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TECHNICAL DATA SHEET

Product Name: Polysorbate 60

INCI Name: Polysorbate 60

CAS: 9005-67-8

Chemical Classification: Sorbitan derivative

Functional Category: Surfactant ~ Emulsifier, Solubilizer

IUPAC Name: Poly(oxy-1,2-ethanediyl), α-(2-[(1-oxo-9-octadecenyl)oxy]ethyl)-ω-hydroxy-, (Z)

Description: Polysorbate 60 is a non-ionic emulsifier and solubilizer widely used in cosmetic and pharmaceutical formulations due to its ability to stabilize oil-in-water emulsions. Chemically, it is a derivative of sorbitol and stearic acid, modified with ethoxylated groups (typically 20 ethylene oxide units), which impart high hydrophilicity. This structure enables it to form and maintain stable mixtures of lipophilic components in aqueous phases. It is mild on the skin and non-irritating, making it suitable even for sensitive areas, such as the region around the eyes. In formulations, it enhances texture, prevents phase separation, and serves as a carrier for poorly water-soluble fragrances and actives. Owing to its surface-active properties, it can also improve the dermal penetration of certain actives. It is stable across a broad pH range, compatible with most ingredients, and does not interfere with preservative efficacy. Its applications include creams, lotions, body milks, serums, sunscreens, and hygiene products. It is also used in the pharmaceutical and food industries, where it is labeled as E435.

Physico-Chemical Properties: Polysorbate 60 typically appears as a yellowish to pale brown liquid. At lower temperatures, it may take on a waxy consistency. Its density ranges from approximately 1.07 to 1.10 g/cm³ at 25°C. Viscosity varies significantly with temperature, generally between 300 and 500 cP at room temperature (25°C). It is easily soluble in water and ethanol, allowing for straightforward incorporation into aqueous and alcoholic solutions. It is partially soluble in oils and other organic solvents. Its melting point is low, typically between 20°C and 25°C, becoming fully liquid at higher temperatures, which facilitates mixing and processing. Aqueous solutions of Polysorbate 60 usually have a pH between 5.0 and 7.0, suitable for most cosmetic and pharmaceutical

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applications. The ingredient is hygroscopic, meaning it can absorb moisture from the environment, so it should be stored in tightly sealed containers.

Mechanism of Action: The action of Polysorbate 60 is based on its ability to reduce surface tension between two immiscible phases - oil and water - enabling stable mixing. As a non-ionic surfactant with both hydrophilic and lipophilic parts, it positions itself at the interface between oil and water phases. Its lipophilic segment binds to oil, while the hydrophilic portion aligns toward the water phase, forming a stable interface that prevents coalescence of oil droplets and maintains emulsion homogeneity. This also facilitates dispersion of oil-based components in water, contributing to improved stability, uniform texture, and enhanced bioavailability of active ingredients in the final product.

Benefits:

- Stabilizes emulsions by preventing phase separation
- Improves product texture, giving smoothness and uniformity
- Enables solubilization of oil-based components in aqueous systems
- Enhances efficacy of active ingredients by aiding their dispersion
- Mild on the skin, suitable for sensitive formulations
- Compatible with most raw materials, stable across a wide pH range
- Aids in the dispersion of fragrances and colorants within the formulation

Usage Guidelines: In emulsion preparation, Polysorbate 60 is added to the oil phase and can be heated with other oil components to ensure full dissolution and uniform integration with the aqueous phase. It may also be added directly to aqueous solutions for solubilizing essential oils, fragrances, or other hydrophobic substances. It is suitable for both cold and hot process formulations, depending on product design. Typical usage concentrations vary by product type and intended function:
In creams and lotions: 0.5% to 5%
In shampoos and conditioners: 0.5% to 3%
For solubilizing fragrances and essential oils: 1% to 10%
In microemulsions and serums: 1% to 10%, depending on formulation goals

Natural or Synthetic Origin: Polysorbate 60 is a synthetic ingredient. It is produced via chemical modification of sorbitan monostearate (derived from natural sorbitol and

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stearic acid) through ethoxylation, in which approximately 20 ethylene oxide units are added to the molecule. Although the starting materials may be of plant origin (e.g., stearic acid from vegetable oils), the final product is the result of industrial synthesis and is not considered a natural ingredient under standards for natural and organic cosmetics (e.g., COSMOS, NATRUE).

Animal Testing: Not tested on animals

GMO Status: Non-GMO

Vegan: Contains no animal-derived components