

AC Kerazyme® Protect



seals in color to reduce fade
proven results
 thermal protection up to 450°F
 nourishes + conditions tresses
 chemically and heat damaged
perfect + protect + preserve
 each hair strand and tress

BACKGROUND

In a world of Photoshop, wigs, weaves and extensions it can be hard for the average consumer to achieve the shiny, glossy and voluminous hair as portrayed by their favorite celebrities¹. Hair itself is becoming a fashion accessory as iconic as the red-lipstick or the little black dress. However, with an increase in the use of heat styling, hair coloring, environmental aggressors, and stress our hair is subject to extensive damage on a daily basis causing thinning, split ends, breakage and lack-luster results.

In order to answer a growing market demand Active Concepts has utilized the natural power of bamboo, keratin and *Trametes versicolor* to create a unique active for the protection of hair and hair color fade caused by everyday washing, heat styling and exposure to UV irradiation. **AC Kerazyme® Protect** works to maintain the hair's natural integrity and defines a sustainable new style.

Bambusa Bamboo, or Giant Thorny Bamboo, are known to be one of the fastest growing plants in the world with a tensile strength to match that of steel. The bamboo grows in humid tropical climates where the plants can reach a height of 20-30m. Its culms are used for house construction, scaffolding, furniture, cooking utensils and fencing. Shoots and seeds are edible and leaves are used in medicine. As such, bamboo has rapidly been accepted as a natural material pioneering the concept of sustainability throughout many industries including that of personal care.

Bamboo also serves as a natural source of silica. Although the function of silica in bamboo is unclear, researchers postulate that silica provides structural support for the plant. Deposits occur in the form of hydrated amorphous silica that forms through the polymerization of monosilicic acid, which is absorbed by the bamboo roots. The bio-silicate isolated from bamboo has typically been used in supplements targeted for the treatment of arthritis. Today, Active Concepts is looking to transfer this sustainable source of bio-silicate into the hair care market capitalizing on its natural properties to seal, protect and condition each hair strand.

Code Number: 16824

INCI Name: Hydrolyzed Keratin & Bambusa Arundinacea Leaf Extract & Trametes Versicolor Extract

INCI Status: Conforms

REACH Status: Complies

CAS Number: 69430-36-0 & 91771-32-3 & N/A

EINECS Number: 274-001-1 & 294-922-2 & N/A

Origin: Botanical & Animal

Processing:

GMO Free

No Ethoxylation

No Irradiation

No Sulphonation

Additives:

Preservatives: None

Antioxidants: None

Other additives: None

Solvents Used: None

Appearance: Slightly Hazy to Hazy Liquid

Soluble/ Miscible: Water

Ecological Information:

100% Biodegradability

Microbial Count: <100 opg, No Pathogens

Suggested Use Levels: 1.0 – 10.0%

Suggested Applications: Hair Color Protection, Thermal Protection, Conditioning

Benefits of AC Kerazyme® Protect:

- Reduces Hair Color Fade
- Provides Thermal Protection
- Improves Hair Manageability
- Nourishes and Conditions

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SCIENCE

Hair is colored for various reasons giving way too many different tones, shades and types of dye available on the market. However, research indicates that colored hair is prone to rapid fading and that most color protection products do not live up to expectations². These products typically work to optimize the surfactant system of a shampoo in order to reduce the harsh cleansing and subsequent dye diffusion out of the hair shaft. Another method is to coat the hair with polymers, silicones or actives or by adding a UV filter. It is essential that these products are substantive to the hair and are otherwise not rinsed off³.

Oxidative hair dyes are a more traditional method of permanently changing hair color. They produce an effect that is resistant to washing, compared to that of direct dyes, and are chosen to provide long term color changes, ranging from the subtle to the dramatic. However, permanent hair dyes are not resistant to hair color fade and damage initiated by wash-out, UV-radiation and the use of heat styling appliances. These can cause the tone of the original color to dramatically change giving way to dull, flat and brassy results.

Oxidative dyes can be based on an alkaline agent and oxidation coloring agents. The alkaline agent has the effect of opening the hair cuticle so that the coloring and oxidizing agents can penetrate into the hair shaft. Color precursors are small molecules which only develop their own color tone once inside the hair. The oxidizing agent (usually hydrogen peroxide) is mixed with the color precursors prior to application. Oxygen is released by the reaction between the alkaline agent and the oxidizing product to stimulate the color-change. Large colored molecules are consequently formed within the hair's cortex⁴.

