ECKART

LignoBase

The first upcycled ingredient line that transfers the multifunctional properties of lignin into cosmetic formulations

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LignoBase, a new sustainable multifunctional line for the beauty industry

LignoBase is a natural multifunctional cosmetic ingredient line from sustainably sourced plants that simplifies the color formulation of skin tones and different brown undertones for multiple cosmetic formulations. Each LignoBase offers a soft skin feeling with a mattifying effect and oil absorbing properties, while their unique polyphenolic molecular structure provides multiple cosmetic functionalities such as skin protection against free radicals, antioxidant activity in the formulation and an SPF boosting effect. Derived from ethically sourced non-food competition biomasses, and using our patented transformation process that preserves the natural properties of its lignin of origin, each **LignoBase is a natural, safe and sustainable first-of its-kind ingredient.**

Innovation meets circularity for a new cosmetic ingredient

Lignin is one of nature's most abundant polymers found in a wide variety of plants. Although lignin is widely considered a waste product, several researchers have been studying it in recent years for its amazing properties and how it might be used in high-value applications. Until now, this multitalented material has not received the attention it deserves due to its sturdy nature and challenging processability. However, this is about to change, thanks to **Lignopure's patented particle technology** that enables the upcycling of crude lignin into a fine-tuned micro powder ready to be used in personal care and color cosmetic applications.

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Lignopure’s sustainability commitment

As individuals and as a company, the increasing concerns for our planet and environment are more than a trend for us at Lignopure. Our commitment to a traceable and ethical supply chain and sustainability throughout our processes is rooted in all that we do and who we are.

We strongly believe that without traceability, there is no real sustainability. **Our focus is on both ends, sustainable sourcing of upcycled materials as well as positive environmental impact and beneficial impact of our products on customers.** We are therefore strongly committed to ensuring that any product containing LignoBase will have no negative impact on the environment and its biodiversity long after the product’s useful life has ended. To ensure the quality of our lignin, we have a socially and environmentally conscious supplier selection process that follows strict regulations to offer safe, sustainable and functional bio-based lignin solutions to the cosmetic industry.

BIOMASS ASSESSMENT
To ensure not only that all our biomasses are derived from non-endangered species, but also that they are of the highest quality and free from harmful materials.

SUPPLY ASSESSMENT
To ensure that our suppliers work with high quality and ethical standards across their entire supply and manufacturing chain.

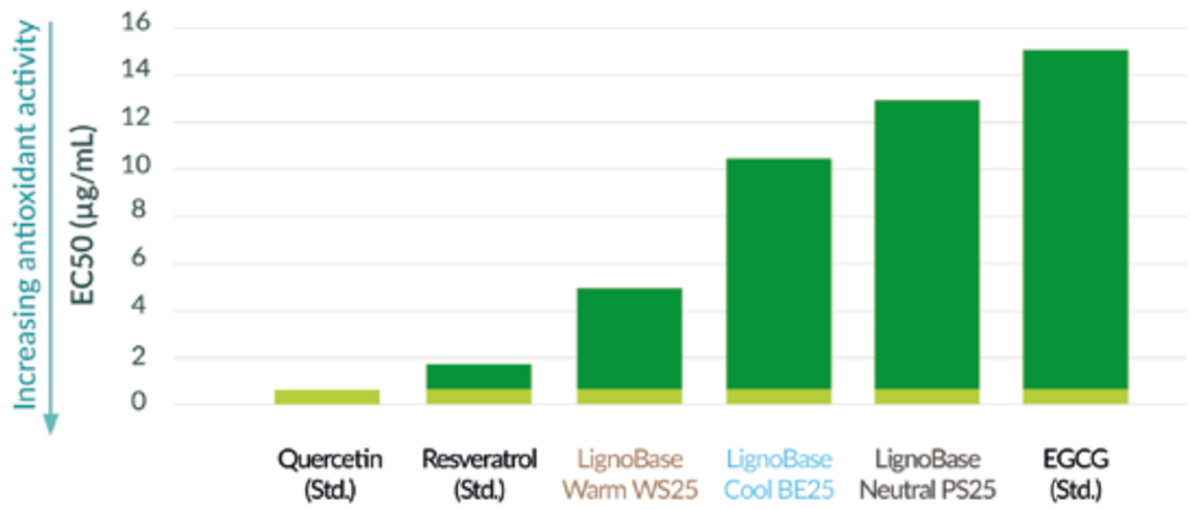
IMPACT ASSESSMENT
To ensure not just the safety and benefits of our ingredients for consumers, but also for all ecosystems above and below water at the end of a product’s useful life.

A natural antioxidant for skin protection and formulation stability

LignoBase's natural polyphenolic structure, with multiple proton-donating functional groups, makes it a powerful active with free radical scavenging properties. Therefore, this novel ingredient **protects skin cells from harmful oxidative stress and acts as a natural antioxidant system for formulations** by stabilizing actives and other ingredients prone to oxidation.

