SUNSPHERES™ SPF Boosters

Highly Effective SPF Boosters with Excellent Product Feel for Sunscreens

Description

Hollow styrene/acrylic copolymer spheres approximately 350 nm in diameter for enhancing UV protection.

SUNSPHERES PGL is supplied as 25.5% solids emulsion.

SUNSPHERES Powder is supplied as white, non-dusty, flowable powder (90% active).

INCI Name: Styrene/Acrylates Copolymer

Advantages

- Significantly boosts SPF for any given active level and across entire UVA and UVB regions
- Excellent compatibility with both organic and inorganic UV actives
- Compatible with all commonly used sunscreen ingredients
- Microspheres impart silky feel in sunscreens
- Liquid and powder versions are easy to formulate with and handle

Applications

- Daily wear products with UV protection
- Moderate protection sunscreens (SPF 15)
- High protection sunscreens (SPF >25)

Recommended Use Levels

1.0% to 5.0%, solids basis

Regulatory Status

- In the United States, SUNSPHERES SPF Boosters are inert by definition, do not impart SPF at levels up to 5.5%, and are, therefore, not regulated as a sunscreen active
- In Europe, SUNSPHERES SPF Boosters conform to EINECS regulations
- In Japan, SUNSPHERES Powder is permitted according to the 1998 CLS ingredient code 522011.

Storage and Handling

SUNSPHERES PGL is supplied as a 25.5% solids emulsion with a maximum viscosity less than 100 cps at room temperature (25°C). The recommended storage temperature for this material is 5°C to 35°C. Keep from freezing. If exposed to temperatures below 5°C and above 35°C for extended periods, material may become unusable.

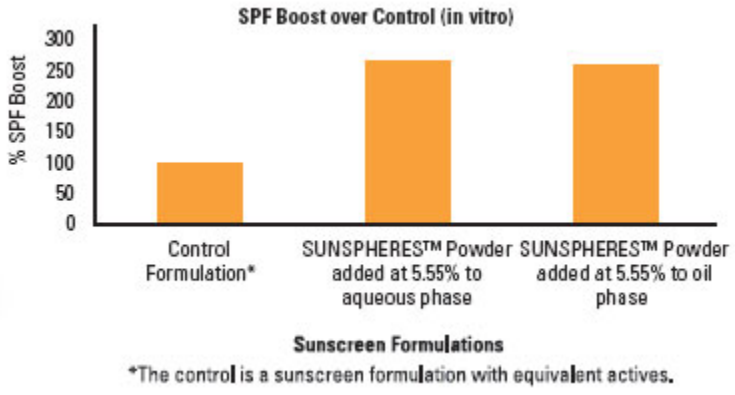
SUNSPHERES Powder is supplied as a low density powder and requires appropriate equipment for handling. The recommended storage temperature for this material is 5°C to 40°C. Please follow recommended handling procedures on MSDS. Avoid inhalation when handling.

Use in Sunscreen Formulations

SUNSPHERES SPF Boosters enable greater SPF efficiency across the entire UVA/UVB spectrum, working equally well with organic and inorganic actives, in all sun care and daily wear SPF products. This performance is utilized by sunscreen formulators in a variety of ways:

1. **Achieve high SPF levels:** The addition of SUNSPHERES into a sunscreen formulation provides a predictable increase in SPF levels (>15) that may not be easily accomplished with UV actives alone. This automatic boost gives formulators the flexibility to choose the levels and combinations of actives that work best.
2. **Maintain SPF levels with lower levels of UV actives:** The addition of SUNSPHERES to an existing formulation raises the efficacy of UVA/UVB filters in formulations allowing the formulator to use significantly less UV actives to deliver the same level of SPF. As an extra benefit, the ability to reduce UV active levels in a formulation can also reduce potential irritation.

