



# Colour Protection Assay

## L\*a\*b\* Data

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**Tradename:** AC Kerazyme® Protect

**Code:** 16824

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

**Lot #:** NC140826-E

**Test Request Form #:** 978

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### **Abstract**

Hair is coloured for various reasons giving way to many different tones, shades and types of dye available on the market. However, research indicates that coloured hair is prone to rapid fading and that most colour protection products do not live up to expectation. These products typically work to optimise 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 off.

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

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

In order to prevent diffusion of these colour molecules from the hair cortex during washing and subsequent colour fade it is vitally important to seal the hair cuticle. **AC Kerazyme® Protect** is a product designed to maintain the structural integrity of the hair cuticle in order to reduce the hair colour fade as influenced by everyday aggressors such as washing and UV irradiation. The purpose of this study was to confirm whether or not **AC Kerazyme® Protect** is capable of providing these colour-fast benefits.

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An *ex-vivo* study was conducted on dyed human hair tresses to evaluate the ability of **AC Kerazyme® Protect** to provide perceivable benefits to the hair. 2.0% **AC Kerazyme® Protect** was tested in a base shampoo and conditioner against a control of the base shampoo and conditioner with no added actives. The dyed hair tresses were washed and air dried 14 times using the test and control products. The tresses were then exposed to 30 hours of UV irradiation. Micro Imaging was then used to compare the results. This photographic comparison shows that 2.0% **AC Kerazyme® Protect** has the ability to decrease hair colour fade compared to that of the control shampoo and conditioner.

### Materials and Methods

Blonde hair tresses were dyed red, as this is the shade which shows the greatest level of wash-out. The control set of dyed tresses were treated with a base shampoo and conditioner while the test set of dyed tresses were treated with the same base shampoo and conditioner containing 2.0% **AC Kerazyme Protect**. The study was conducted using a blind protocol in order to limit bias.

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 colourfastness to light the tresses were exposed to 30 hours UV irradiation 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.

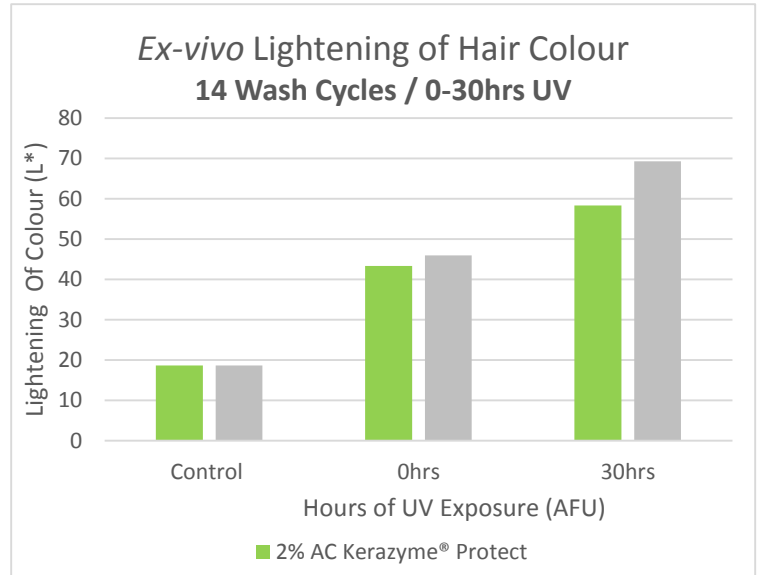
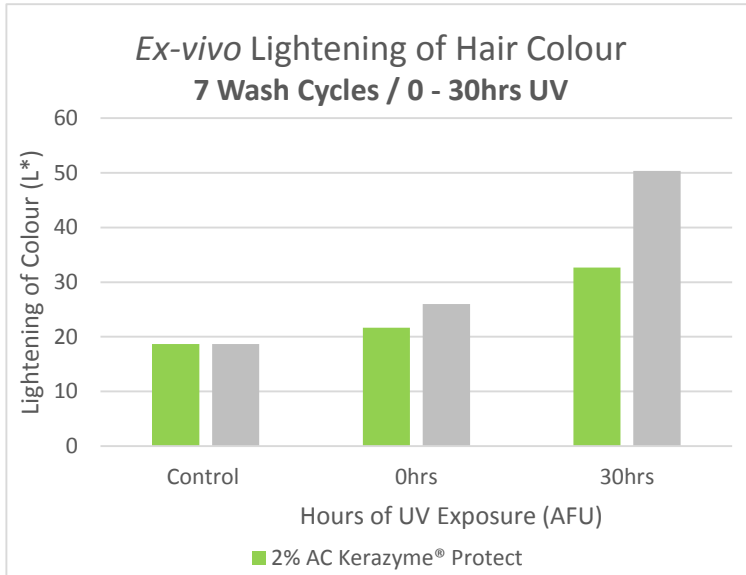
Quantitative data was collected in the form of L\*a\*b\*-values. Three points per hair swatch were measured to give a mean. This was then analysed using the L\*a\*b\* scale to determine the colour light fastness of the hair samples. Here L\* = lightness therefore, as the L\*-value increases it can be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

### Results

7 Wash Cycles / 0 - 30hrs UV			
L*-value			
	Control	0hrs	30hrs
2.0% AC Kerazyme® Protect	18.67	21.67	32.67
Base Shampoo & Conditioner	18.67	26.00	50.33

14 Wash Cycles / 0 - 30hrs UV			
L*-value			
	Control	0hrs	30hrs
2.0% AC Kerazyme® Protect	18.67	43.33	58.33
Base Shampoo & Conditioner	18.67	46.00	69.33

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**Figure 1.** Lightening of hair colour expressed as (L\* = Lightness) to show the influence of UV exposure and number of wash cycles on hair colour-fastness. Dyed hair washed with a base shampoo and conditioner were compared to that of dyed hair washed and treated with a base shampoo and conditioner plus 2.0% AC Kerazyme® Protect.

### Discussion

The results of the quantitative L\*-values indicate that when incorporated into a shampoo and conditioner, **AC Kerazyme® Protect** is capable of decreasing lightening / colour fade of the hair more than the control shampoo conditioner. Hair which has been exposed to 30hrs AFU and 14 wash cycles with the base shampoo and conditioner has very low color fastness but this lightening can be reduced when using 2.0% **AC Kerazyme® Protect** within a cleansing and conditioning product.

From these results it can be concluded that **AC Kerazyme® Protect** would be an ideal active to use in cosmetic applications designed for preventing hair colour fade instigated by washing and UV irradiation.