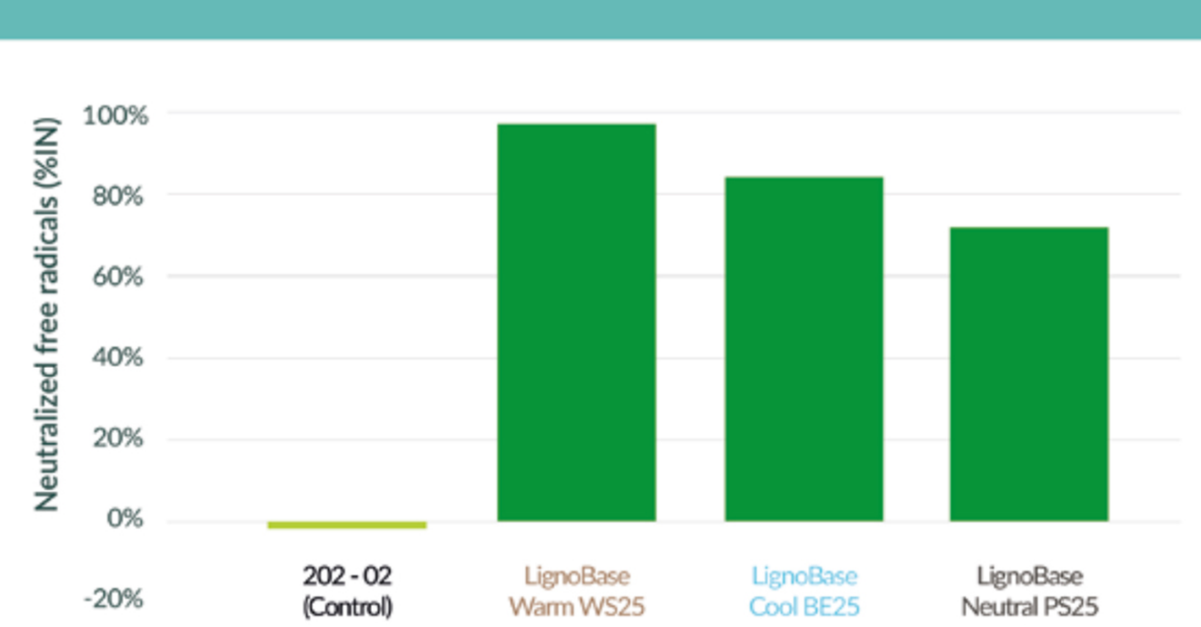
To confirm LignoBase's antioxidant activity on skin cells, the neutralization of intracellular Reactive Oxygen Species (ROS), including the free radical species superoxide anion (O2•-) and hydroxyl radical (OH•), generated by a photoinduction process was measured in human keratinocytes (HaCaT). The results showed that LignoBase demonstrated **a full antioxidant effect in human keratinocytes, being competitive with the standard Epigallocatechin gallate.**

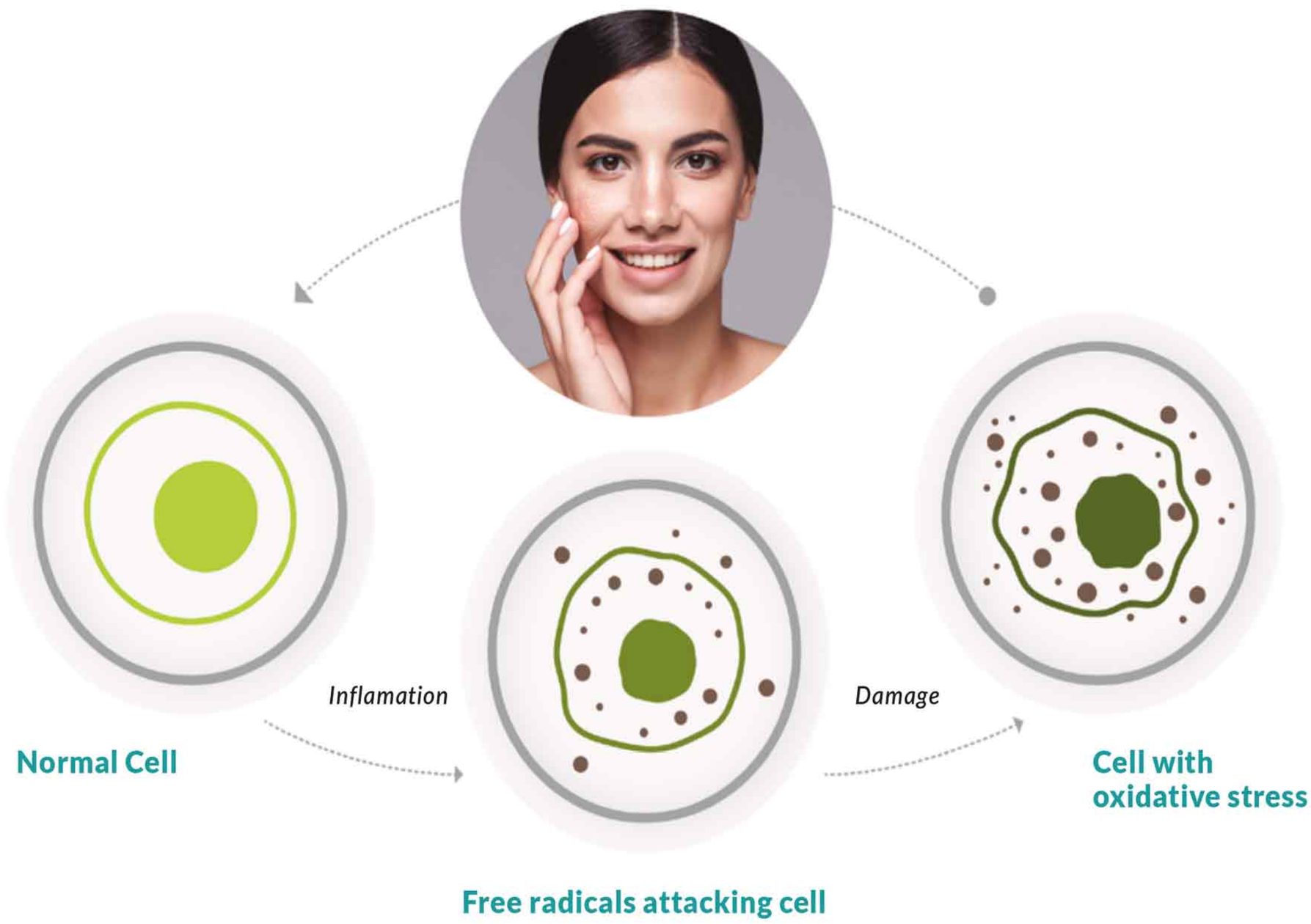
LignoBase intracellular antioxidant activity in human keratinocytes (HaCaT)



