PERSONAL CARE

SP-Incroquat Behenyl TMS-MBAL

SP-Incroquat Behenyl TMS-MBAL is an exceptionally effective cationic self-emulsifying wax and quaternary conditioner for both hair and skin care applications. As a Behenyl derivative, its longer chain fatty moiety (C_{22}) offers distinct formulating advantages over the more traditional Lauryl- to Stearyl-based quaternaries. SP-Incroquat Behenyl TMS-MBAL provides enhanced conditioning and emulsifying properties in combination with the greater mildness demanded by cosmetic formulations today.

SP-Incroquat Behenyl TMS-MBAL is manufactured via the RSPO's Mass Balance System.

SP-Incroquat Behenyl TMS-MBAL	Typical Properties
INCI Name	Cetearyl Alcohol (and) Behentrimonium Methosulfate
Appearance	White solid
% Active	25
Typical Usage Level	1-10%

SP-Incroquat Behenyl TMS-MBAL is a quaternary amine salt derived from the natural plant oil Colza, commonly known as Rapeseed oil, and is supplied as a 25% active pastillated form. As a multifunctional ingredient it is recommended in a variety of personal care applications.

Benefits

- Substantive to hair and skin
- Confers excellent wet combability
- Outstanding conditioning agent
- Improved mildness/reduced irritation potential
- Low CMC
- Primary emulsifier
- Thickening agent/stabiliser
- Emulsifies high levels of silicone
- Vegetable-derived
- Easy-to-handle pastille form

Applications

- Leave-on and rinse-off conditioners
- Hair detanglers
- Hair bodying conditioners
- Skin creams and lotions
- Protective silicone emulsions
- Hair relaxer creams/ethnic hair conditioners
- Antiperspirant/deodorant sticks

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SP-Incroquat Behenyl TMS-MBAL is Croda's sustainable palm oil variant allowing customers to use sustainably sourced material. The product is manufactured by the RSPO's Mass Balance system. The Mass Balance supply chain allows certified sustainable palm oil material and non-certified material to be mixed throughout the supply chain but administratively monitors the mass of certified material produced and sold. The Mass Balance system is fully audited allowing buyers of the material to view the products life span. Another advantage of this system is that it actively encourages palm growers to produce sustainable palm and move towards a segregated supply chain system. By choosing these ingredients, you contribute to the production of sustainable palm oil. Products manufactured with sustainable palm oil do not in any way compromise on performance.

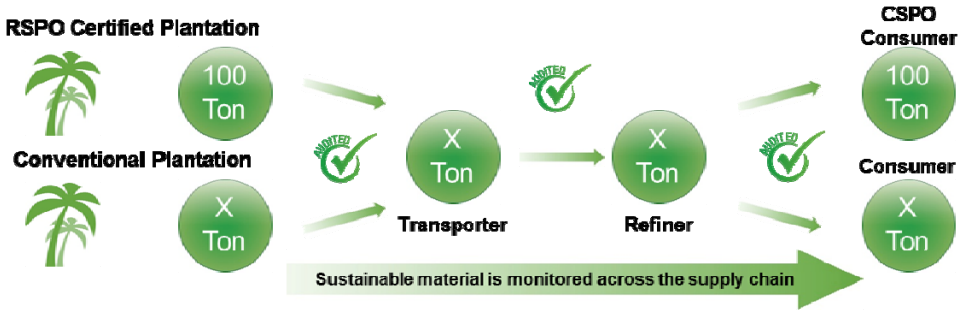

Figure 3: RSPO Mass Balance Supply Chain

Conditioning

As a long chain C_{22} surfactant, SP-Incroquat Behenyl TMS-MBAL is more hydrophobic in nature than conventional quaternaries and so confers superior detangling, conditioning and thickening properties in performance hair care

formulations. Exhibiting exceptional mildness, SP-Incroquat Behenyl TMS-MBAL is ideal for incorporating in leave-on conditioners and cream rinses as well as a broad range of skin care preparations including moisturisers, nourishing creams, lotions, sun/baby care products and makeup bases.

SP-Incroquat Behenyl TMS-MBAL is substantive to both hair and skin. In hair care preparations it imparts excellent wet combability and manageability, reducing static and leaving hair feeling lightly conditioned without the build-up often associated with polymeric quats.

Figure 1 depicts the reduction of wet combing forces by SP-Incroquat Behenyl TMS-MBAL compared to two other quaternary conditioning agents. Results are expressed as mean ± standard deviation.

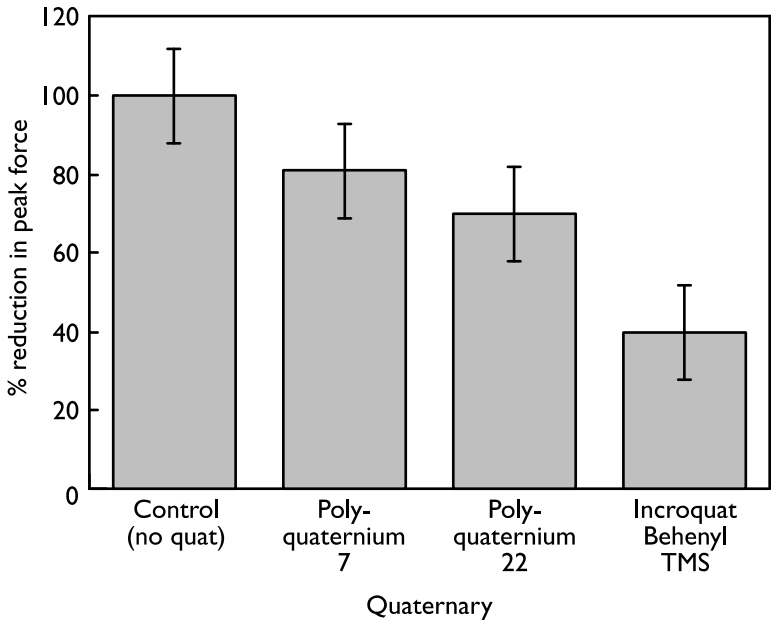

Figure 1: Reduction of wet combing forces by various quats (2% active)

Wet combing force measurements were performed on six washed European hair swatches using a Diastron Tensile Tester with a 2000g load cell. Full details of the test protocol and results are available on request[i].

