

Readily Biodegradable Multifunctional Emollient



Overexposure to UV radiation can have adverse health effects. UV filters are now vital in many personal care products, including sunscreens, color cosmetics, hair care, and skincare. Neopentyl Glycol Diheptanoate (NPG Di-heptanoate (CQ)) is a light emollient ester that provides exceptional organic UV filter solubility. It improves the texture of skin and hair care products without leaving a heavy or greasy feel on skin or hair. NPG Di-heptanoate (CQ) delivers a superior solubility of UV filters and a more satisfying sensory experience than cyclic silicones. The use of this readily biodegradable light ester with multiple functions balances the number of ingredients in a formulation while also addressing environmental sustainability concerns.

NPG Di-heptanoate (CQ) has multiple functions in a formulation. Its primary purpose is to form a layer that helps to retain moisture in the skin. It also enhances the texture of the final product as a sensory agent and improves the solubility of the UV filter. In addition, it acts as a film former to help improve spreadability.

A solubility study has been conducted for crystalline organic UV filters. The maximum solubility of crystalline UV filters in the three different common emollients NPG Di-heptanoate (CQ) (NPGC7), Cyclopentasiloxane (D5) and Isododecane was determined. The supersaturated solutions were prepared and stored at +6°C for 7 days, and subsequently the UV filter concentration analyzed.

UV filter evaluated	NPGC7	Isododecane	D5	EU Allowed *	Max
Ethylhexyl triazone	26%	0.10%	0.10%	5%	
Diethylamino Hydroxybenzoyl Hexyl Benzoate	17%	1.19%	0.27%	10%	
Butyl Methoxydibenzoylmethane	12%	0.97%	0.17%	5%	
Benzophenone-3	18%	1.63%	0.61%	** 6%	
Diethylhexyl Butamido Triazone	29%	0.10%	0.10%	10%	
Bis-Ethylhexyloxyphenol Methoxyphenyl Triazine	9%	0.47%	0.10%	10%	

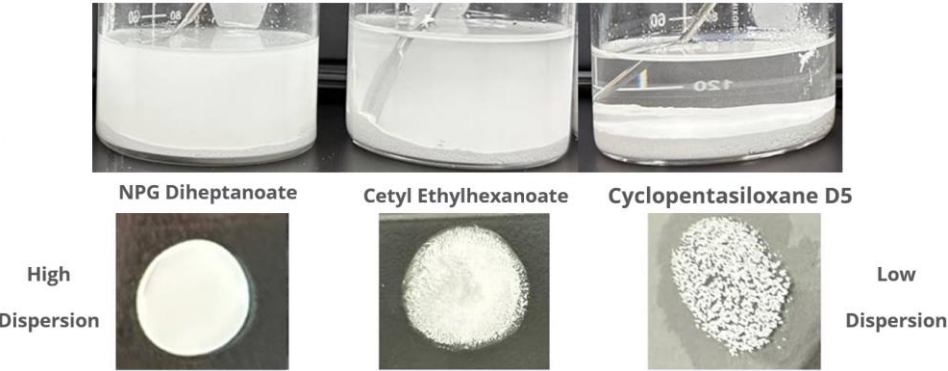
* EU. Allowed UV Filters: Annex VI, Regulation 1223/2009/EC on Cosmetic Products, as amended by Regulation (EU) 2022/2195, OJ L 292, 11 November 2022

** Propellant and pump spray products 2.2%

While there is a maximum concentration allowed for UV filters in sun care products, the typical concentration range of individual UV absorbers in sunscreen products is between 1 and 5%, sometimes higher. Since the emulsion consists of water and oil,

the solubility of the UV absorber in the pure oil must be higher than the desired concentration in the final formulation. NPG Di-heptanoate (CQ) offers a higher solubility than Isododecane or Cyclopentasiloxane.

The UV Filter carrier has a significant effect on the intensity and wavelength of UV absorbance of the individual filter. Film formers and emulsifiers determine the uniformity and thickness of the protection layer on the skin surface, which in turn determines the SPF level, durability, and water resistance. NPG Diheptanoate (CQ) also has a good compatibility with inorganic UV filters like titanium dioxide facilitating the dispersion.



The use of this readily biodegradable¹ light ester that decomposes more easily in the environment is a powerful alternative to cyclomethicones and it shows a better performance as multifunctional emollient.

Environmentally conscious consumers want products that both protect against sun damage and follow sustainable practices. Formulating personal care products that address different aspects such as UV protection efficiency and water resistance, combined with no persistence, no toxicity, no bioaccumulation, but biodegradability, can be challenging. Using readily biodegradable multifunctional emollients could help formulators to meet these requirements.

1 NPG-Diheptanoate (CQ) is readily biodegradable according to OECD 301B.