



# Scanning Electron Microscopy

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**Tradename:** Mycofuse® Protect

**Code:** 16916

**CAS #:** 7732-18-5 & 999999-99-4 & 68333-16-4 (or) 1686112-36-6

**Test Request Form #:** 6628

**Lot #:** N190605B

**Test Performed:**

Scanning Electron Microscopy (SEM)

**Sponsor:** *Active Concepts, LLC; 107 Technology Drive Lincolnton, NC 28092*

**Study Director:** *Maureen Danaher*

**Principle Investigator:** *Parisa Mehrzadeh*

## Background

This study was conducted to determine if **Mycofuse® Protect** is capable of protecting the hair when thermal styling stress is applied.

## Methods & Materials

This study was conducted by salon professionals using Royal Impression's 100% Unprocessed Brazilian Virgin Human Hair. Test swatches were treated and submitted for testing. One swatch was left untreated by spritzing with water, blown dry for two minutes, and flat ironed at 232°C (450°F) for 25 passes. The other test swatch was treated, spritzed with a 5.0% **Mycofuse® Protect** solution and water, blown dry for two minutes, and flat ironed at 232°C (450°F) for 25 passes. A second set of test swatches were bleached (40V) then treated with either water or 5.0% **Mycofuse® Protect** water solution, followed by a two-minute blow dry and 5 passes through a flat iron at 232°C (450 °F). The swatch treatment was designed to mimic long-term effects of styling the hair. It is important to note no additives or fixatives were used in the test solution. This was done intentionally in order to visually see clear results.

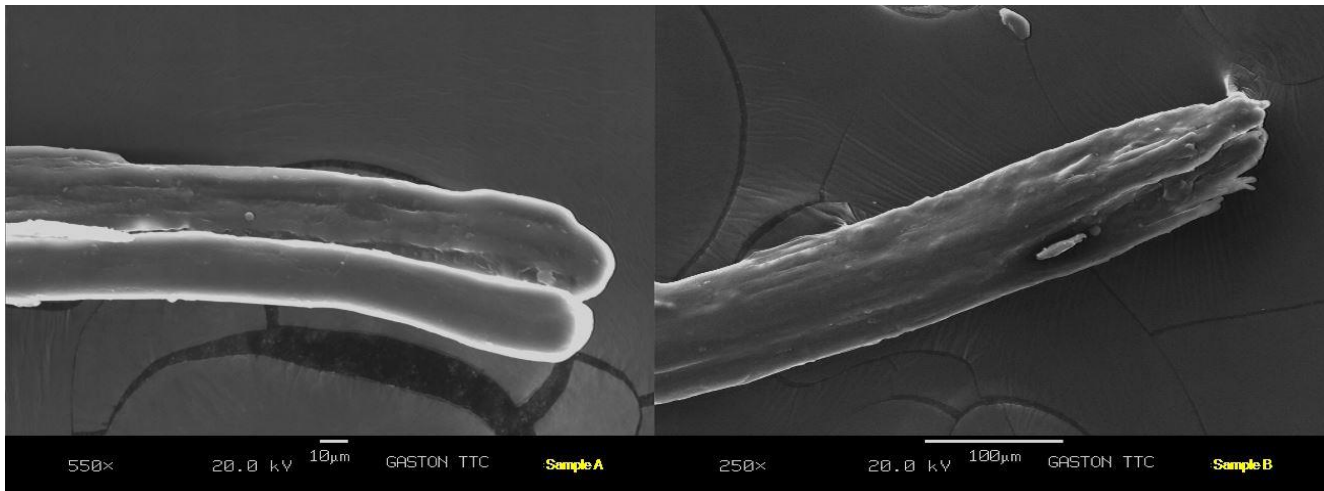
Gaston College Textile Technology Center located in Belmont, North Carolina was asked to perform Scanning Electron Microscopy Imaging (SEM) on the swatches provided by Active Concepts, LLC. Gaston College used a Zeiss DSM 962 to perform the test at 20.0kV using a magnification range from 200x-800x. This method utilizes an electron microscope that produces images of chemically treated hair by scanning the hair with a focused beam of electrons. These electrons interact with the atoms of the hair sample to provide longitudinal and cross-section images of the hairs surface topography and surface composition.

