

AMIDET®

APA-

22

**100% ACTIVE
ECOLOGICAL CONDITIONER
HAIR CARE
SNF APPROVED**

**ECO-FRIENDLY
CONDITIONING SURFACTANT
FOR HAIR CARE PRODUCTS**

KAO SURFACTANTS TECHNOLOGY AT YOUR SERVICE



AMIDET® APA-22, taking the eco-way

The rise in ecological awareness among consumers and industry is pushing the surfactants market into eco-friendly alternatives. This driving force is especially strong in the cationic surfactants market where the most commonly used cationic surfactants, basically Cetrimonium Chloride (CTAC) and Behentrimonium Chloride (BTAC), present some drawbacks regarding eco-toxic properties. In accordance with these market approaches, Kao Chemicals Europe (KCE) has studied the application in hair care of an eco-friendly product: Behenamidopropyl Dimethylamine (BAPDMA) under the trade name AMIDET® APA-22.

The conditioning performance of AMIDET® APA-22 is superior to that of commonly used cationic surfactants, providing a superior sensory profile and improved combing force reduction in hair conditioners.

SNF approved

In hair conditioners, AMIDET® APA-22 works as a cationic surfactant. Moreover, AMIDET® APA-22 can be incorporated as a non-ionic surfactant, working as a conditioning and color protection agent in 2-in-1 shampoos and as a gelling and hair protection agent in hair coloring creams.

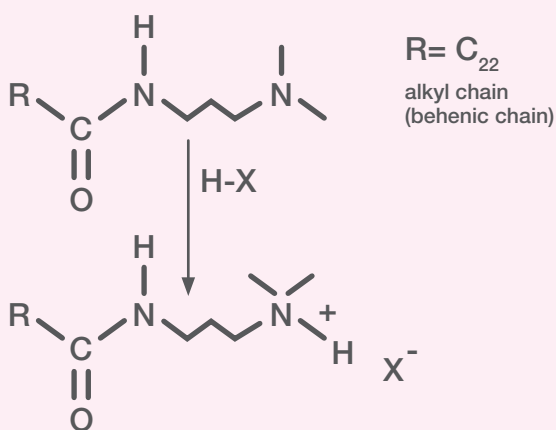
This multifunctional and high performance profile, together with good biodegradation and low aquatic toxicity compared to currently used cationic surfactants, make AMIDET® APA-22 a very interesting eco-friendly alternative for the hair care market.

TECHNICAL DATA

Trade name	AMIDET® APA-22
INCI name	Behenamidopropyl Dimethylamine (BAPDMA)
Appearance	White pellets
Active Matter (a.m.)	100%
Melting point	≈ 80°C
Viscosity at 80°C	< 100 cPs
Flammability	Non-flammable
Hygroscopy	Non-hygroscopic

HOW TO FORMULATE

AMIDET® APA-22



NON-IONIC FORM: SHAMPOO

AMIDET® APA-22 works as a non-ionic surfactant in shampoo formulations so the product can be incorporated as other solid materials. AMIDET® APA-22 can be added after heating the surfactant base up to 60°C minimum or by melting it with one of the components of the formulation.

CATIONIC FORM: HAIR RINSE

AMIDET® APA-22 performs as a conditioning agent in its cationic form while its commercial state is the non-ionic form. In order to activate the cationic conditioning behavior, the product must be acidified in a particular way. The recommended procedure for incorporating AMIDET® APA-22 into hair rinse products is the following:

1

Heat deionized water to 80°C minimum

2

Add the acid (lactic acid recommended)

3

Add AMIDET® APA-22 and stir vigorously until the formulation turns clear

Why is lactic acid recommended?

Mineral acids give less viscosity than organic acids. Among them, lactic acid gives the best cost/performance ratio. Citric acid is not recommended due to stability problems.

AMIDET® APA-22 Neutralization example

The following formula calculates how much lactic acid (90%) is necessary to completely neutralize a certain amount of AMIDET® APA-22.

$$\begin{aligned} & \text{g Lactic acid (90\% solution)} \\ & = \\ & 1.78 \cdot 10^{-3} \times \text{TAV} \times \text{g AMIDET® APA-22} \end{aligned}$$

TAV (Total Amine Value) can be found in the product specifications.

