

## Key Performance Advantages

- Milder for skin
- Reduces hair damage
- Neutral odor



Personal Care

## AMP-ULTRA™ PC SPECIALTY NEUTRALIZERS

### A Milder Solution for Hair Color

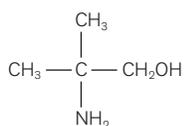
Hair coloring is an ancient art that involves treatment of the hair with various chemical compounds. Today, hair coloring is seen by consumers of all ages as a way to look younger, keep pace with the latest trend or express their individuality.

With the constant shift in hair color trends, the frequency of application has increased, and many consumers are concerned about how hair colorants might damage their hair. This is helping drive the design of milder hair colorants for sensitive skin, and manufacturers are adding skin safety claims, clinical safety data and skin caring ingredients to hair color products to help further reassure consumers.

Ammonia (including ammonium hydroxide) is typically used in permanent hair color, where the dyes remain permanently in the hair fiber and color lasts until the hair grows out. These colorants can also result in the color being applied evenly on the whole hair, sometimes giving a less natural result. Monoethanolamine (MEA, including ethanolamine) is typically used in non-permanent hair color. With this type of hair color product, the dyes wash off after 20 to 24 shampoos. The obtained color is appreciated for its natural result. Hair color cream typically contains 3% to 7% of alkalizing agent and has a pH between 9 and 10. Ammonia and MEA are the most common alkaline agents in hair colorants formulations, but there are some negative aspects related to these ingredients:

- Safety concerns
- Strong or bad odor (mainly ammonia)
- Perceived as highly aggressive by consumers
- May cause hair damage
- May cause allergies and skin/scalp irritation

To reduce the risk of sensitization, formulators are looking to develop a mild hair color product that will respect all skin types. Safe and non-irritant ingredients are the best choices to reach the double objective of formulating a hair color cream that is as mild as possible while reducing the risk of allergy for the consumer.



pKa = 9.8, MW = 89

AMP-ULTRA™ PC 2000 can provide the required level of alkalinity and has a long history as a safe and non-irritating amine into personal care applications. It is a globally compliant neutralizer, attending cosmetics directives rulings on secondary amine and nitrosamine content of raw materials used in the manufacture of cosmetics and personal care products.

AMP-ULTRA PC 2000 is a primary alkanolamine. It is a low viscosity liquid that contains 5% water. These alkaline agents can be used alone or in combination with ammonia.

## VOC Exemption

AMP™ (aminomethyl propanol) is the only amine-based chemical listed as VOC-exempt in the USA Clean Air Act. This means that AMP does not contribute to global warming potential, ozone depletion or air quality.

## Maintaining Performance

With the three-dimensional L\*a\*b\* model, where L\* value is the lightness and where a\* and b\* are color-opponent dimensions, the difference or distance between two colors can be calculated as such:

$$\Delta E^*_{ab} = \sqrt{(\Delta L^*)^2 + (\Delta a^*)^2 + (\Delta b^*)^2}$$

Difference between color on hair when using different alkalizing agents is given by ΔE. A difference is perceivable by human eye when ΔE is higher than 3.

ΔE	
Ammonia vs. MEA	2.9
Ammonia vs. AMP-ULTRA PC 2000	4.0
MEA vs. AMP-ULTRA PC 2000	1.4

## Black Color Test



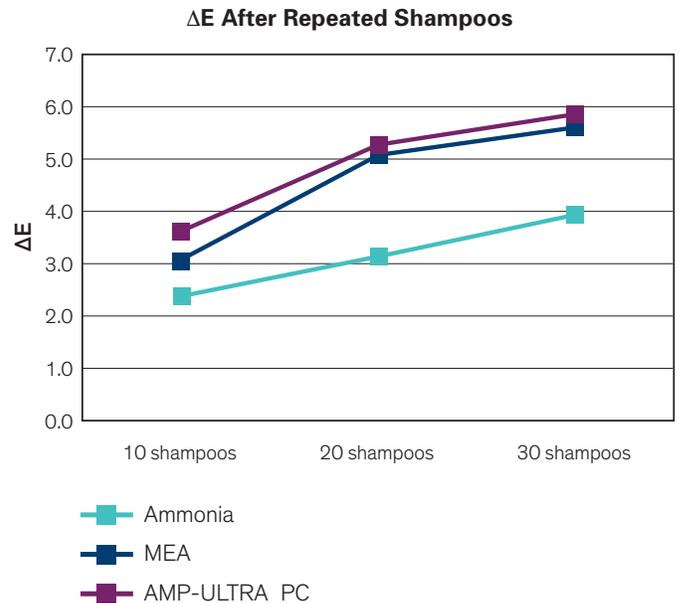
AMP-ULTRA PC 2000 delivers a similar shade as ammonia with a lighter intensity.

