AkzoNobel Surface Chemistry

DERMACRYL® E Film-Forming Polymer

Water resistant film-forming polymer for sun care applications

From water-resistant products for use at the beach, to daily-wear moisturizers, today's sun care products demand both superior function and consumer-pleasing form. Products need to feature easy application, rinse-off and rub-off resistance, and excellent aesthetic properties in addition to providing stable, broad spectrum UV protection.

For emulsion sun care products, DERMACRYL® E polymer (INCI: Styrene/Acrylates Copolymer) provides effective and durable film formation, enabling the formulation of long-lasting, high SPF systems. Easy-to-use and cost effective, DERMACRYL E film-forming polymer helps to create a wide range of products that offer excellent skin feel on application and dry-down, and appeal to consumers seeking the best in sun protection.

Application Areas

Recreational sun protection products, daily wear moisturizers with SPF, tinted sun protection products, color cosmetics, face, body, hand, and foot creams and lotions

Features and Benefits

Feature	Benefit
Film-formation	Proven water resistance and SPF retention at low use levels Resistant to rub off
Low Viscosity, Polymer Emulsion	Easy to use No heat or neutralization required No impact on formulation viscosity Exceptional sprayability in spray emulsions
Globally Approved	Useful in a wide range of systems Suitable for use in all regions

Suggested Use Levels (as supplied)

Application	% Total Solids
Sun Protection	1.0% - 2.0%
SPF Daily Wear Moisturizer	1.0% - 3.0%
Tinted Sunscreens	1.0% - 5.0%
Color Cosmetics	1.0% - 20.0%
Creams and Lotions	1.0% - 5.0%
Antiperspirant/Deodorant	1.0% - 2.0%

Suggested pH range of final formulation: 4 - 8

Formulation Guidelines

Supplied as a low viscosity liquid aqueous emulsion, DERMACRYL E film-forming polymer is easily dispersed in the water phase of oil-in-water emulsions and is easy to work with in lab and large scale manufacturing settings. DERMACRYL E 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 E film-forming polymer performs well in the typical sunscreen formulations and has excellent compatibility with commonly used sunscreen actives, including Ethylhexyl Methoxycinnamate (Octinoxate), Ethylhexyl Salicylate (Octisalate), Benzophenone-3 (Oxybenzone), Homosalate, Octocrylene, Avobenzone, Titanium Dioxide and Zinc Oxide.

Other

DERMACRYL E film-forming polymer is also compatible with a wide range of commonly used cosmetic ingredients: Carbomer, Xanthan Gum, Acrylates/C10-30 Alkyl Acrylate Crosspolymer, and other frequently used thickeners and polymeric emulsifiers. It is recommended that DERMACRYL E polymer be incorporated after emulsification and neutralization has taken place when formulations include Acrylates/C10-30 Alkyl Acrylate Crosspolymer at levels above 0.3%.

Spray Emulsions

Although DERMACRYL E film-forming 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 and enables the development of water resistant spray emulsion sunscreens with excellent spray aesthetics.

Performance Properties

The following film-forming polymers designed for use in emulsion based sunscreens were evaluated in an SPF 50+ emulsion sunscreen system for *in-vivo* SPF, static and 80 minute very-water resistance, as well as aesthetic tack evaluations using a texture analyser.

Polymer	INCI Name, Trade Name	Supplier
A	Styrene/Acrylates Copolymer, DERMACRYL E polymer	AkzoNobel
B	VP/Eicosene Copolymer	Ashland, Inc.
C	Polyurethane-34	Bayer MaterialScience
D	Acrylates Copolymer	DOW Chemical
E	Acrylates/C12-22 Alkylmethacrylate Copolymer	DOW Chemical

