Next-Generation Broad-Spectrum Photoprotection & HEV Blue Light Shielding (Engineering Review 2020)

Por Cristiano Ricardo · Publicado em 27/02/2020

Technical dermocosmetic engineering lecture by Prof. Cristiano Ricardo on next-generation broad-spectrum photoprotection & hev blue light shielding (Photobiology & Photoprotective Technology), featuring colorful schematic diagrams and clinical data.

Versão online e eventuais atualizações:
https://cristianoricardo.com/post/next-generation-broad-spectrum-photoprotection-hev-blue-light-shielding-2020-02-27

Photobiology & Photoprotective Technology · Cosmetic Engineering & Science

Modern sunscreen engineering extends beyond UVB erythema to tackle long-wave UVA1 photoaging and high-energy visible light.

Engineering Mechanism & Kinetic Flowchart

UVB
290-320 nm

UVA II / I
320-400 nm

HEV Blue
400-500 nm

IR-A
760-1440 nm

Photostable Polymeric UV Filters

Modern organic filters such as Bis-Ethylhexyloxyphenol Methoxyphenyl Triazine (Tinosorb S) and Methylene Bis-Benzotriazolyl Tetramethylbutylphenol (Tinosorb M) exhibit superior photostability, dissipating absorbed photons without decomposing into photo-allergenic radicals.

Mineral Filter Micronization & Surface Functionalization

Zinc Oxide (ZnO) and Titanium Dioxide (TiO2) nanoparticles are coated with triethoxycaprylylsilane, silica, or alumina to suppress surface photocatalytic activity,

preventing lipid peroxidation of formulation oils.

Iron Oxide Pigment Blends against HEV Melasma

In Fitzpatrick phototypes III–VI, high-energy visible blue light (400–500 nm) induces sustained hyperpigmentation via opsin-3 photoreceptors. Surface-treated yellow, red, and black iron oxides provide the only clinically validated barrier against HEV radiation.

Prof. Cristiano Ricardo

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