Color performance of MEA and AMP-ULTRA PC 2000 is comparable. AMP-ULTRA PC Specialty Neutralizers offer a natural looking result of shade on hair with a performing coverage of white hair, as typically observed from a non-permanent coloration. AMP-ULTRA PC Specialty Neutralizers facilitate the creation of the same large variety of color shades as ammonia.

## Maintaining Long-Lasting Color After Repeated Shampoos

After repeated shampoos the color fades away as colorants are washed out from the hair fiber. This is measured by an increase of ΔE value as shown on the chart below.

- With ammonia: best resistance to repeated shampoo
- With MEA: resistance to shampoo decreases notably after 10 shampoos
- With AMP-ULTRA PC 2000: similar resistance to shampoo as with MEA



## Reducing Hair Color Cream Odor

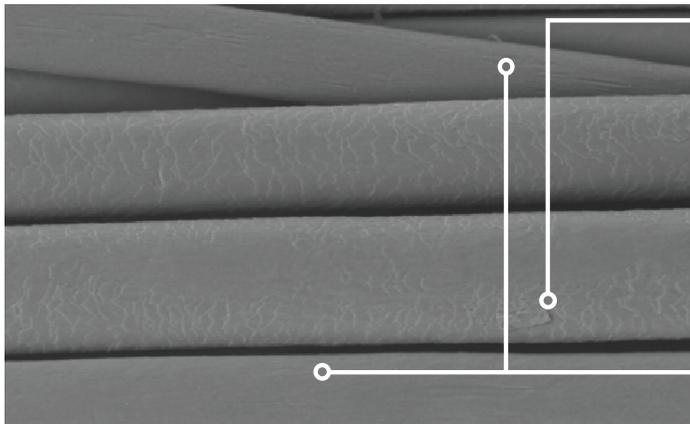
Ammonia has a pungent odor that stings and irritates the nose. Hair dressers, who are frequently exposed when applying hair color on their customers, may even feel a headache. AMP-ULTRA PC Specialty Neutralizers offers a neutral base odor to the hair color cream. The characteristic amine odor is recognizable but remains weak.

## Reducing Hair Damage

The mechanism of hair coloration comprises an opening of the hair cuticle to let the molecules of hair dyes enter. This is particularly the case with ammonia which, by causing the hair shaft to swell, forces the scales of the cuticle to separate slightly. The positive effect is a deeper penetration of the hair dyes into the hair fiber. The negative effect is the potentially greater damage on the hair structure. AMP-ULTRA PC grades control the swelling phenomena and therefore cannot open the hair cuticle to the same extent. The damage on the hair structure is considerably reduced.

Hair swatches were colored five times with hair color product containing ammonia or AMP-ULTRA PC 2000. Scanning Electron Microscope (SEM) analysis was performed on hair and damage was observed.

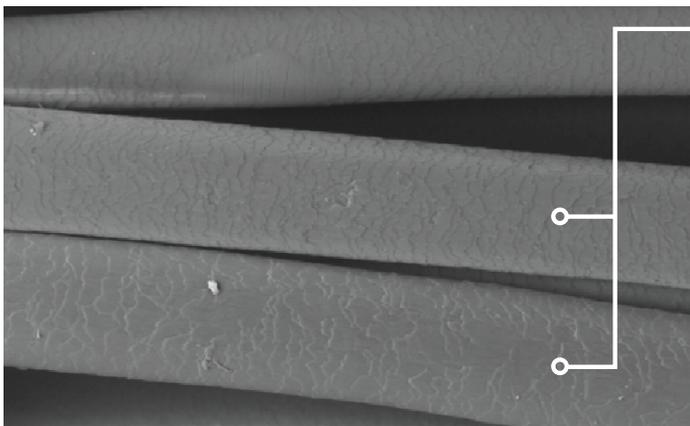
### Ammonia



Cuticle is stripped away partially or even completely.

Cuticle layers have disappeared and the inner cortex is visible.

### AMP-ULTRA PC 2000



Broken cuticles are visible but inner cortex is still protected.

## Product Stewardship

ANGUS encourages its customers to review their applications of ANGUS products from the standpoint of human health and environmental quality. To help ensure that ANGUS products are not used in ways for which they are not intended, ANGUS personnel will assist customers in dealing with environmental and product safety considerations. For assistance, Safety Data Sheets, or other information, please contact your ANGUS representative at the numbers provided in this document. When considering the use of any ANGUS product in a particular application, review the latest Safety Data Sheet to ensure that the intended use is within the scope of approved uses and can be accomplished safely. Before handling any of the products, obtain available product safety information including the Safety Data Sheet(s) and take the necessary steps to ensure safety of use.

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Published March 2017 Form number: AMP-1583-0317-TCG