SPF 50+ Emulsion Sunscreen

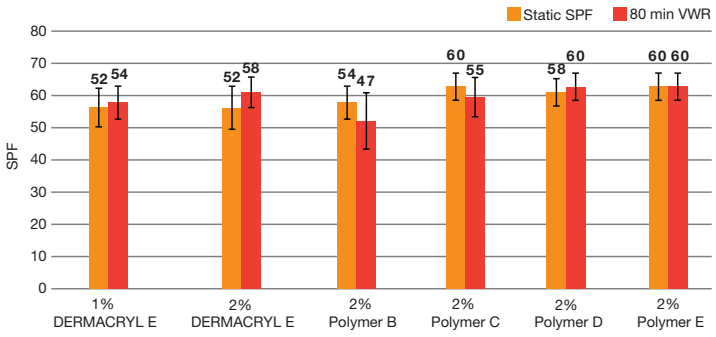
Phase	INCI Name, Trade Name	%w/w
A	Deionized Water	48.27%
	Disodium EDTA, DISSOLVINE® NA2-S Chelate	0.10%
	Propylene Glycol	2.00%
	Phenoxyethanol (and) Ethylhexylglycerin, Euxyl® PE 9010	1.00%
	Acrylates/C10-30 Alkyl Acrylate Crosspolymer, Pemulen® TR-1 Polymeric Emulsifier	0.40%
B	Avobenzone	3.00%
	Homosalate	13.00%
	Octylsalate	5.00%
	Octocrylene	5.00%
	Oxybenzone	6.00%
	Glyceryl Stearate (and) PEG-100 Stearate, Arlacel™ 165	2.50%
	C12-15 Alkyl Benzoate, Finsolv® TN	5.00%
	Dimethicone, XIAMETER® PMX-200 Silicone Fluid 350CS	2.00%
	Polymer B	**See Use Levels**
C	Triethanolamine-99%	0.60%
	Deionized Water	4.00%
D	**Polymers A, C, D, E**	**See Use Levels**
E	50% Citric Acid Solution	0.13%
	Total	**100.00**

Polymer Use Levels

A: DERMACRYL E polymer, 1.0 wt.% , 2.2 wt.% as supplied
B: VP/Eicosene Copolymer, 2.0 wt.%, 2.0 wt.% as supplied
C: Polyurethane-34, 2.0 wt.%, 5.0 wt.% as supplied
D: Acrylates Copolymer, 2.0 wt.%, 4.4 wt.% as supplied
E: Acrylates/C12-22 Alkylmethacrylate Copolymer, 2.0 wt.%, 4.16 wt.% as supplied

FDA Method

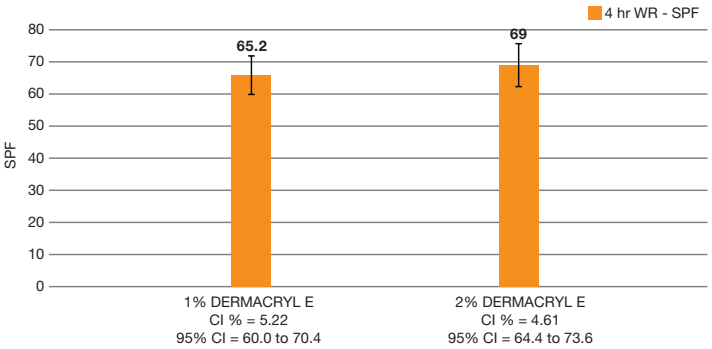
Target SPF 50+ Results, 5 Subjects *In-vivo*



DERMACRYL E polymer at 1% active performs as well as an SPF 50+ sunscreen formulation and shows equal SPF and water resistance compared to other polymers at 2% active level.

Australian Method

Target SPF 50+ Results, 5 Subjects *In-vivo* AZ/NZS 2604:2012 and ISO 24444:2010 Method



DERMACRYL E polymer at 1% and 2% active level provides 4 Hour Water Resistant performance according to Australian method.

European SPF 50+ Emulsion Sunscreen

Phase	INCI Name, Trade Name	%w/w
A	Deionized Water	34.10%
	Disodium EDTA, DISSOLVINE® NA2-S Chelate	0.10%
	Propylene Glycol	1.00%
	Acrylates/C10-30 Alkyl Acrylate Crosspolymer, Pemulen® TR-1 Polymeric Emulsifier	0.40%
B	Avobenzone	5.00%
	Homosalate	8.00%
	Octylsalate	5.00%
	Octocrylene	6.50%
	Bis-Ethylhexyloxyphenol Methoxyphenyl Triazine, Tinosorb® S	2.00%
	Diethylhexyl Butamido Triazone, Uvasorb® HEB	1.00%
	Glyceryl Stearate (and) PEG-100 Stearate, Arlacel™ 165	2.50%
	Cetearyl Alcohol	1.00%
	Glyceryl Stearate	0.50%
	C12-C15 Alkyl Benzoate	5.00%
	Dicaprylyl Carbonate	3.00%
	Titanium Dioxide (and) Silica (and) Dimethicone, Parsol® TX	3.00%
C	**Polymers A, B**	**2.20%**
D	Triethanolamine-99%	1.20%
	Phenylbenzimidazole Sulfonic Acid, Parsol® HS	2.50%
	Deionized Water	9.00%
	Methylene Bis-Benzotriazolyl Tetramethylbutylphenol (and) Aqua (and) Decyl Glucoside (and) Propylene Glycol (and) Xanthan Gum, Tinasorb® M	3.00%
E	Tapioca Starch (and) Polymethylsilsesquioxane, DRY-FLO® TS PURE Starch	2.00%
	Phenoxyethanol (and) Ethylhexylglycerin, Euxyl® PE 9010	1.00%
	Triethanolamine-99%	1.00%
	Total	**100.00%**