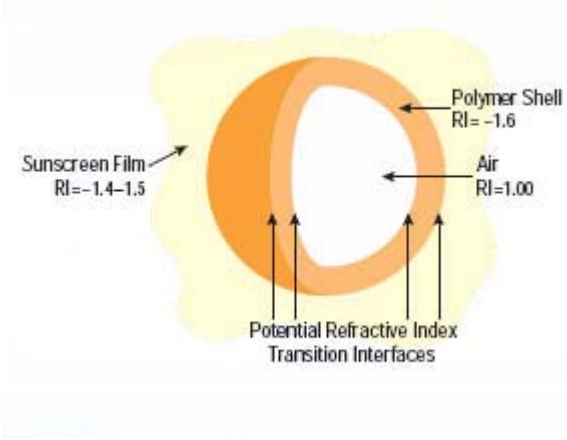
SPF Booster Performance - SUNSPHERES Powder Example**



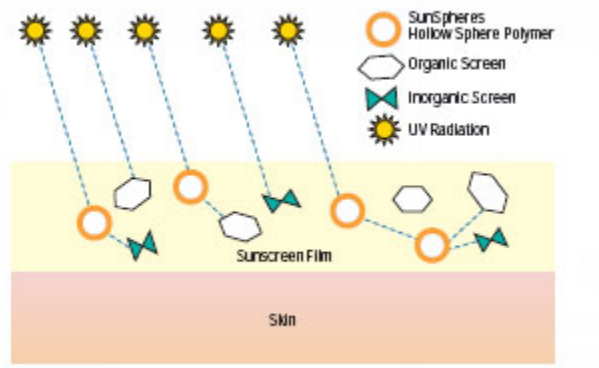
*The control is a sunscreen formulation with equivalent actives.

**SUNSPHERES PGL performs equally on a solids basis

Light Refraction via SUNSPHERES Hollow Sphere Technology



Model for UV Scattering by the SUNSPHERES Hollow Sphere Polymer Within a Sunscreen Film



As radiation passes through material of one refractive index into a material of another refractive index, it is bent or scattered. The presence of a large number (1% - 5% solids) of the SUNSPHERES hollow spheres in a formulation increases and makes more efficient the scattering of radiation. Since scattering of UV radiation increases its path-length, the likelihood that the radiation will be in the presence of an UV active is also increased, thereby increasing the SPF level of the formulation. According to Beer's Law, the absorbance of the UV radiation is increased when an active ingredient is present, which leads to increases in the SPF value of the formulation.

Cold-Processed Formulations

SUNSPHERES PGL is recommended for cold-processed formulations since it is a low viscosity emulsion and can be easily incorporated into formulations. SUNSPHERES PGL should be incorporated and dispersed in the aqueous phase after dissolution of any water-soluble solids and prior to emulsification.

Heat-Processed Formulations

Both SUNSPHERES PGL and SUNSPHERES Powder are recommended for heat-processed formulations.

SUNSPHERES PGL can be incorporated into a formulation during the cool down stage of the emulsion, as long as the viscosity of the product is not too high (>30,000 cps).

SUNSPHERES Powder is best incorporated either in the aqueous phase or the oil phase prior to forming the emulsion. Formulations with SUNSPHERES Powder should include homogenization during processing and the addition of heat. Heating to 50°C facilitates processing.

Homogenization

SUNSPHERES Powder, as supplied, is in the form of agglomerates, with a mean particle size of about 100 µ. The agglomerates must be broken down in the final formulation to liberate the primary SUNSPHERES SPF Booster particles. If this step is not performed, the expected SPF performance boost will not be achieved, and a granular appearance will be observed in the formulation causing the emulsion to feel "gritty" when applied to the skin.

To break down the agglomerates, a high shear process, such as homogenization, is recommended.

High and Low Viscosity Emulsions

For low viscosity emulsions (<1000 cps), it is recommended that both SUNSPHERES PGL and Powder be incorporated at the end of the processing, i.e., at point of biocide addition using homogenization to fully disperse. Very viscous formulations will require extended mixing to ensure uniform dispersion of the SUNSPHERES PGL and Powder.

High Level of Silicones and SUNSPHERES Powder

When formulating with high levels of silicones, it is best to blend SUNSPHERES Powder into an oil phase containing aliphatic oils to avoid flocculation. SUNSPHERES Powder can be either added to the water phase or dispersed in the non-silicone organic phase prior to preparing the emulsion, and then post adding the silicones.

Non-Aqueous Formulations and SUNSPHERES Powder

SUNSPHERES Powder is especially recommended for non-aqueous products, such as, sunscreen sticks and lip balms.

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