In order to prevent diffusion of these color molecules from the hair cortex during washing, and subsequent color fade, it is vitally important to seal the hair cuticle. **AC Kerazyme® Protect** utilizes a unique complex of bio-silicate, isolated from bamboo, hydrolysed keratin and *Trametes versicolor* extract to help improve the structural integrity of the hair cuticle reinforcing this protective layer.

Trametes versicolor is a type of mushroom which contains the oxidative enzyme laccase. This distinct enzyme cross-links free carboxylic acid groups in the hydrolyzed keratin with the amine groups along the hair cuticle to create a stable network with the hair shaft. Further crosslinks are created by the bamboo bio-silicate. By forming a scaffold around the hair shaft, which is bonded to the hair itself, a resistant seal is created, preventing loss of color molecules through physical diffusion. This complex lattice can also help to absorb harmful UV rays therefore protecting the hair from damage and increased fading.

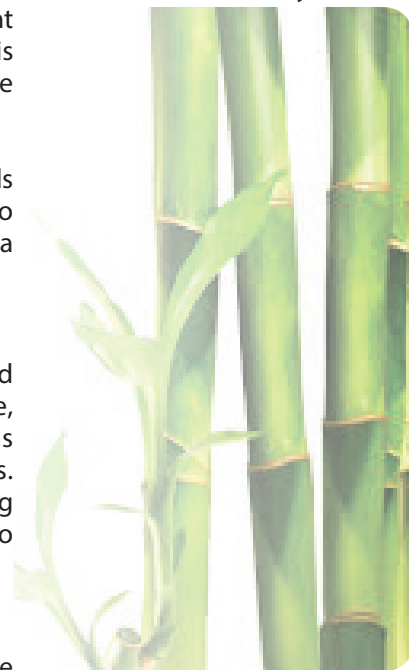
The enzyme found in *Trametes versicolor* is also capable of annealing disulphide bonds which help enhance hair strength. Combined with the hydrolyzed keratin and bamboo proteins for enriching and conditioning **AC Kerazyme® Protect** demonstrates a reduction in thermal damage caused by heat styling.

BENEFITS

AC Kerazyme® Protect is a natural active, derived from Bamboo, Keratin and *Trametes versicolor*, and acts to protect hair from heat and UV induced damage, whilst simultaneously slowing color fade. This multifunctional active was developed to seal the hair, helping defend against everyday, external aggressors. The properties of the hair fiber are improved, thus lending to a more appealing aesthetic of healthier looking, and more manageable hair, allowing consumers to achieve their own unique style.

EFFICACY DATA

A series of *ex-vivo* studies were conducted on human hair tresses to evaluate the ability of **AC Kerazyme® Protect** to provide perceivable benefits to the hair. In order to simulate real life conditions, the hair tresses were exposed to everyday stressors such as washing, UV-radiation and heat styling. Across all study protocols blonde hair tresses were dyed red, as this is the shade is know for the the greatest level of wash-out. A control of dyed hair treated with a base shampoo and conditioner was compared to dyed hair treated with the same base shampoo and conditioner containing **2.0% AC Kerazyme® Protect**. All studies were conducted using a blind protocol in order to limit bias.



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The first study was performed to assess the level of color fade caused by both regular washing and exposure to UV light. The dyed hair tresses were washed and air dried 14 times using the base shampoo and conditioner and the base shampoo and conditioner with **2.0% AC Kerazyme® Protect**, respectively. Using a Xenon-Arc Test for colorfastness to light, the tresses were exposed to 30 hours UV-radiation using the AATCC accelerated fading units (AFUs) model. The Xenon-Arc lamp was used for the accelerated light exposure as it has been shown to simulate the spectral characteristics of daylight better than any other artificial light source.

A microscopic examination of the hair tresses was then conducted on the Hirox 3D Imaging Digital Microscope. This gave photographic images for comparison of the dyed hair tresses washed 7 and 14 times, in order to represent 1 and 2 weeks worth of washing, and also at 0, 10, 20 and 30 hours of light (AFUs).