What's more, **with the addition of 5% LignoBase, a regular O/W cream neutralized 70-98% of intracellular free radicals produced by human keratinocytes** in culture.

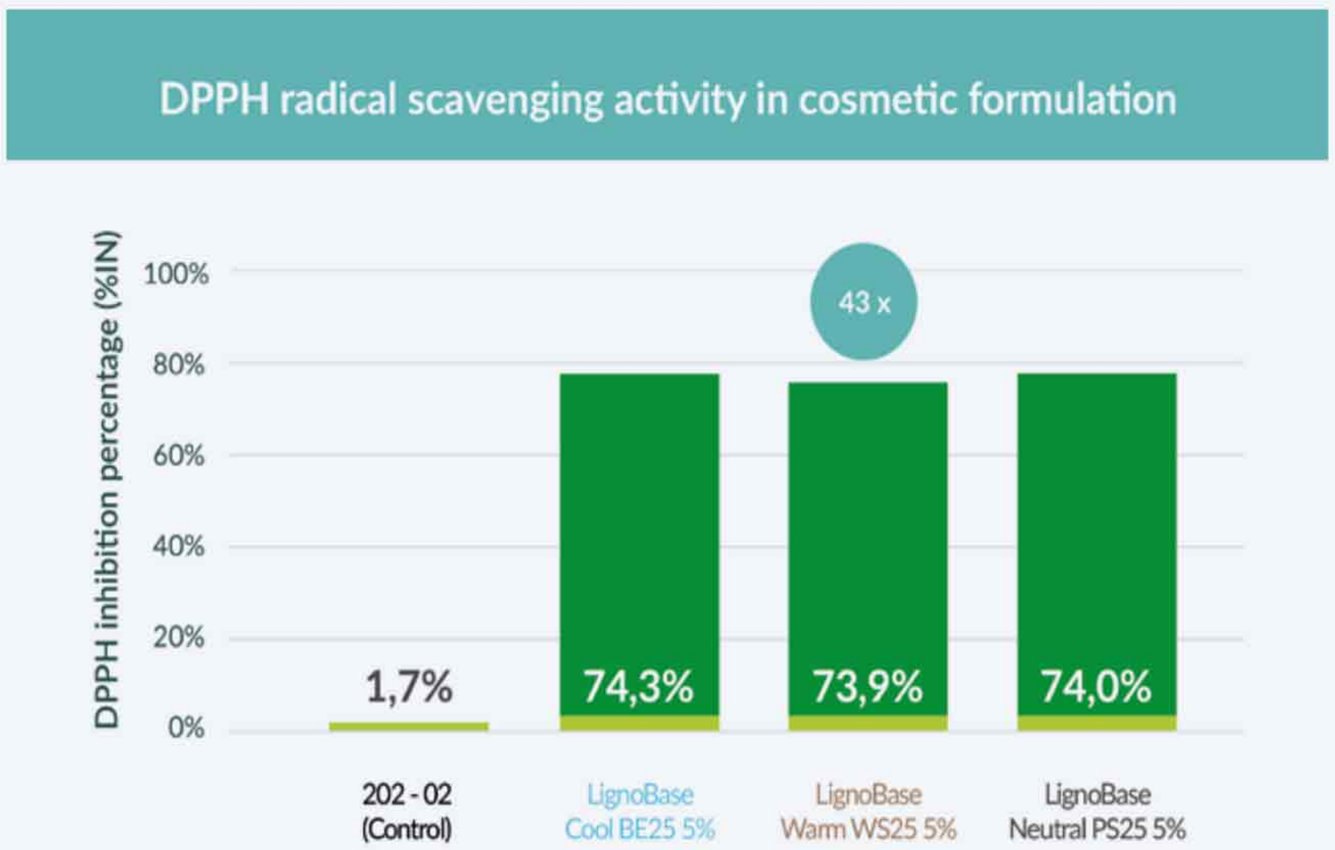
Neutralization of intracellular free radicals in human keratinocytes (HaCaT) in O/W formulation