In skin creams and lotions, SP-Incroquat Behenyl TMS-MBAL confers conditioning and skin softening effects, imparting a pleasant cushioned afterfeel.

Emulsification

SP-Incroquat Behenyl TMS-MBAL is a powerful primary emulsifier and can produce stable cationic emulsions even at low inclusion levels. When used as the only oil phase ingredient and emulsifier in low solids formulations, it facilitates the production of stable cost-effective emulsions without compromising performance standards.

In addition, SP-Incroquat Behenyl TMS-MBAL can emulsify high levels of silicone eg dimethicone, cyclomethicone, materials which can be difficult to incorporate into emulsion systems. Silicones are typically used in hair conditioning products for their hydrophobicity, as restoring the hair's water repellency after chemical treatments (perming, colouring, relaxing) is an important part of the conditioning process. Protective silicone skin creams also function on this basis. By incorporating SP-Incroquat Behenyl TMS-MBAL into silicone systems a pronounced conditioning effect is obtained, enhancing both product performance as well as aesthetics.

Mildness

A two stage independent study was conducted to evaluate irritancy and skin care benefits of SP-Incroquat Behenyl TMS-MBAL compared to a series of other cationic surfactants. Testing consisted of an *in vitro* bioassay for cytotoxicity using a reconstituted skin model and an *in vivo* clinical trial for evaluation of irritancy.

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The *in vitro* study used normal human-derived epidermal keratinocytes to measure the relative cytotoxicity of the various test lotions at 1% active surfactant. Results indicate that the SP-Incroquat Behenyl TMS-MBAL lotion shows greater cell viability and therefore lower irritation compared to other commonly used conditioning quaternaries, including Cetrimonium Chloride. Additionally, the scores for SP-Incroquat Behenyl TMS-MBAL are comparable to a standard non-ionic emulsifying wax NF which is generally considered to be non-irritating[ii].

Figure 2 shows the results of a further *in vitro* safety test, comparing SP-Incroquat Behenyl TMS-MBAL and Stearalkonium Chloride at equal activities. Cell viability scores correlate with previous tests to reinforce the lower irritation potential of this innovative quat.

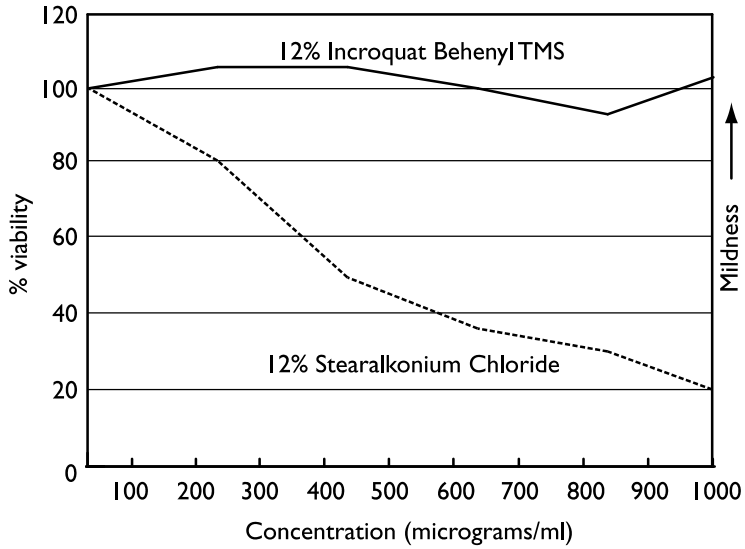

Figure 2: In vitro mildness test – comparative cytotoxicity

It is believed this lack of irritation is due to the much lower critical micelle concentration (CMC) that characterises the Methosulfate form of the Behenyl quat. A low CMC indicates that a small fraction of a surfactant is present in its monomeric form which can penetrate skin tissue and cause irritation.

In vivo clinical testing of SP-Incroquat Behenyl TMS-MBAL consisted of the topical treatment of test lotions to both forearms of human subjects in an 18-member panel. Skin sites were evaluated for evidence of irritation including erythema, flaking, roughness and barrier dysfunction. Results demonstrate that SP-Incroquat Behenyl TMS-MBAL is non-irritating and does not compromise the barrier function of the skin[ii].

Health and safety

Both *in vitro* and *in vivo* studies have demonstrated that SP-Incroquat Behenyl TMS-MBAL is non-irritating at in-use dilutions, and as with other quaternaries it is expected to be irritating to skin and eyes as supplied. SP-Incroquat Behenyl TMS-MBAL is non-toxic on ingestion.

References

[i]. Incroquat Behenyl TMS - effect on wet combing forces of hair, (V020), Croda technical report

[ii].Evaluation of the mildness of Incroquat Behenyl TMS in topical leave-on preparations, (V073), Croda technical report