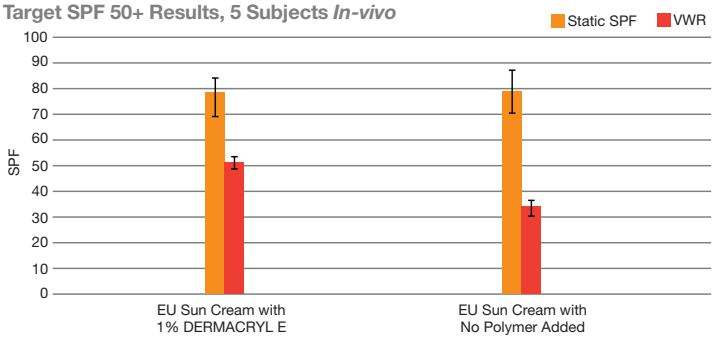
Polymer Use Levels

A: DERMACRYL E polymer, 1.0 wt.%, 2.2 wt.% as supplied

B: No Polymer added, Q.S. with Deionized Water

European Method

Target SPF 50+ Results, 5 Subjects *In-vivo*

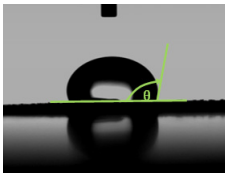


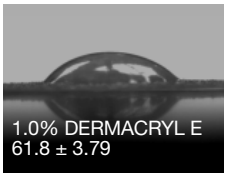
DERMACRYL E polymer at 1% achieved a 50+ SPF and Water Resistance Retention according to COLIPA method.

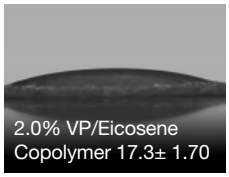
Film Properties

Contact Angle

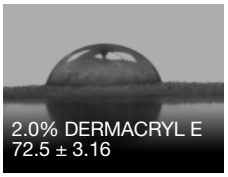
DERMACRYL E polymer films maintain integrity after water exposure and allows for formulation of durable and long-lasting products.

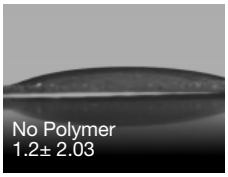






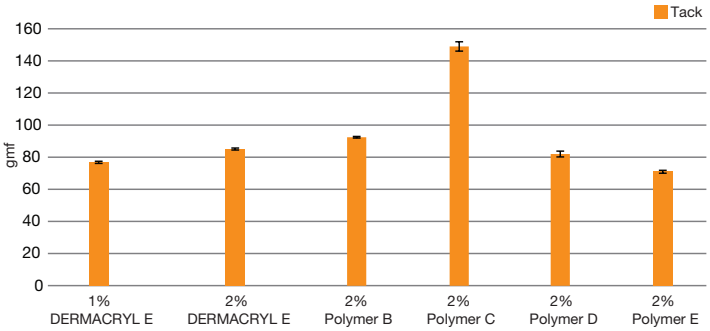
Model systems (2mg/cm² dosage) applied to pre-hydrated Vitro Skin® (N-19). A drop of deionized water was placed on sample substrate θ measured of image captured after 11.5 minutes.





Texture Evaluations

SPF 50+ Emulsion System Texture Analyzer Tack Test Results



Tack evaluations on the texture analyzer show that DERMACRYL E polymer, at 1% and 2% active, shows similar or lower tack compared to other competitive polymers evaluated.

Storage and Handling

DERMACRYL E film-forming 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 E film-forming polymer is available on request. Information on DERMACRYL E 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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AkzoNobel is a leading global paints and coatings company and a major producer of specialty chemicals. Calling on centuries of expertise, we supply industries and consumers worldwide with innovative products and sustainable technologies designed to meet the growing demands of our fast-changing planet. Headquartered in Amsterdam, the Netherlands, we have approximately 46,000 people in around 80 countries, while our portfolio includes well-known brands such as Dulux, Sikkens, International, Interpon and Eka. Consistently ranked as one of the leaders in the area of sustainability, we are committed to making life more liveable and our cities more human.

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