Visible antioxidant activity

LignoBase's **antioxidant activity in the formulation** was confirmed by a DPPH radical scavenging test. The methodology allows the test product to react with a stable radical, 2,2-Diphenyl-1-picrylhydrazyl (DPPH) in methanol solution. The inhibition of the DPPH radical is followed by monitoring the decrease in its absorbance at 517 nm after 30 min of reaction. Upon reduction by an antioxidant, the absorption at this wavelength disappears. According to the DPPH radical scavenging test, all three types of LignoBase increased the **antioxidant activity** of an O/W multifunctional cream containing 5% LignoBase up to 43 times compared to the control.



A new upcycled ally to optimize photoprotection

LignoBase has a unique combination of properties that optimize the performance of mineral and chemical-based sun care products. Its **photo-stabilizing, radical quenching properties help to stabilize the UV filter system, while its film-forming capacity allows an even dispersion of the UV filters to protect the skin.** In addition, its scattering microparticles boost the photoprotective efficiency by increasing the optical path length of the UV rays before reaching the skin.

To demonstrate its photoprotection boosting capacities, the in vitro SPF of mineral and chemical-based sun care and daily care products containing LignoBase was determined according to an adjusted Diffey and Robson (1989)/ISO 24443:2012 methodology.

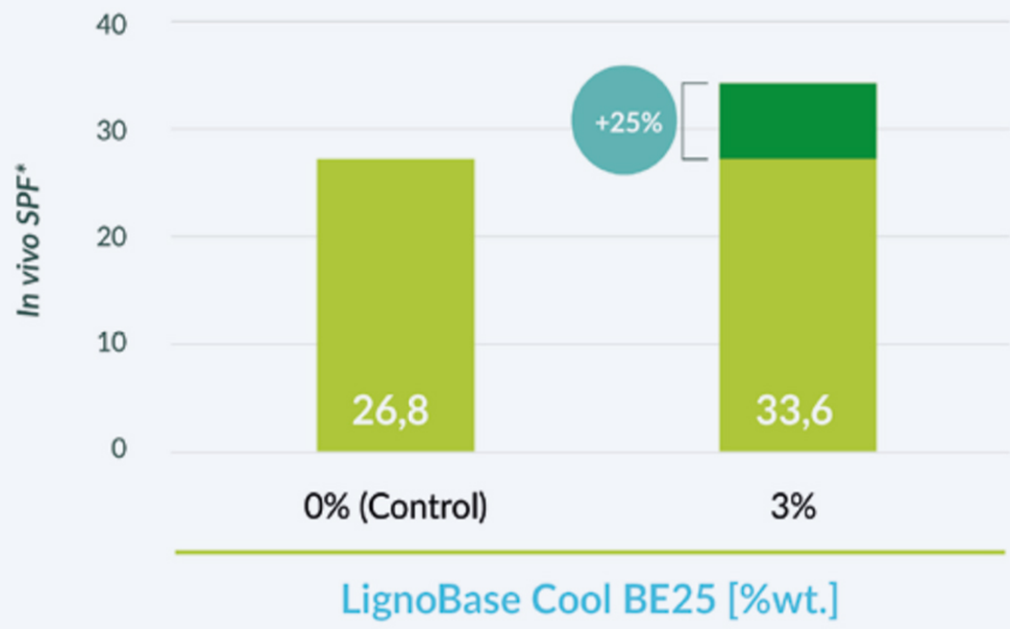
The protocol determines SPF based on the absorbance of UV light by its passage through a roughened PMMA plate coated with the sunscreen product. The in vitro SPF is computed from the ratio of the amount of light transmitted through the plate wetted with glycerol and the test product applied in the range of 290 to 400 nm, the erythemal action spectrum and a reference solar spectrum.