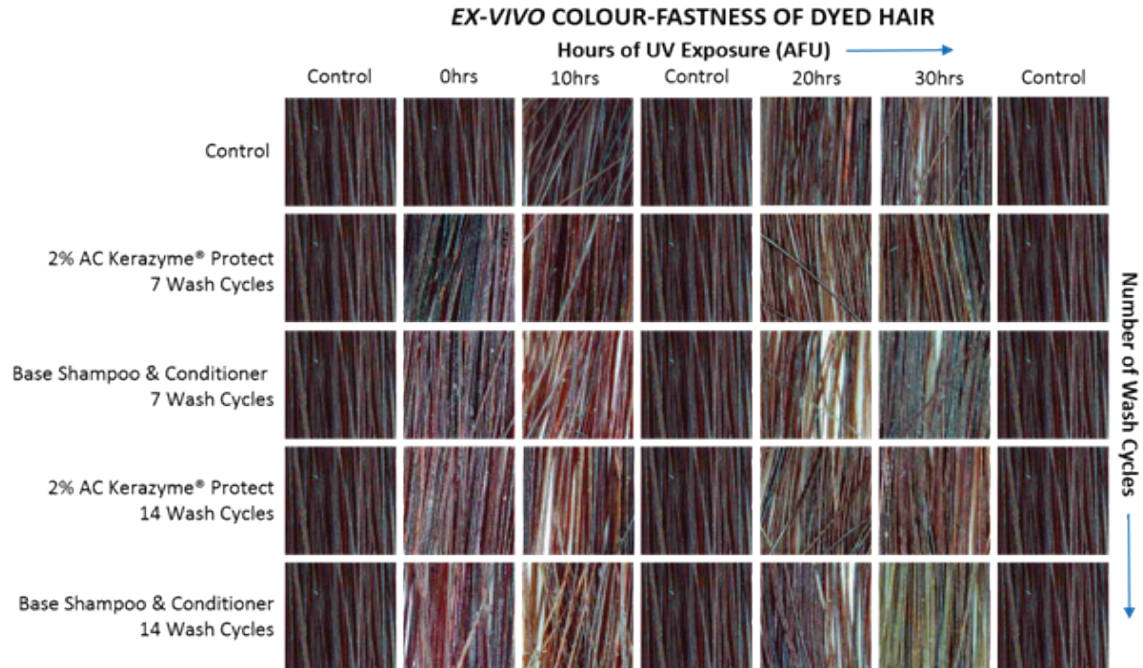


Figure 1. Color-Fade Comparison Chart to show the influence of UV exposure and number of wash cycles on hair color-fastness.

From this photographic comparison of the hair tresses, it can be seen that both washing, and exposure, to UV light can exacerbate the color fade process. However, with the application of **2.0% AC Kerazyme® Protect**, the fading of hair color is reduced greatly. Hair, which was exposed to 30hrs AFU and 14 wash cycles with the base shampoo and conditioner, revealed very low color fastness, the blonde color of the virgin shade easily perceived to be coming through. Conversely, the exposed hair treated with **2.0% AC Kerazyme® Protect** maintained its red tones and appears to have a closer resemblance to that of the original dyed hair color.

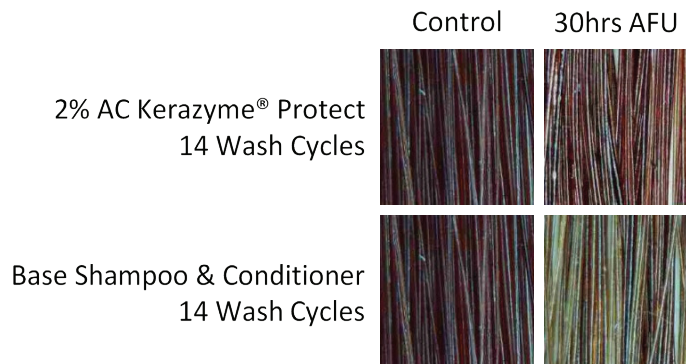


Figure 2. Color-Fade Comparison Chart to show the influence of UV exposure and number of wash cycles on hair color-fastness.