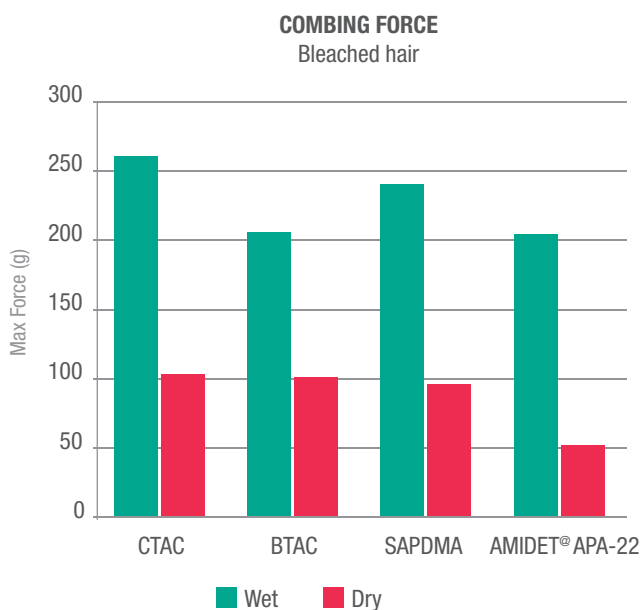
HAIR CONDITIONERS

Hair conditioners are used to confer a range of benefits on hair, such as facilitating combing, enhancing gloss and smoothness, providing antistatic properties and improving manageability.

In order to analyze the benefits of AMIDET® APA-22 in this application, it is compared with different cationic surfactants using a basic hair conditioning formulation (final pH = 4) with 1.5% a.m. of cationic surfactant and 3% of Cetearyl Alcohol (and Lactic Acid if amidoamine is used). All the data shown in this section are related to this formulation.

COMBING FORCE

In both natural and bleached hair, AMIDET® APA-22 performs better than CTAC and Stearamidopropyl Dimethylamine (SAPDMA) while having similar results to BTAC. The greatest differences between AMIDET® APA-22 and BTAC are seen in dry conditions, especially for bleached hair where the combing force is clearly better with the AMIDET® APA-22 formulation.



ANTISTATIC EFFECT

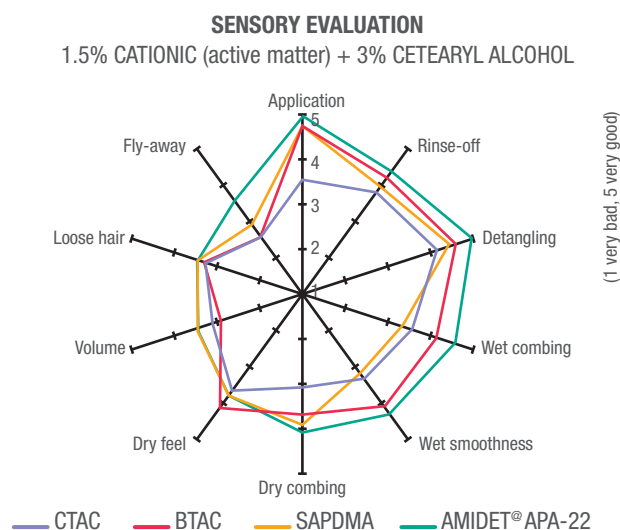
Amidoamines like AMIDET® APA-22 and SAPDMA give their formulations a remarkable antistatic effect in comparison with both BTAC and CTAC. The static reduction is more than 40% for amidoamines compared to less than 15% for BTAC and CTAC.

VISCOSITY

It is important to achieve a certain viscosity in hair conditioning formulations, especially in hair mask formulations, to facilitate handling the product and spreading it on the hair. AMIDET® APA-22 gives much higher viscosities than CTAC and BTAC, aiding formulation stability and eliminating (or reducing) the use of polymeric thickening agents. Formulation C-077, for example, has a viscosity of approximately 40,000 cPs without the need for polymers.

SENSORY EVALUATION

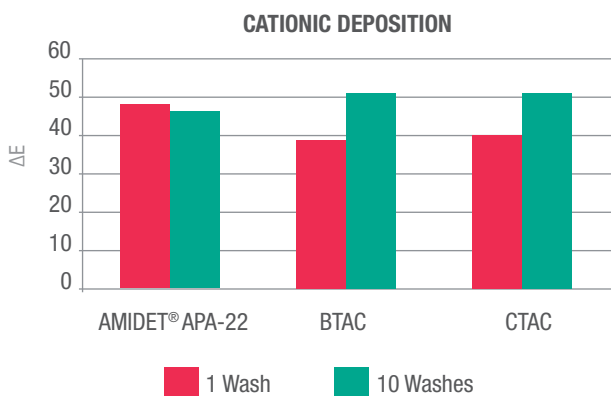
In the sensory evaluation, AMIDET® APA-22's overall performance is the best among the four cationic surfactants studied, being clearly better in wet combing, wet smoothness and fly-away control.