According to the adjusted Diffey and Robson (1989)/ISO 24443:2012 methodology, **incorporation of LignoBase at a 5% concentration into mineral and chemical-based sun care formulations showed a 35-75% boosting effect in their in vitro SPF.**

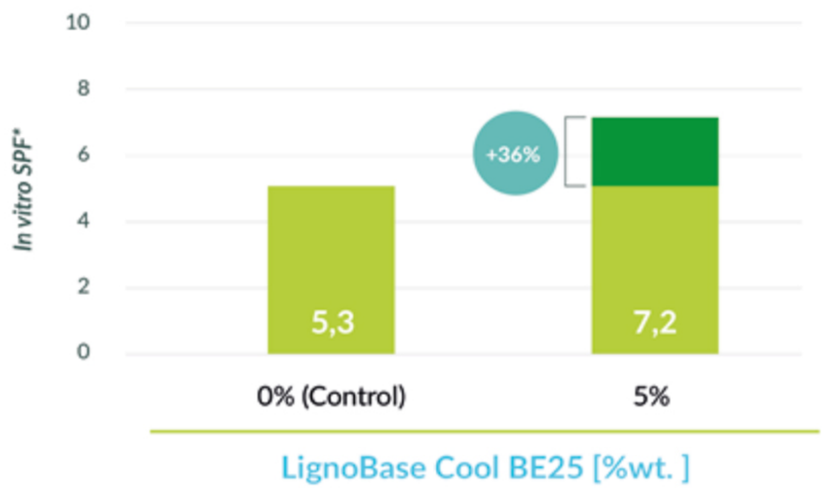
A natural SPF booster

Moreover, the **sun protection factor of a mineral-based sunscreen containing LignoBase Cool BE25** was confirmed **in a panel of 13 healthy human subjects** after application under controlled conditions using the non-invasive LED HDRS method. In this method, spectrally resolved diffuse reflectance (DRS) measurements can be carried out on the skin for cosmetic purposes. To this end, the spectrum of several UV LEDs is emitted in the range of 290 to 400 nm and the reflectance is detected at several points by means of fiber optics. This methodology combines the in vitro spectrum in UVB with the in vivo spectrum in UVA. In this way, a hybrid spectrum for transmission is calculated and used to determine the SPF in accordance with ISO 24443. Based on the LED HDRS methodology, the incorporation of 3% of LignoBase Cool BE25 **significantly boosted the SPF** of a commercial **mineral-based sunscreen by 25% in human subjects.**

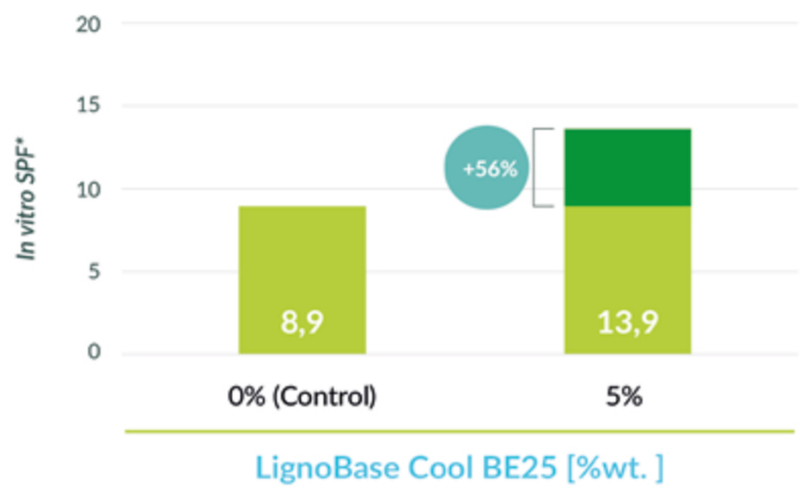
SPF of commercial mineral sunscreen in human subjects



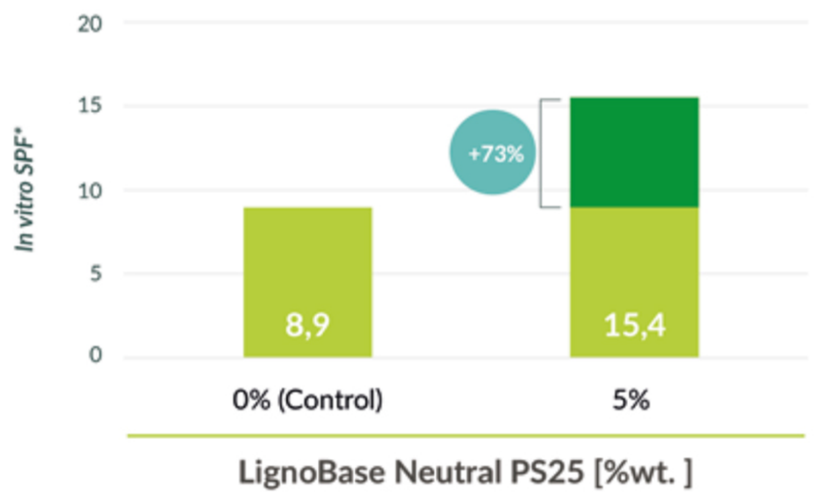
In vitro SPF* in commercial mineral sunscreen