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The sample identifications are listed below:

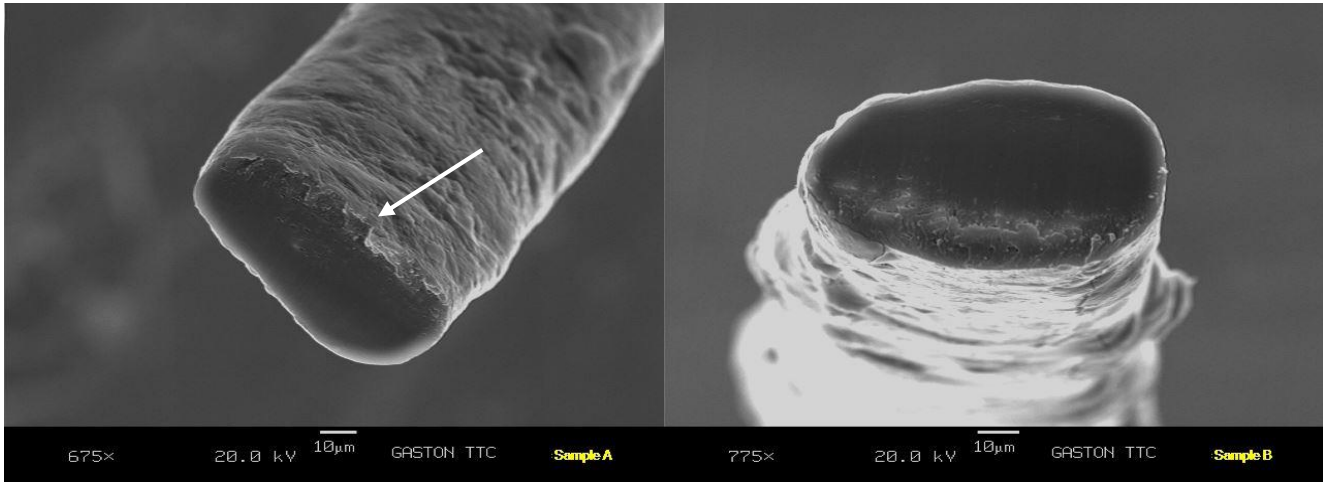
Parameter	Test Sample ID
Straightened Hair, Untreated	Sample A
Straightened Hair + 5.0% <b>Mycofuse® Protect</b> Treated	Sample B
Bleached (40V) Hair, Untreated	Sample C
Bleached (40V) Hair + 5.0% <b>Mycofuse® Protect</b> Treated	Sample D

## Results



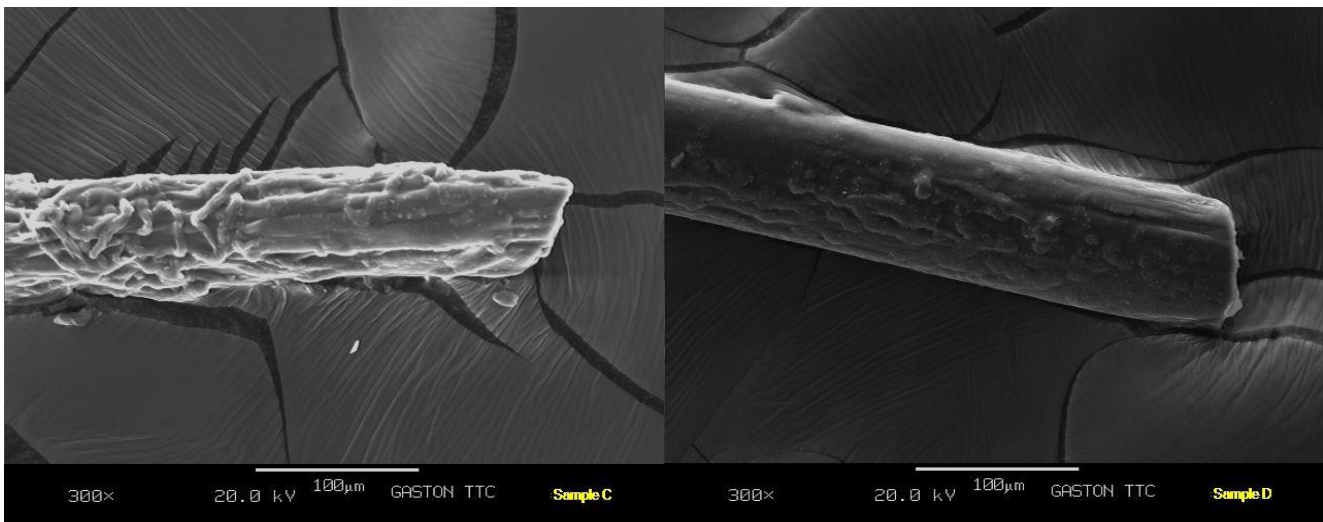
**Figure 1.** Longitudinal image of Straightened Hair, Untreated. The hair strand is split in half and cuticles are not present.

