SOLAPURE™ GLO

All-natural multifunctional emollient leveraging turmeric's wellness benefits to enhance sun protection efficacy and promote skin wellbeing

HALLSTAR BEAUTY

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The sun care regulatory landscape is changing fast. In every region around the world, the list of permitted UV filters is becoming increasingly shorter, and several traditional sunscreen ingredients are disappearing from new sun care launches altogether. The rise of mineral sunscreens is a clear response to this trend, but formulating safe, effective and elegant sun care with only inorganic filters requires additional multifunctional ingredients. Ensuring excellent performance while maintaining a clean profile is the challenge met by multifunctional emollient SolaPure™ Glo. In developing SolaPure™ Glo, Hallstar Beauty was inspired and guided by nature – and more specifically by the inherent wellness benefits of turmeric (curcuma longa (turmeric) root extract). The curcuminoids found in turmeric plants boast anti-inflammatory, antioxidant and anti-microbial properties, and can reduce the ROS production that leads to oxidative skin damage. SolaPure™ Glo is a holistic sun care solution that leverages turmeric's benefits to improve sun protection's SPF and PFA performance, control hyperpigmentation and promote overall skin wellbeing. It can be used in any cosmetic formulation to provide youthful radiance and glow.

REGULATORY AND MARKET TRENDS

Sun care brands are looking for solutions to meeting performance requirements in the face of increasing regulation. With the recent banning of traditional UV filters like oxybenzone, oxycrylene and octinoxate from sunscreen formulation, developers have more limited ingredient options, especially if they want to create high SPF products with pleasant sensoriality at a reasonable price. Brands are also reacting to consumers' desire for sun care that is multifunctional, effectively shortening their skin care regimen.

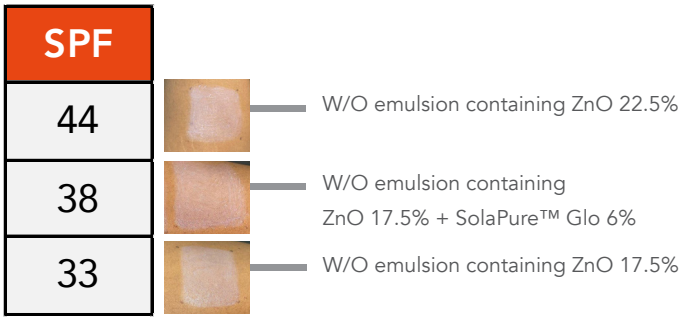
ENHANCE SUN PROTECTION EFFICACY

Higher ZnO levels provide increased SPF/PFA performance but result in increased skin whitening. Replacing 5.0% ZnO with the recommended use level of SolaPure™ Glo restores half the SPF loss, improves skin feel and maintains the decreased whitening benefits of lower ZnO concentration.

Products	JZ14-187	JZ14-189	JZ14-188
Biochemica® Olive Oil	35.00	34.00	34.00
Biochemica® Palm Butter	—	—	6.00
Olivem® 2090	4.00	4.00	4.00
Zinc Stearate	1.00	1.00	1.00
Zinc Oxide	**22.50**	**17.50**	**17.50**
SolaPure™ Glo	—	6.00	—
Silica	2.00	2.00	2.00
Glycerin	2.00	2.00	2.00
Water	q.s.	q.s.	q.s.
Sodium Chloride	1.00	1.00	1.00
Preservative	—	a.n.	a.n.
SPF *in vivo*, 3 subjects	**44.3**	**38.6**	**33.0**
Colipa 2011, PFA (*in vitro* SPF)	15	15	12
Critical Wavelength, nm	372	372	372
UVA1/UV	0.83	0.83	0.83

TECHNICAL DATA

- INCI name: Vegetable Oil, Simmondsia Chinensis (Jojoba) Seed Oil, Curcuma Longa (Turmeric) Root Extract
- Oil soluble
- Appearance: pale yellow to dark yellow solid
- Recommended: 5 – 6%
- COSMOS-approved
- ISO 16128 NI/NOI: 1/1



Formula	Actives	*in vivo* SPF	*in vitro* PFA	SPF Change	PFA Change
Mineral W/O	ZnO 17.5% (JZ14-188)	33	12	+15%	+25%
	ZnO 17.5% + SolaPure™ Glo 6% (JZ14-189)	38	15		

In regulatory restricted markets such as the U.S., a limited number of organic UV filters are permissible for sun care formulation development. This restriction of organic UV filters makes it nearly impossible to obtain SPF 30 or higher in sun care formulations without the use of critical performance aids.

