

## AMIDET® APA-22: An Eco-friendly Surfactant for Hair Care

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### Abstract

Because of market and regulation requirements, we have studied the application in hair care of a product that is readily biodegradable and has a low aquatic toxicity: Behenamidopropyl Dimethylamine (BAPDMA, KCE trade mark: Amidet® APA-22).

This product is a non-ionic surfactant that can act as a cationic surfactant at acid pH. Several applications in hair care are suitable for this surfactant. The performance of Amidet® APA-22 has been compared to that of currently used products, particularly Stearamidopropyl Dimethylamine (SAPDMA), which is widely used in the market but shows high aquatic toxicity.

In hair conditioning, Amidet® APA-22 has been studied in hair rinses and conditioning shampoos. It has also been compared to SAPDMA in hair colouration applications, where amides are used as gelling and conditioning agents.

In all applications Amidet® APA-22 shows good performance and a better eco-toxicological profile than benchmarks. In conclusion, this surfactant is a multifunctional and eco-friendly product, whose market share is increasing rapidly.

### Introduction:

#### Hair Care Market and Regulations

Hair care is a strongly growing market within the personal care industry. The most representative sectors of this market are hair conditioners, shampoos and hair dyes. Currently, there is a growing trend to formulate products that are safe, both to humans and to the environment, due to consumer perception and to regulations.

The eco-toxicological profile is one of the most important features of surfactants in Europe, where regulations are becoming more restrictive. In order to obtain eco-labelling for soaps, shampoos and conditioners, all ingredients in a formulation must comply with ecological criteria such as biodegradability and low aquatic toxicity.<sup>[1]</sup>

If the cationic surfactants used in market formulations of hair rinse are analysed, Cetrimonium Chloride (CTAC) and Behentrimonium Chloride (BTAC) are still the most popular (Figure 1). However, in the near future, the use of C<sub>16</sub> and C<sub>22</sub> monoalkyl quats is expected to be restricted due to some safety concerns.<sup>[2]</sup>

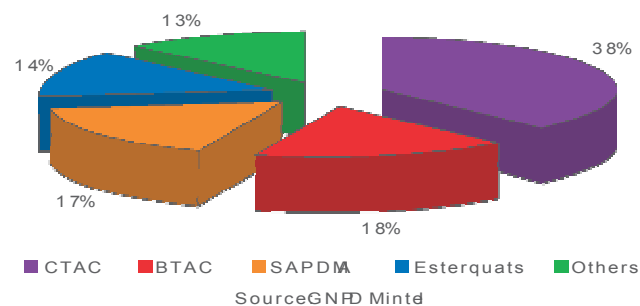


Figure 1. Analysis of the cationic surfactants present in hair rinses launched from October 2006 to October 2007 worldwide.

An interesting alternative to monoalkyl quats is provided by alkyl amidoamines.<sup>[3]</sup> The C<sub>18</sub> amidoamine, Stearamidopropyl Dimethylamine (SAPDMA), is nowadays used in many market products. This product is readily biodegradable, but shows high aquatic toxicity, as shown in Table 1. On the contrary, the C<sub>22</sub> amidoamine (Amidet® APA-22) has a lower aquatic toxicity.

The eco-toxicology of this latter product has been determined on the amidoamine salt with lactic acid, which is the product that is actually released into the environment. The product is readily biodegradable, and with low toxicity for fish, daphnia and algae, which means that no label is needed concerning the environment.

Name	CTAC	BTAC	SAPDMA	Amidet® APA-22
Biodegradability	Readily	Not readily	Readily	Readily
Fish toxicity L50	<1	<1	--	>1
Daphnia toxicity EC50	--	--	--	>1
Algae toxicity EC50	--	--	<1	>1
R phrase (environment)	R50/53	R50/53	R50/53	--

Table 1. Eco-toxicological profile of common cationic surfactants.