Nouryon

Dermacryl® AQF polymer

Efficient film-forming polymer in systems containing organic and inorganic UV actives

INCI: Acrylates Copolymer

Today's sunscreens go everywhere! Considered an everyday necessity, sunscreens are being incorporated into skin care and makeup products that require excellent aesthetics while still providing rub-off and water resistance. Dermacryl AQF polymer offers proven in-vivo water resistance that is paired with a great skin feel.

Dermacryl AQF polymer is well suited for use as a water resistant film former in emulsion sunscreen formulations. It is a virtually universal ingredient suited for formulating spray emulsions as well as traditional creams and lotions. Dermacryl AQF polymer works well in systems that contain organic UV actives, inorganic actives, or combinations of the two. In addition, both UVA and UVB filters may be incorporated into these formulations, thereby allowing the formulation of systems that offer broad-spectrum protection.

Features and benefits

Features	Benefits
Film-formation	Proven water resistance and SPF retention Resistant to rub-off
Low viscosity, polymer emulsion	Easy to use No heat or neutralization required Exceptional sprayability in spray emulsions No impact on formulation viscosity
Broad acceptability	Safety tested for use in spray applications Globally approved

Recommended applications

- Daily wear moisturizers with SPF
- Recreational sun protection products
- Tinted sun protection products
- Color cosmetics
- Face, body and hand creams and lotions

Suggested use levels, as supplied

Application	% active
Sun protection	2-5
SPF daily wear moisturizer	1-3
Tinted sunscreens	1-5
Color cosmetics	1-20
Creams and lotions	1-5

Formulation guidelines

Supplied as a liquid aqueous emulsion, Dermacryl AQF polymer is easily dispersed in the water phase of oil-in-water emulsions. Dermacryl AQF polymer can either be added into the water phase prior to forming the emulsion or post added after the emulsion is formed. It requires no heat or neutralization and can be used in either hot or cold emulsification processes. The material can be used at typical sunscreen formulation pH ranging from pH 5 to 7.

Compatibility

Sunscreen actives

Dermacryl AQF polymer performs well in the typical sunscreen formulation pH range, pH 4 to 8. It has excellent compatibility with commonly used sunscreen actives, including Ethylhexyl Methoxycinnamate (Octinoxate), Ethylhexyl Salicylate (Octisalate), Benzophenone-3 (Oxybenzone), Homosalate, Octocrylene, Avobenzone, and Zinc Oxide. Dermacryl AQF polymer is sensitive to some coatings in Titanium Dioxide (TiO2) dispersions. The following grades of titanium dioxide dispersions have good compatibility with the polymer and can be used as starting points when formulating TiO2 containing sunscreens with Dermacryl AQF polymer.

Titanium dioxide compatibility

Supplier	Trade name	INCI name
Croda	Tioveil AQ-G	Titanium Dioxide (and) Alumina (and) Silica (and) Sodium Polyacrylate
	Solaveil CT-100	C12-15 Alkyl Benzoate (and) Titanium Dioxide (and) Polyhydroxystearic Acid (and) Aluminum Stearate (and) Alumina
	Solaveil CT-10W	Water (and) Titanium Dioxide (and) Isodeceth-6 (and) Oleth-10 (and) Aluminum Stearate (and) Alumina (and) Simethicone
	Tioveil 50 FIN	C12-15 Alkyl Benzoate (and) Titanium Dioxide (and) Polyhydroxystearic Acid (and) Aluminum Stearate (and) Alumina
Kobo	GCP50VTTS	Caprylic / Capric Triglyceride (and) Titanium Dioxide (and) Alumina (and) Polyhydroxystearic Acid (and) ITT/TCS Crosspolymer
Granula	Granlux MSN-50	Titanium Dioxide (and) Apricot Kernel Oil PEG 40 Esters (and) Cetearyl Alcohol (and) Cetearyl Glucoside (and) Hydrogenated Decene Oligomers (and) Dimethicone (and) Alumina

Pigment coatings

Dermacryl AQF polymer shows good compatibility with commonly used pigment coatings. These pigments were tested at a 10% use level in a screening emulsion containing Ethylhexyl Methoxycinnamate and included pigments coated with the following: Dimethicone Copolyol, Triethoxy Caprylylsilane, Triethoxyl Caprylylsilane, Isopropyl Titanium Triisostearate, Perfluoroalcohol Phosphate, bonded Dimethylpolysiloxane, Disodium Steroyl Glutamate.