JZ14-62-	1	2
Ethylhexyl Salicylate [Octisalate]	5.00	5.00
Homosalate [Homosalate]	10.00	10.00
SolaStay® S1	3.00	3.00
HallBrite® BHB	5.00	5.00
IPM	7.00	2.00
Acrylates/Dimethicone Copolymer	2.00	2.00
Butyl Methoxydibenzoylmethane [Avobenzone]	3.00	3.00
SolaPure™ Glo	—	**5.00**
Water (Aqua)	53.80	53.80
Glycerin	8.00	8.00
Xanthan gum	0.15	0.15
Preservative	1.00	1.00
Disodium EDTA	0.05	0.05
Olivem® 2020	2.00	2.00
Total	100.00	100.00

The following tests proved that the inclusion of 5.0% SolaPure™ Glo in a base organic oil-in-water system improved SPF and PFA performance when compared to the base organic o/w system alone. *In vivo* SPF testing was conducted in compliance with the regulatory requirements set forth by the FDA (U.S. Food and Drug Administration) Final Rule 2011. *In vitro* PFA testing was conducted through the analysis of HD 6 plates with UV2000S UV Transmittance Analyzer (Labsphere, Inc.).

O/W Organic Filter Formulation	Actives	*In vivo* SPF	*In vitro* PFA
JZ14-62-1	Organic 18%	29	13
JZ14-62-2	Organic 18% SolaPure™ Glo 5%	39 +34%	17 +31%

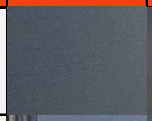
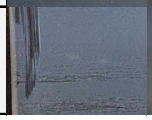
In organic systems, SolaPure™ Glo improves sun protection efficacy without the need to increase UV filter concentration.

Global regulations for inorganic UV filters are largely similar across global regions when it comes to maximum usage levels. These inorganic filters align with the clean and natural trend, as zinc oxide and titanium dioxide are sustainable, inert and derived from mineral sources. Of the two, zinc oxide is often the more sought-after mineral UV filter because it provides UVA/UVB protection, is globally acceptable, and has a lower refractive index – which means that it is the more transparent option of the two by weight.

JZ14-	126	121-1
Zinc Oxide	25.00	20.00
SolaPure™ Glo	—	**6.00**
Dispersun DSP-OL 100	0.60	0.80
HallStar® Zinc Stearate	2.50	2.50
Biochemica® Sweet Almond Oil	28.00	—
Biochemica® Olive Oil	—	19.00
Olivem® 2090	3.50	4.00
Xanthan Gum	0.20	0.20
Glycerin	3.00	8.00
Water (Aqua)	33.20	36.50
Magnesium Sulfate	1.50	2.00
Preservative	1.00	1.00
Silica	1.50	—
Total	**100.00**	**100.00**
SPF *in vivo*, 3 subjects	**39**	**36**
Colipa 2011, PFA (*in vivo* SPF)	**11**	**10**
Critical wavelength, nm	**371**	**370**
UVA1/UV	**0.82**	**0.80**

However, zinc oxide needs a relatively high use level (20-25%) to achieve an SPF of 20-40 and, at this percentage, formulators will need to combat the resulting whitening effect and chalky skin feel. SolaPure™ Glo leverages the phytoconstituents present in turmeric to enable higher SPF and PFA performance with less zinc oxide, which means reduced whitening and a smoother formulation texture for consumers.

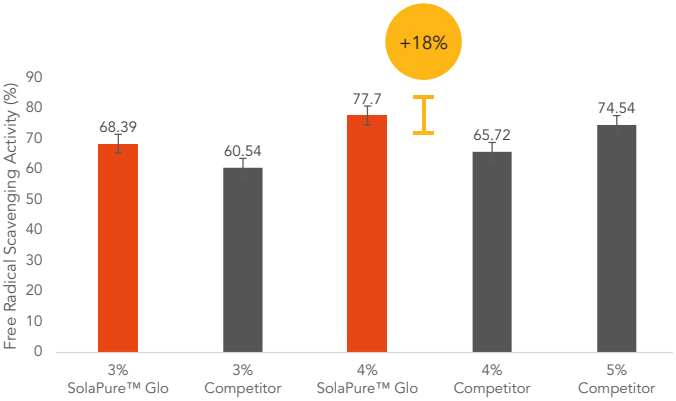
To demonstrate this benefit, whitening films were prepared with 10-micron film thickness using a draw down bar.

