origin. It is obtained by a chemical reaction between polyglycerol, generally produced from plant-derived glycerol, and oleic acid, an unsaturated fatty acid present in plant oils such as olive and sunflower oil. Although it undergoes chemical modification by esterification, its primary raw-material basis is plant-derived. Ethylene oxide is not used in its manufacture and the ingredient is PEG-free. It may therefore be classified as a processed ingredient of natural origin and may be suitable for natural, organic and vegan cosmetics. Compliance with ECOCERT or COSMOS requirements must be confirmed for the specific commercial grade by the supplier's documentation.

Safety of use: In 2017, the Cosmetic Ingredient Review (CIR) published a safety assessment covering polyglyceryl esters of fatty acids, including Polyglyceryl-4 Oleate.

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The assessment reviewed available toxicological data and information on irritation, sensitisation, phototoxicity and long-term safety in different cosmetic products. According to the CIR findings, Polyglyceryl-4 Oleate has a very low potential to cause skin or eye irritation, including at higher use levels. Its toxicity was assessed as negligible, and available dermal-use data did not indicate significant adverse reactions. CIR also reported that polyglyceryl esters, including Polyglyceryl-4 Oleate, were not associated with mutagenic, carcinogenic or reproductive toxicity effects. Available use data indicate concentrations generally ranging from 1% to 10%, depending on product type. Higher concentrations may be used in water-in-oil emulsions, balms and oil cleansers, while lighter formulations such as lotions may require lower levels. CIR did not identify a need to establish a specific maximum concentration, but concluded that use at customary formulation levels does not present a risk to consumer health. On the basis of the overall assessment, Polyglyceryl-4 Oleate was considered safe for use in both leave-on and rinse-off cosmetic products when formulated according to good manufacturing practice.

Suitable alternatives: Polyglyceryl-4 Oleate, Polyglyceryl-3 Oleate and Polyglyceryl-10 Oleate are esters of polyglycerol and oleic acid. Their principal difference lies in the degree of glycerol polymerisation, which directly affects emulsifying properties, the texture imparted to products and their use in formulations. Polyglyceryl-4 Oleate contains four glycerol units linked to oleic acid. It is most commonly used to stabilise water-in-oil emulsions and is known for creating rich, creamy textures with a pronounced emollient effect. Due to its good compatibility with oil phases, it is particularly useful in cleansing balms, oil gels and products intended for dry skin, where it provides a mild occlusive effect and increases formulation richness. Polyglyceryl-3 Oleate contains three glycerol units and is therefore slightly smaller and less hydrophilic than Polyglyceryl-4 Oleate. It is also used as an emulsifier in water-in-oil emulsions, but may provide a somewhat lighter texture and a less greasy skin feel. It is suitable for formulations in which a balance between moisturising performance and a non-greasy feel is required, and may be used in milky emulsions and body lotions. Polyglyceryl-10 Oleate has a substantially higher degree of polymerisation, with ten glycerol units, which gives it more pronounced hydrophilic properties. This structure makes it more suitable for oil-in-water systems, solubilising applications and self-emulsifying cleansing products, depending on the commercial grade. The differences among these emulsifiers allow formulators to select an ingredient according to the intended emulsion type, texture and sensory effect. A higher degree of polyglycerol polymerisation generally increases

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hydrophilicity, while a lower degree retains greater affinity for oil phases, directly influencing the character and intended use of the final product.

Animal testing: The substance has not been tested on animals.

GMO: Non-GMO

Vegan: Does not contain components of animal origin

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