Stabilizing Vitamin C: L-Ascorbic Acid vs Lipophilic & Ethyl Esters (Engineering Review 2020)

Por Cristiano Ricardo · Publicado em 19/02/2020

Technical dermocosmetic engineering lecture by Prof. Cristiano Ricardo on stabilizing vitamin c: l-ascorbic acid vs lipophilic & ethyl esters (Antioxidant Chemistry & Dermocosmetic Formulation), featuring colorful schematic diagrams and clinical data.

Versão online e eventuais atualizações:
https://professor.cristianoricardo.com/post/stabilizing-vitamin-c-l-ascorbic-acid-vs-lipophilic-ethyl-esters-2020-02-19

Antioxidant Chemistry & Dermocosmetic Formulation · Cosmetic Engineering & Science

Formulating unoxidized, bioavailable L-Ascorbic Acid requires strict pH regulation and stabilization co-antioxidants.

Engineering Mechanism & Kinetic Flowchart

L-Ascorbic Acid (Pure)
? pH < 3.5 mandatory (Duke Eq)
? Rapidly oxidizes to Dehydroascorbic
Requires Ferulic + Vitamin E

Tetrahexyldecyl (THD)
? Lipid-Soluble (Oil Phase)
? Stable at Neutral pH (~ 6.0)
Deep Cellular Membrane Affinity

The Duke Formulation Parameters

Unmodified L-Ascorbic Acid (pKa 4.2) requires an aqueous formulation pH < 3.5 to keep the molecule unionized for passive stratum corneum absorption. Adding 0.5% Ferulic Acid and 1.0% Alpha-Tocopherol increases photoprotective efficacy eight-fold via synergistic free-radical scavenging.

Lipophilic Tetrahexyldecyl Ascorbate (THD)

THD is a tetra-esterified, oil-soluble precursor that seamlessly crosses lipid membranes, undergoing intracellular enzymatic cleavage into ascorbic acid without the erythema associated with low-pH water serums.

Tyrosinase Inhibition & Melanogenesis Regulation

Ascorbate inhibits cutaneous hyperpigmentation by chelating copper ions at the catalytic site of tyrosinase, while simultaneously reducing dopaquinone back into L-DOPA.

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