Salts

For formulations containing electrolytes, (i.e. water in oil or water in silicone emulsions), Dermacryl AQF polymer has good salt tolerance. The polymer (4% active tested) can tolerate up to 1% and 2% of magnesium sulfate and sodium chloride, respectively, as well as any level of sodium citrate (maximum salt level tested: 4% by weight).

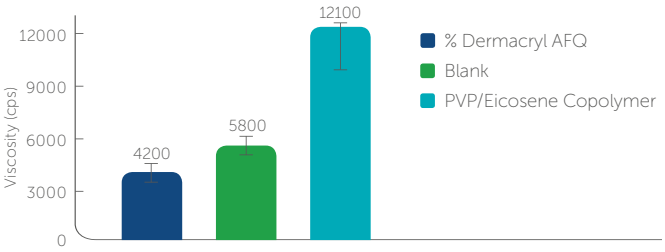
Other

Dermacryl AQF polymer is also compatible with a wide range of commonly used cosmetic ingredients: Carbomer, Xanthan Gum, Acrylates/C12-30 Alkyl Acrylate Crosspolymer, and other frequently used thickeners and emulsifiers.

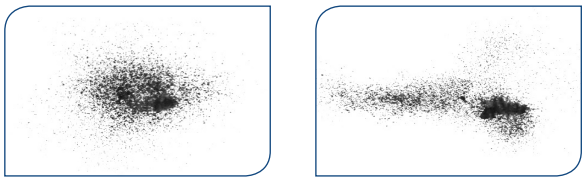
Spray emulsions

Although Dermacryl AQF polymer can be used in a broad range of sunscreen emulsions, it is particularly well suited for sunscreen spray emulsions. The polymer does not increase formulation viscosity which allows the formulator to create water resistant spray emulsion sunscreens with excellent spray aesthetics. A spray system was formulated to demonstrate the impact of film forming polymers on formulation viscosity and spray performance as shown below. The system containing Dermacryl AQF polymer was less viscous than a similar systems formulated with PVP/Eicosene Copolymer.

Viscosity benefit on spray formulation



Spray characteristics



12689-109F1A with Dermacryl AQF polymer

12689-109F1C with no polymer

The spray pattern on the left is for an emulsion formulated with Dermacryl AQF polymer and on the right is the same emulsion formulated with PVP/Eicosene copolymer. The product on the left has excellent spray aesthetics including less particle drift which results in more uniform coverage.

Sunscreen spray formulation

Ingredient	12689-109F1A %	12689-109F1C %
Phase A		
Deionized Water	QS to 100	QS to 100
Dissolvine® NA2-S Chelate	0.04	0.04
Acrylates/C10-30 Alkyl Acrylate Crosspolymer	0.20	0.20
Glycerin 99.5%	3.00	3.00
Phenoxethanol (and) Methylparaben (and) Ethylparaben (and) Butylparaben	1.00	1.00
Dermacryl AQF polymer (45% active)	4.40	
Phase B		
Ethylhexyl Methoxycinnamate	7.50	7.50
Ethylhexyl Salicylate	5.00	5.00
Benzophenone-3	4.00	4.00
Cetearyl Alcohol	0.30	0.30
Sorbitan Oleate	0.45	0.45
PVP/ Eicosene Copolymer		2.00
Phase C		
Triethanolamine	QS to pH 6.5	QS to pH 6.5

Performance properties

In-vivo SPF evaluation

Dermacryl AQF polymer provides the ability to create water resistant sunscreen emulsions. The polymer exhibits excellent SPF retention after immersion in water in both in-vitro and in-vivo testing.