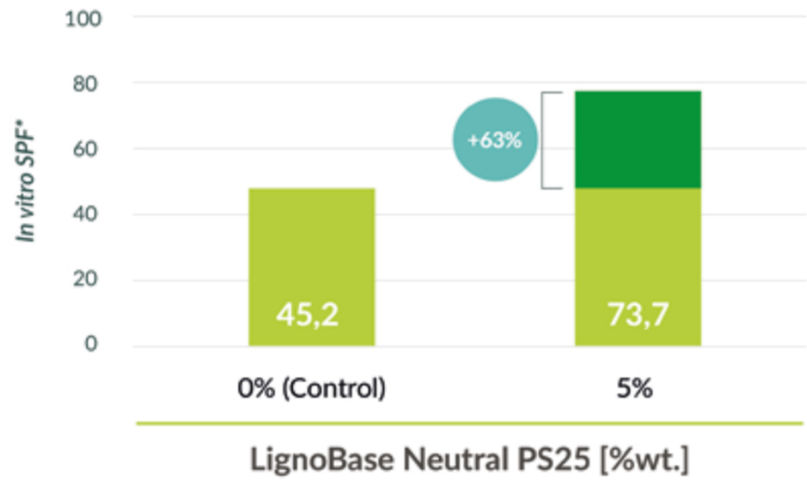
In vitro SPF* in commercial chemical sunscreen



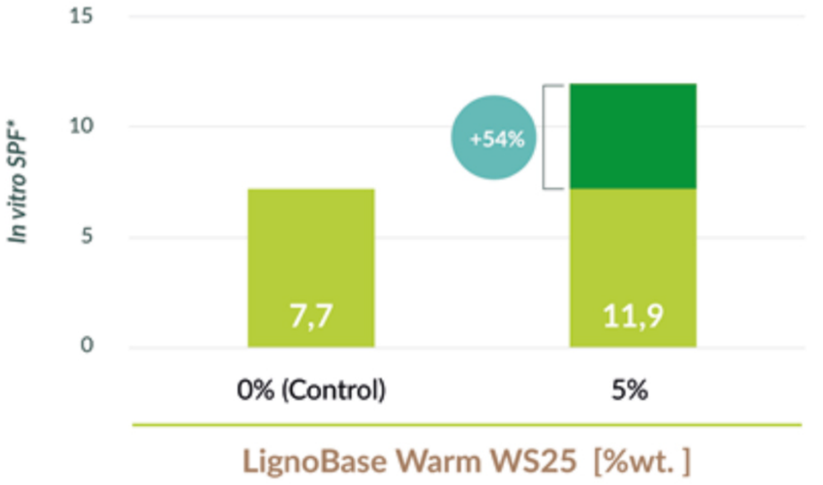
In vitro SPF* in commercial chemical sunscreen



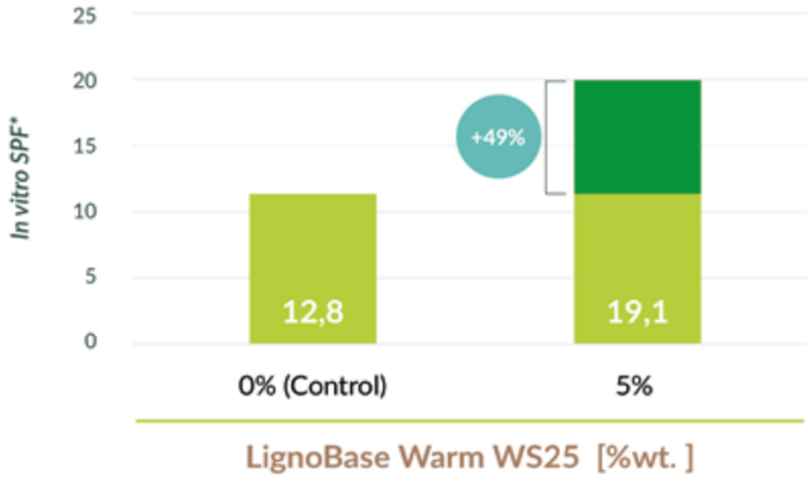
In vitro SPF* in in-house developed mineral sunscreen



In vitro SPF* in commercial mineral sunscreen



In vitro SPF* in commercial chemical sunscreen



Natural color

LignoBase's natural brown tones **simplify the color formulation for many cosmetic applications.** Each LignoBase variant has a distinctive undertone, which is key to meeting the demand for inclusive products for diverse ethnicities. The formulation's coverage and color intensity can be adjusted with the addition of white pigments and the amount of LignoBase used. In this way, the need to use yellow, red and black iron oxide mixtures can be reduced or avoided in products like tinted sun care, makeup, tinted multifunctional creams, mascaras, and eye shadows, among other formulations.