W/O Mineral Filter Formulation	Actives	*In vivo* SPF	*In vitro* PFA	Whitening	Texture
JZ14-121-1	ZnO 20% + SolaPure™ Glo 6%	36	10		
JZ14-126	ZnO 25%	39	11		

By enabling a reduction of ZnO, sun care using SolaPure™ Glo is less whitening and has a smoother texture.

Protection from environmental stressors

Antioxidants complement the benefits of sun care products by helping to defend against the free radical damage that accompanies UV exposure. Free radicals are highly active and unstable molecules that can trigger a reaction of inflammation and skin damage, leading to premature skin aging. A DPPH antioxidant assay was performed to evaluate the free radical scavenging activity of SolaPure™ Glo compared to a leading competitor material containing argania spinosa kernel oil and tocopheryl acetate and bisabolol. Both 3% and 4% SolaPure™ Glo show higher free radical scavenging activity (measured by DPPH) than 3% and 4% of the competitor product. At 5% SolaPure™ Glo, free radical quenching was activated faster than the experimental time window allowed.

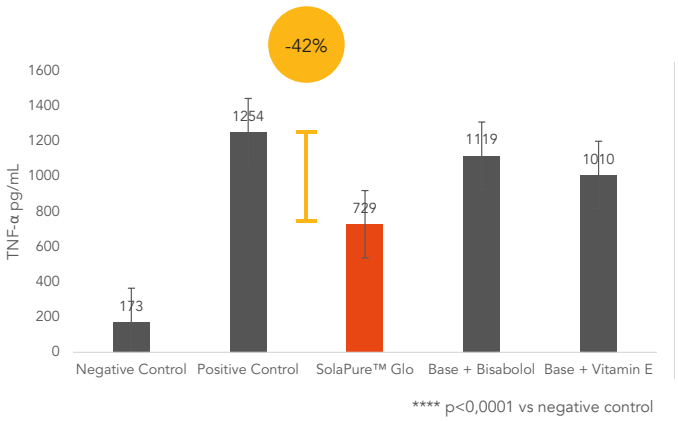


SolaPure™ Glo is highly efficient at quenching free radicals.

Anti-inflammatory properties

Inflammation is mainly characterized by the secretion of proinflammatory cytokines such as TNF-α, IL-6. A compound with anti-inflammatory properties decreases these pro-inflammatory cytokines secretions. Inflammation is a driving force of the skin aging process and is one of the first responses of the immune system to UV radiation, pollution or stress, SolaPure™ Glo has the potential to alleviate skin inflammation at the source.

An *in vitro* TNF-α inflammation assay was performed to analyze the ability of SolaPure™ Glo to deliver anti-inflammation benefits. SolaPure™ Glo is the only sample that showed significant reduction compared to the Positive Control.

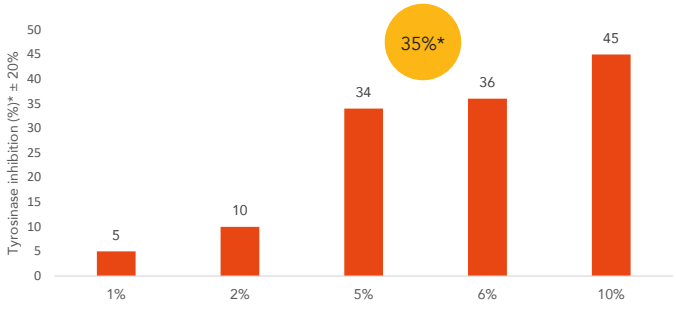


**** p<0,0001 vs negative control

SolaPure™ Glo reduces the inflammatory response by 42%.

Tyrosinase inhibition for improved skin tone

SolaPure™ Glo diminished tyrosinase activity in a dose-dependent manner and up to 45% indicating its potential to decrease melanin synthesis.



* 35% Inhibition at recommended use levels

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