CATIONIC DEPOSITION & BUILD-UP EFFECT

The graph below shows that the cationic deposition of AMIDET® APA-22 on hair after one application is clearly better than that of CTAC and BTAC. Although the deposition is higher, AMIDET® APA-22 does not have a build-up effect, meaning that the concentration of AMIDET® APA-22 on the hair remains stable after repeated applications, preventing stickiness and loss of hair volume.



*Additives: Perfume, dyes, preservatives, etc.

FORMULATIONS

Ref. C-107

LEAVE-IN CONDITIONER

%

AMIDET® APA-22 Behenamidopropyl Dimethylamine	0.5
Lactic Acid (90% solution)	0.12
OXIDET® DMCLD Lauramine Oxide	1
Glycerine	1
Merquat 5210 Polyquaternium-52	0.1
Additives*	q.s.
Deionized Water	Up to 100

Ref. C-218

CONDITIONER

%

KALCOL® 6850 Cetearyl Alcohol	4.4
AMIDET® APA-22 Behenamidopropyl Dimethylamine	2.2
Lactic Acid	0.6
LEVENOL® H&B Glycereth-2 Cocoate	0.5
Keratec® TM IFP PE Keratin	1
Avocado Oil	0.5
Ucare® TM JR-30M Polyquaternium-10	0.3
Provit® 50 D-Panthenol	0.2
Additives*	q.s.
Deionized Water	Up to 100

Ref. C-077

HAIR MASK "REPAIRING CREAM"

%

KALCOL® 6850 Cetearyl Alcohol	7
AMIDET® APA-22 Behenamidopropyl Dimethylamine	3.2
Lactic Acid (90% solution)	0.7
Additives*	q.s.
Deionized Water	Up to 100

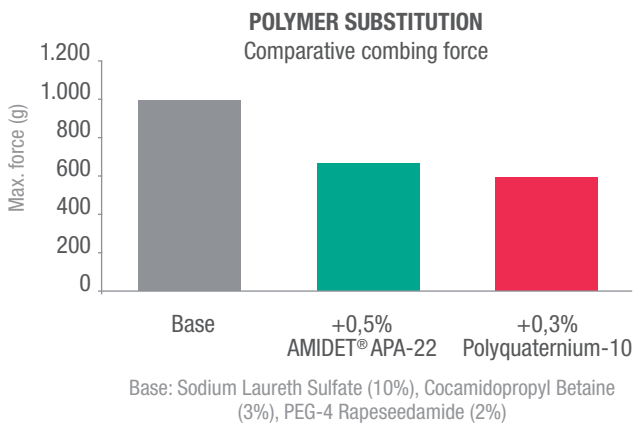
A more complex formulation (Hair Mask, C-140) can be consulted in our website.

SHAMPOO

CONDITIONING SHAMPOO

Conditioning shampoos usually include cationic polymers and/or silicones to reduce combing forces and make hair feel smooth. AMIDET® APA-22 in its non-ionic form plays a similar role in reducing the combing force and controlling fly-away, with a positive impact on overall formulation costs. It also works as a re-fattening agent and thickener like typical fatty amides.

The graph below shows that the addition of 0.5% of AMIDET® APA-22 has the same combing force reduction as adding 0.3% of Polyquaternium-10 in a standard hair rinse formulation, so total substitution is possible.



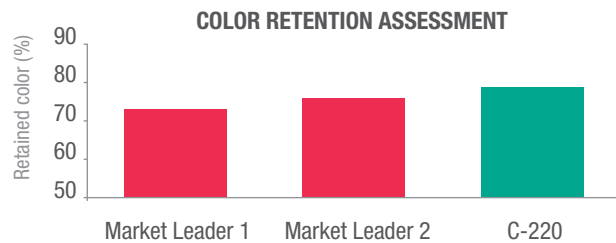
Ref. C-160

SHAMPOO "2-IN-1"

	%
EMAL® 270D Sodium Laureth Sulfate	8.6
AKYPO® FOAM RL 40 Sodium Laureth-5 Carboxylate	4.7
BETADET® SHR Cocamidopropyl Hydroxysultaine	6.8
AMIDET® APA-22 Behenamidopropyl Dimethylamine	0.5
DANOX® PL-10 Pearllizing Agent	4
Ucare® LR-400 Polyquaternium-10	0.2
Dow Corning® DC 193 PEG-12 Dimethicone	0.5
Additives*	q.s.
Deionized Water	Up to 100

COLOR PROTECTION SHAMPOO

The main challenge of a shampoo formulation for colored hair is to clean the hair without removing the dyes absorbed into it. AMIDET® APA-22 has proven that it plays an important role in minimizing color loss due to washing, since it becomes deposited on the hair surface and keeps the hair dye attached to the fiber. Some prototypes including AMIDET® APA-22 as a non-ionic surfactant have been developed, such as formulation C-220 which noticeably improves color retention compared to market leader products.