Additional benefits

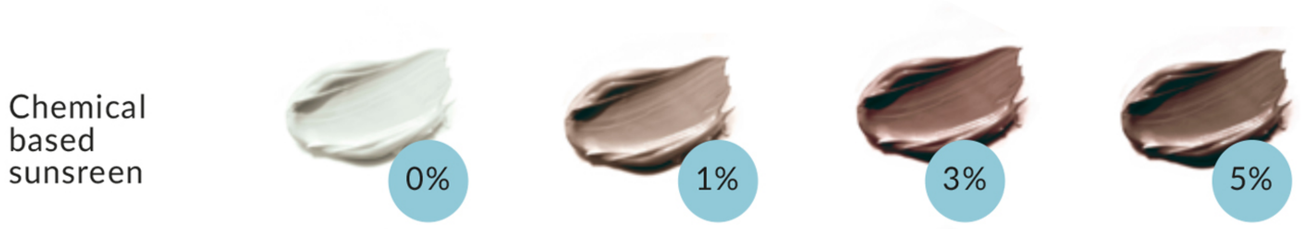
Reduction of the white cast effect typical of mineral sun care formulations.

Subtle rinse-off bronzing effect in formulations without intended coverage.

Soft and smooth skin feel.

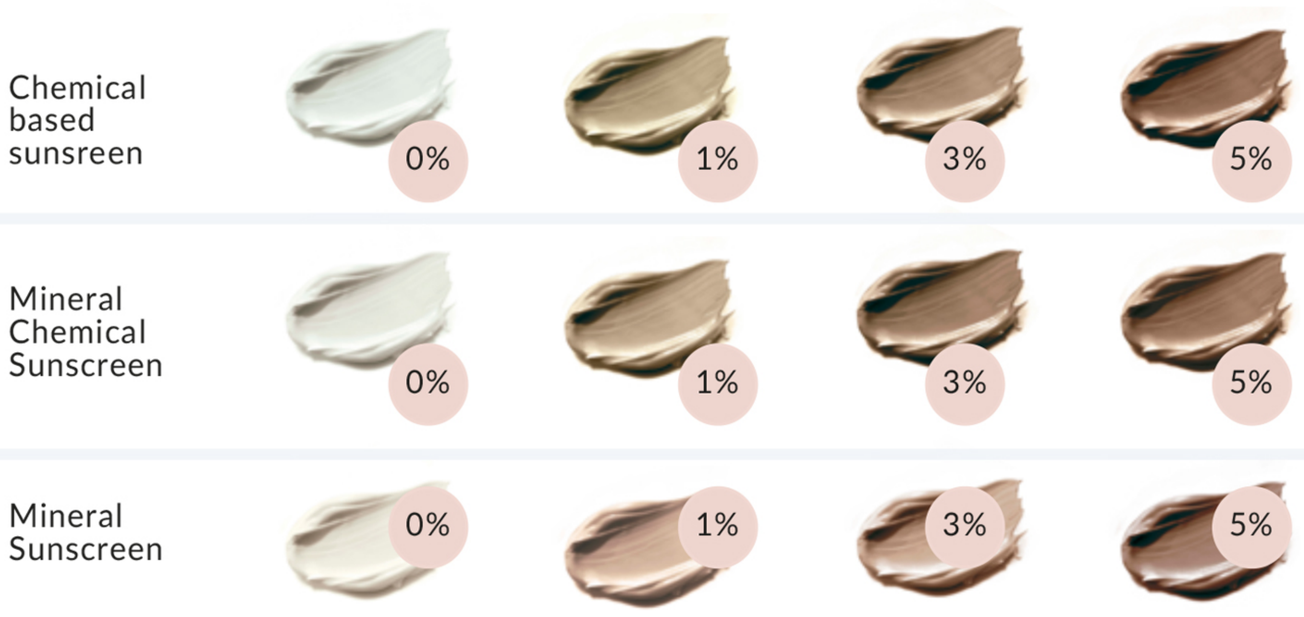
Matte finish and soft-focus effect.