**Figure 2.** Longitudinal image of Straightened Hair + 5.0% **Mycofuse® Protect**. The hair is intact and protected.



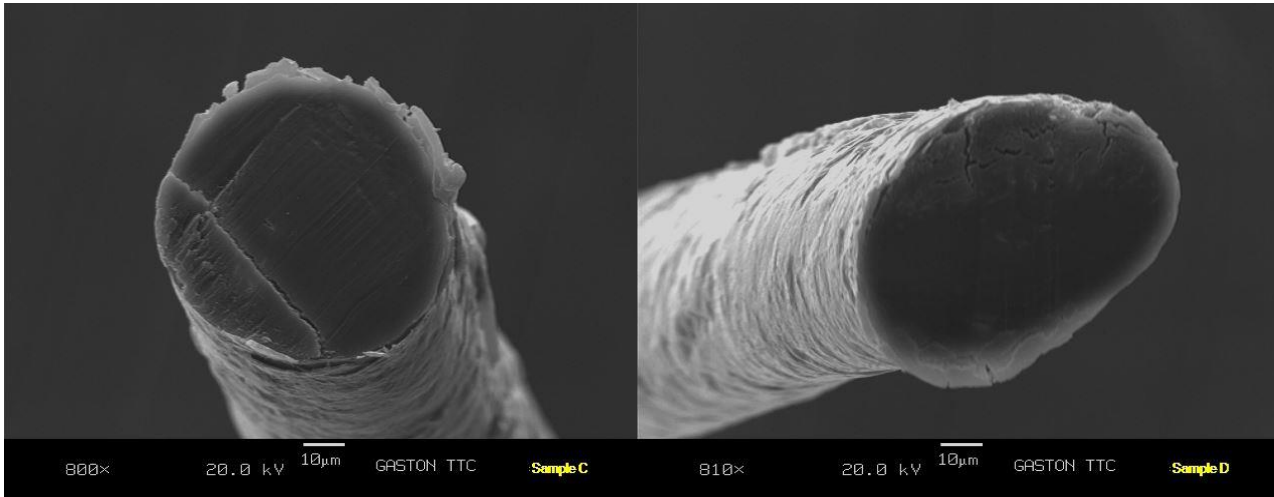
**Figure 3.** Cross-section image of Straightened Hair, Untreated. The outer edges of cross-section are crumbling and cuticles are flared.

**Figure 4.** Cross-section image of Straightened Hair + 5.0% **Mycofuse® Protect**. The outer edges of cross-section are smooth with clean lines. The cuticles are not flaring.



**Figure 5.** Longitudinal image of Straightened + Bleached (40V) Hair, Untreated. The cuticle layer is destroyed due to bleaching. The rigid exterior makes hair feel rough to touch.

**Figure 6.** Longitudinal image of Straightened + Bleached (40V) Hair + 5.0% **Mycofuse® Protect**. The cuticle layer is smoothed down, making hair feel soft and healthy to touch.



**Figure 7.** Cross-section image of Straightened + Bleached (40V) Hair, Untreated. The cuticles on the outer edge are flared up, allowing openings for particles to enter the cortex. Note how the cortex is already cracked.

**Figure 8.** Cross-section image of Straightened + Bleached (40V) Hair + 5.0% **Mycofuse® Protect**. The outer edges are smoothed down, providing a protection layer for the cortex. Note how the cortex remained intact.

## Discussion

The SEM images depict how the outermost layer of the hair, the cuticle, is effected by stressors, in this case thermal styling stressors and chemical bleach treatments. The SEM imagery results of the Straightened Untreated Hair samples depict an extensively damaged, split cuticle. The cuticle acts as a protective layer to the fiber. This type of damage leads to irregular growth, breakages, and overall unhealthy, dead appearance. The SEM imagery results of the Straightened + Bleached Untreated Hair samples show cracks within the cortex surrounded by crumbling cuticle layers. This type of damage contributes to inevitable loss of moisture and leaves hair strands more prone to breaking and splitting.

When the untreated images are compared to the **Mycofuse® Protect** treated swatches, a significant decrease in damage of the both the cuticle and cortex is exhibited. Better yet, the **Mycofuse® Protect** treated SEM images prevented cortex cracking in both Straightened and Straightened + Bleached samples. The cuticle formation **Mycofuse® Protect** employs also exhibits properties such as moisturization, pH balance, barrier protection, and additionally, protection from hair weakening after exposure to heat. Overall **Mycofuse® Protect** is an ideal addition to everyday treatment to repair and protect against thermal styling stressors and chemical treatments.