Ref. C-220

COLOR & CARE SHAMPOO

	%
AKYPO® FOAM RL 40 Sodium Laureth-5 Carboxylate	15
BETADET® S-20 Lauryl Hydroxysultaine	9
AMIDET® APA-22 Behenamidopropyl Dimethylamine	1.5
Silsoft® Q Silicone Quaternium-18	1
Aculyn™ 60 PEG-150 Distearate	0.4
Carbopol® Ultrez 21 Carbomer	0.3
Ucare™ JR-30M Polyquaternium-10	0.15
Preservative	q.s.
Deionized Water	Up to 100

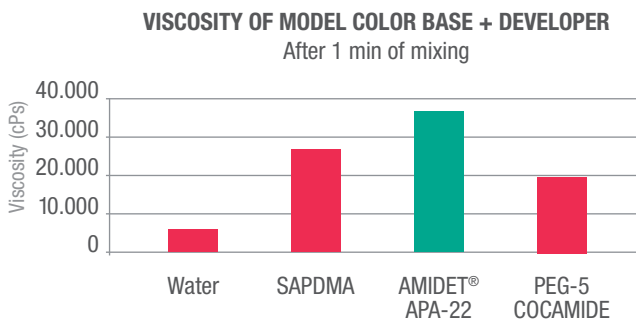
*Additives: Perfume, dyes, preservatives, etc.

HAIR COLORATION

There are some key points regarding application and effectiveness in the hair coloration market where AMIDET® APA-22 creates an advantage.

GELLING EFFECT

Surfactants are normally used to give consistency to the final emulsion of the product which results from mixing the color base and the developer. Comparing different amides (like the market standard PEG-5 Cocamide) in a model formulation of color base with AMIDET® APA-22, the formulation with KAO's product gives the highest viscosity after 1 minute of mixing, which makes application easier and safer.



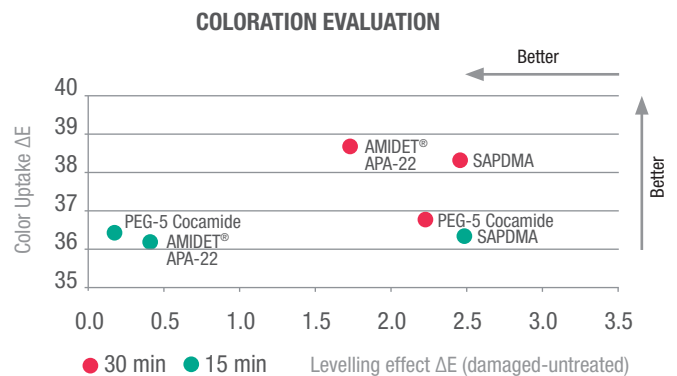
MODEL COLOR BASE

% a.m.

Oleth-13	10
Oleic acid	10
AMIDE	5
Monoethanolamine	7.5
Ethanol	10
Toluene-2, 5-diamine	0.61
Resorcin	0.55
Sodium Sulfite	0.5
Ascorbic acid	0.5
Tetrasodium EDTA	0.5
Water	Up to 100

COLOR UPTAKE & LEVELLING EFFECT

To compare the differences in performance, the color uptake (ΔE) and leveling effect of the hair fibers after the treatment are measured. Levelling effect is defined as the difference in color intensity between damaged and untreated hair. As seen in the graph, the best leveling effect and color uptake after 15 minutes' application is obtained with PEG-5 Cocamide and AMIDET® APA-22 while the overall performance at 30 minutes is clearly better for AMIDET® APA-22.



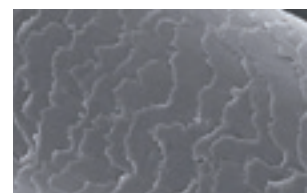
HAIR PROTECTION

The addition of AMIDET® APA-22 to the formulation offers better hair protection as observed by contact angle measurements and Scanning Electron Microscopy (SEM).

SEM images, 1:900 zoom resolution



AMIDET® APA-22



SAPDMA

KAO CHEMICALS EUROPE

www.kaochemicals-eu.com



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in harmony with nature.

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