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In order to further substantiate these visual results, quantitative data was collected in the form of L*a*b*-values. Three points per hair swatch were measured to give a mean. This was then analysed using the L*a*b* scale to determine the color light fastness of the hair samples. Here L* = lightness therefore, as the L*-value increases it can be shown that the color fastness decreases and the subsequent color of the hair is faded.

**EX-VIVO LIGHTENING OF HAIR COLOUR
7 Wash Cycles / 0 - 30hrs UV**

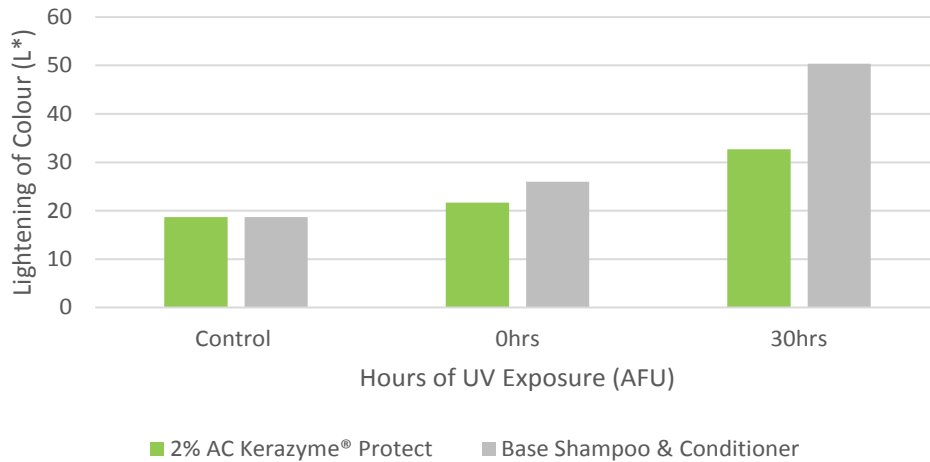


Figure 3. Lightening of hair color expressed as (L* = Lightness) to show the influence of UV exposure and number of wash cycles on hair color-fastness.

**EX-VIVO LIGHTENING OF HAIR COLOUR
14 Wash Cycles / 0-30hrs UV**

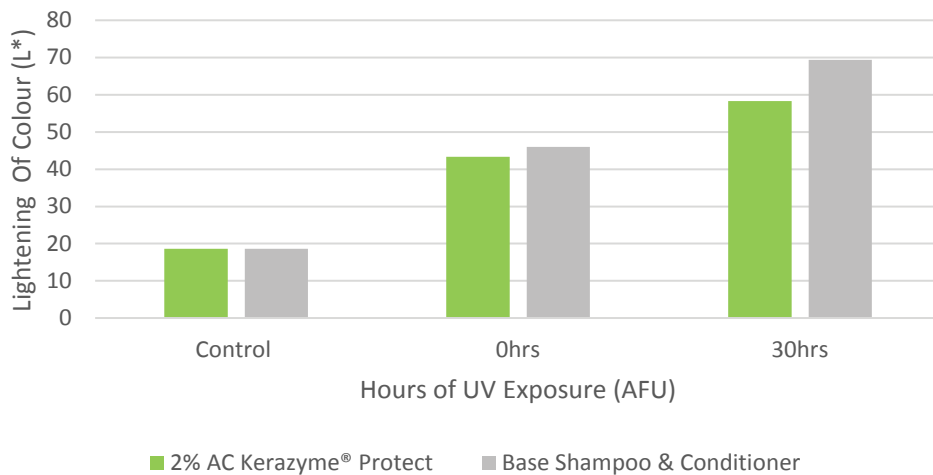


Figure 4. Lightening of hair color expressed as (L* = Lightness) to show the influence of UV exposure and number of wash cycles on hair color-fastness.

The graphs in Figure 3 and 4 show that over hours of UV exposure and with an increase in washing dyed hair becomes lighter as the L*-value increases. However, when comparing the lightening of the samples washed with only the base shampoo and conditioner to that of the samples also treated with **2.0% AC Kerazyme[®] Protect** the L*-values show that the level of hair lightening is lessened following treatment. After 14 wash cycles and 30 hours of exposure to intense UV, **AC Kerazyme[®] Protect** reduces colour fade by 17.2% compared to when using only the base products. The results of this study supports the photographic evidence that **AC Kerazyme[®] Protect** provides colour protection.