The sunscreen emulsion systems were evaluated by Florida Suncare Testing, Inc. SOPs #2011-04, 2011-01, Static and 80 Minute Water Resistant SPF Testing as set forth by the FDA, 21 CFR Sec. 201.327, subpart (i), SPF Test Procedure, Sunscreen Drug Products for Over-the-Counter Human Use, Final Monograph, Federal Register, Vol. 76, No. 117, June 17, 2011.

Two similar sunscreen formulations were compared for their ability to retain SPF after 80 minute immersion in water. These formulations vary in their use level of the film former. The formulation and results are described below. A copy of the complete in-vivo report is available upon request.

Results

Formulas with both 1% and 2% active Dermacryl AQF polymer tested as 80 min very water resistant in SPF 50 target systems.

In-vivo SPF testing formulation #2710-48

	Ingredient	Wt %
Phase A	Water (Aqua)	45.83
	Dissolvine® NA2-S chelate	0.10
	Propylene Glycol	2.00
	Phenoxyethanol (and) Ethylhexylglycerin	1.00
	Acrylates/C10-30 Alkyl Acrylate Crosspolymer	0.40
Phase B	Avobenzone	3.00
	Homosalate	13.00
	Ethylhexyl Salicylate	5.00
	Octocrylene	5.00
	Benzophenone-3	6.00
	Glyceryl Stearate (and) PEG-100 Stearate	2.50
	C12-15 Alkyl Benzoate	5.00
	Dimethicone	2.00
	Polymer B	See note
Phase C	Triethanolamine	0.60
	Water (Aqua)	4.00
Phase D	Polymer A	See note
Phase E	Citric Acid (and) Water	QS

Polymer A: Dermacryl AQF polymer, 1.0% wt% active, 2.2 wt% supplied
Polymer B: Dermacryl AQF polymer, 2.0% wt% active, 4.4 wt% supplied

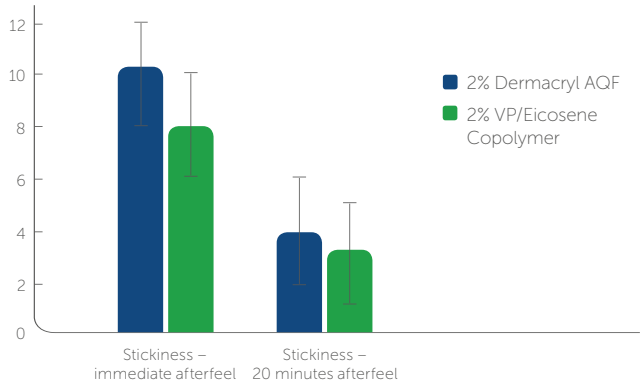
Sensory evaluation

The sensory evaluation was performed by expert panelists trained in Skinfeel Descriptive Analysis methodology.

Results

Dermacryl AQF polymer was shown to have statistically similar tack as compared to VP/Eicosene Copolymer at both immediate and 20 minute afterfeel timepoints. Testing was performed at Sensory Spectrum.

Skinfeel analysis



Storage and handling

Dermacryl AQF polymer should be protected from freezing. Avoid extreme temperatures during storage. Good industrial hygiene practices should be followed when working with this polymer.

Please read the MSDS before working with this or any other chemical.

This product is best used within 12 months of manufacture.

Health and safety

A health and safety summary related for Dermacryl AQF polymer is available on request. Information on Dermacryl AQF polymer relating to EU Cosmetic Directive 76/768/EEC is also available upon request.

The suitability of the final formulations should be confirmed in all respects by appropriate evaluation. The marketer is advised to evaluate the final formulation with regard to performance and health and safety.

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Nouryon

Nouryon is a global, specialty chemicals leader. Markets and consumers worldwide rely on our essential solutions to manufacture everyday products, such as personal care, cleaning goods, paints and coatings, agriculture and food, pharmaceuticals, and building products. Furthermore, the dedication of more than 7,900 employees with a shared commitment to our customers, business growth, safety, sustainability and innovation has resulted in a consistently strong financial performance. We operate in over 80 countries around the world with a portfolio of industry-leading brands. Visit our website and follow us @Nouryon and on LinkedIn.

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