LignoBase™ Cool BE25



LignoBase™ Neutral PS25

LignoBase™ Warm WS25

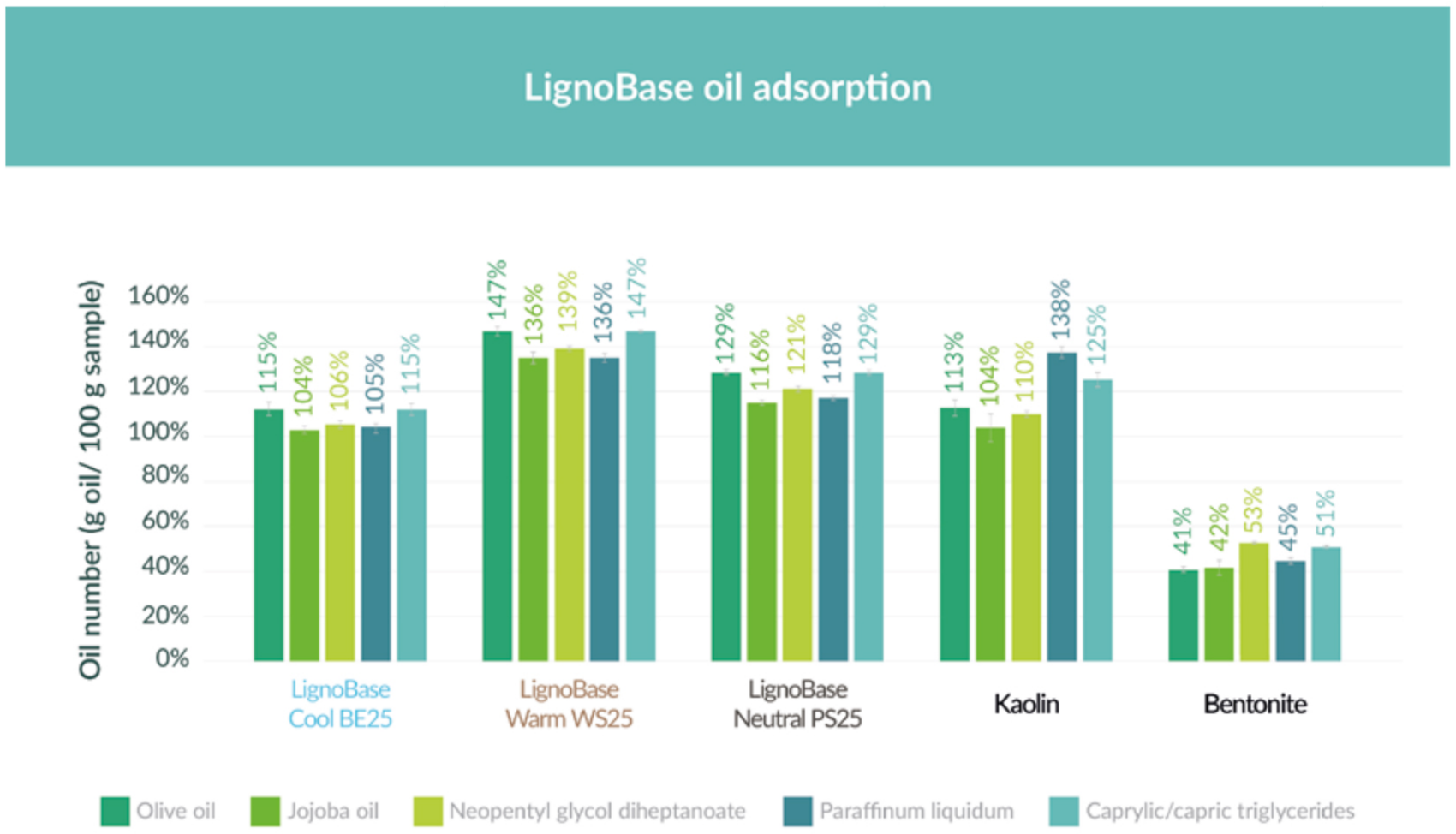


Shades might vary due to printing process.

Oil Adsorption

LignoBase has hydrophobic functional groups as well as an optimized particle size and surface area that give it oil control and mattifying properties, making it a competitive ingredient for cosmetic applications. To demonstrate its oil adsorption capacity, the oil number (g oil/100 g sample) was determined for each LignoBase and was compared to two conventional oil adsorbing clays, kaolin and bentonite, according to DIN-ISO-787/5. Oils with a different chemical composition, polarity and origin were tested.

The results showed that all LignoBase variants can adsorb more than 100% of their weight for all tested oil types. Moreover, **LignoBase had an equal or higher oil adsorption capacity than Kaolin and more than twice the oil adsorption capacity compared with that of Bentonite.** Particularly, LignoBase showed higher adsorption values for oils rich in triglycerides (found in olive oil and caprylic/capric triglycerides) and wax esters (found in jojoba oil), which are major components of skin lipids, in contrast to Kaolin, which displays a higher adsoption for mineral oil (paraffinum liquidum).



Summary

	LignoBase™ Cool BE25	LignoBase™ Neutral PS25	LignoBase™ Warm WS25
INCI	**Betula Pendula Wood Extract**	**Lignin/Cellulose**	**Lignin/Cellulose**
Biomass of origin (scientific name)	Birch *(Betula Pendula)*	Pine and Spruce *(Pinus Sylvestris and Picea Abies)*	Wheat straw and Munj sweetcane bagasse *(Triticum aestivum L. and Saccharum bengalense)*
Appearance	Fine powder	Fine powder	Fine powder
Color	Brown, red undertone	Brown	Brown, yellow undertone
Odor	Neutral to mild woody	Neutral to mild woody	Mild woody, aromatic
Moisture content	Max. 3%	Max. 3%	Max. 3%
Particle size (D90)	Max. 25 µm	Max. 25 µm	Max. 25 µm
pH (10% aq. susp.)	5-7	5-7	3-5

Recommended use level		
3 - 5%	sun care applications
1 - 10%	color cosmetics
1 - 5%	antioxidant protection

Claims:
Antioxidant, SPF boosting, photoprotection optimization, natural color, mattifying effect, smooth feeling, soft-focus effect, oil adsorption.

Applications:

Skin care, sun care, color cosmetics, eye/eyelash/eyebrow color cosmetics, hair care, anti-aging products.

Nayoga compliant

Natural

COSMOS APPROVED

Upcycled biomass

Made in Germany