A third study was conducted to determine the level of thermal damage imparted to the dyed tresses when treated with the base shampoo and conditioner and the base shampoo and conditioner with **2.0% AC Kerazyme[®] Protect**.

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The hair tresses were exposed to thermal damage in the form of a Remington Ceramic Hair Straightener. This flat iron was passed over each tress 20 times, under standard conditions and using a blind protocol. The temperature applied was of the highest setting at 450°F.

A Flexabrasion method was used to evaluate the effect of **AC Kerazyme® Protect** on the integral structure and properties of the hair. Single fiber testing was performed via Favimat to assess the strength of the hair in terms of tenacity and elasticity. Dyed hair and dyed hair treated with **2.0% AC Kerazyme® Protect** were tested using 25 strands from each tress which was then heat styled.

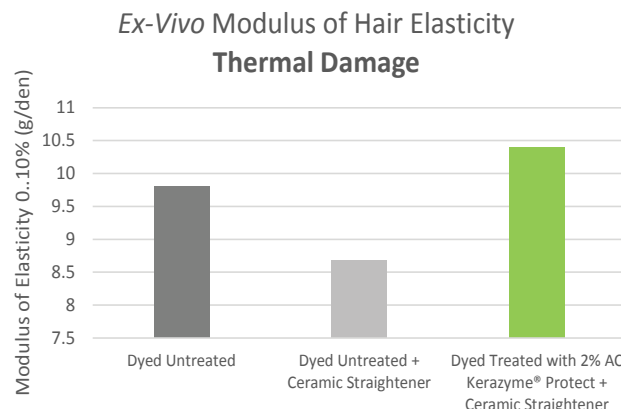
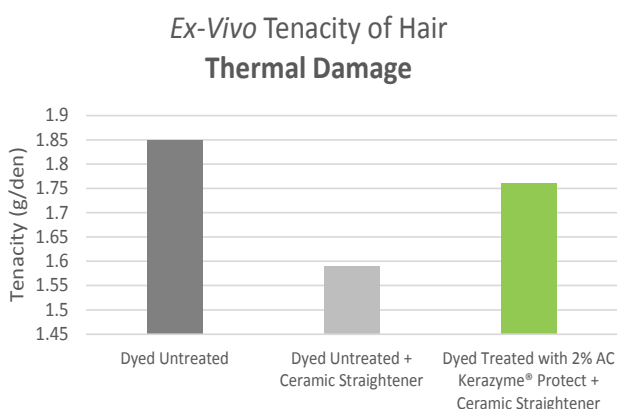


Figure 5. Tenacity of the hair shows influence of thermal styling. **Figure 6.** Elasticity of the hair shows influence of thermal styling.

Tenacity measures the breaking strength of the hair, where the lower the strength needed indicates a weaker and more damaged fiber. Force is applied to the hair strands individually until each strand breaks. Figure 5 shows that the thermal styled hair treated with **2.0% AC Kerazyme® Protect** has greater tenacity than that of the hair washed using only the base shampoo and conditioner. These results indicate that the active is able to effectively protect the hair from thermal damage.

Furthermore, the modulus of elasticity was measured to show the hair's resistance to being deformed. This method indicates the strength needed to increase the fiber length. To calculate this, force is applied to the hair causing elongation. This is expressed as the ratio of change in stress to change in strain as a fraction of the original hair fiber length. The greater the stress needed, the more elastic, thus stronger, the hair. Figure 6 shows that the thermal styled hair treated with **2.0% AC Kerazyme® Protect** requires a greater strain to cause deformation than that of the untreated hair. This further supports the claim that **AC Kerazyme® Protect** helps limit thermal styling damage and promotes stronger hair.

By capitalizing on the unique cross-linking properties of these natural extracts, Actives Concepts created an exciting, new protective seal for the hair that helps maintain structural integrity and prevents diffusion of color. Supported by a comprehensive dossier of *ex-vivo* efficacy trials **AC Kerazyme® Protect** reduces color fade in the hair and significantly minimizes thermal damage. A sustainable styling tool; **AC Kerazyme® Protect** represents a revolution in natural hair care.

References:

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