



Tensile Strength Hair Data

info@activeconceptsllc.com • Phone: +1-704-276-7100 • Fax: +1-704-276-7101

Tradename: ProCutiGen® Bond

Code: 20829

CAS #: 93384-40-8 & 1686112-10-6 (or) 84775-94-0 (or) 9015-54-7

Test Request Form #: 3258

Lot #: NC170116-K

Test Performed:

Tensile Strength

Methods & Materials

This study was conducted by salon professionals using Sensationnel Bare & Natural Brazilian 100% Virgin Remi Unprocessed Human Hair (Hair Zone Moonachie, NJ). One swatch, left unaltered, was analyzed as the control. Two test swatches were bleached alone with Pravana bleach, one with 30V and the other with 40V. Once the bleach processed, the swatches were washed and blown dry. The two treated swatches were treated as follows; Bleach (30V) + 2.0% **ProCutiGen® Bond** and Bleach (40V) + **ProCutiGen® Bond**. Once the bleach processed, the swatches were washed and blown dry.

Note: **ProCutiGen® Bond** was not mixed with the dry powder bleach alone, the developer must be added and mixed to a "butter cream" consistency before adding **ProCutiGen® Bond**.

Gaston College Textile Technology Center located in Belmont, North Carolina was asked to perform Tensile Strength on ten (10) hair swatches provided by Active Concepts, LLC. Gaston College used an Instron 5966 to perform the test, using test method ASTM-D2256-10. This method specifies the test conditions for determining the tensile properties of hair using the single-strand method. The process determines the quality of the raw material and aides in controlling the quality of the end product. To determine tensile strength and elongation at break, specimens are clamped in the appropriate grips and extended at constant rate until failure occurs.

According to ASTM-D2256-10, single-strand hair specimens are broken on a tension testing machine at a predetermined elongation rate and the breaking force and the elongation at break are determined. Elongation at a specified force or the force or tenacity at a specified elongation may also be obtained. Breaking force, breaking tenacity, elongation, initial and chord modulus, and breaking toughness of the test specimen, in terms of linear density, may be calculated from machine scales, dials, recording charts, or by an interfaced computer.

Results

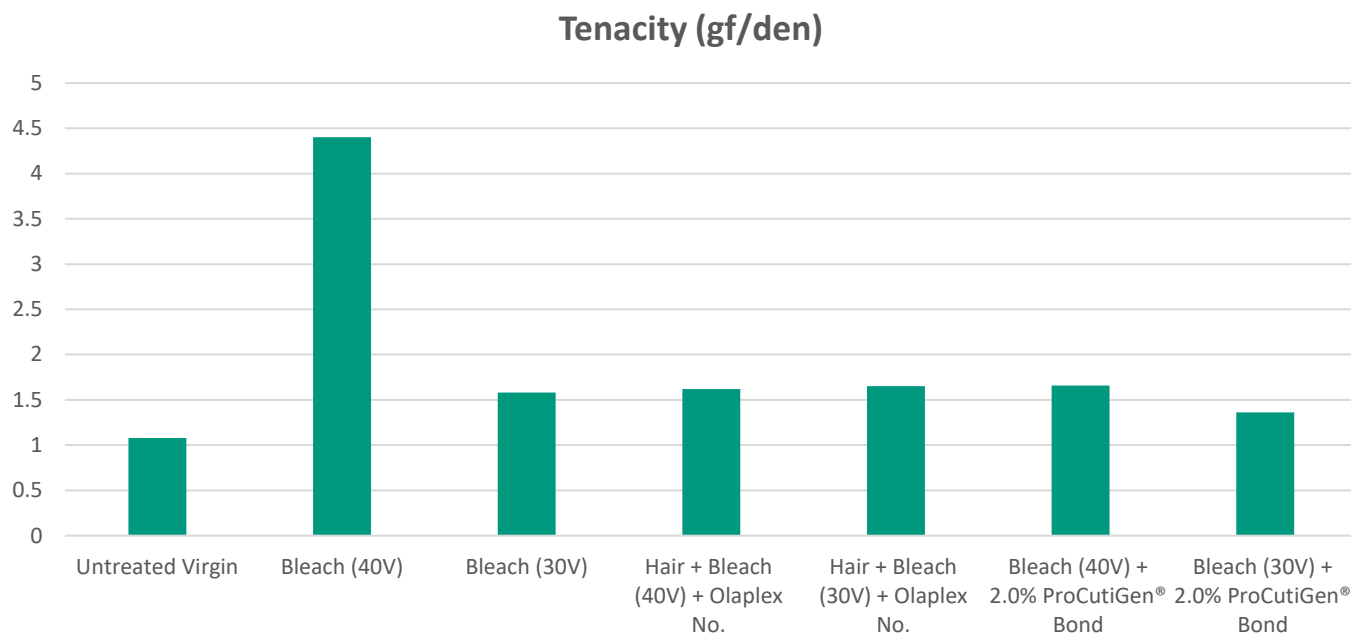


Figure 1. Tenacity, defined as the ultimate (breaking) force of the fiber (in gram-force units) divided by the denier.

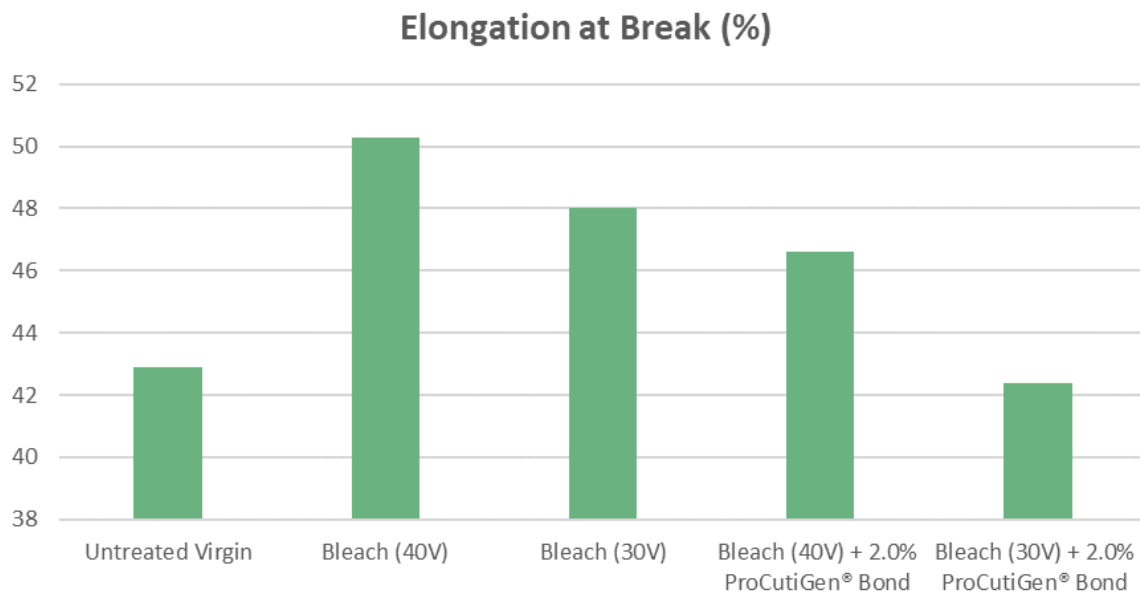


Figure 2. Elongation at break or fracture strain of test fibers

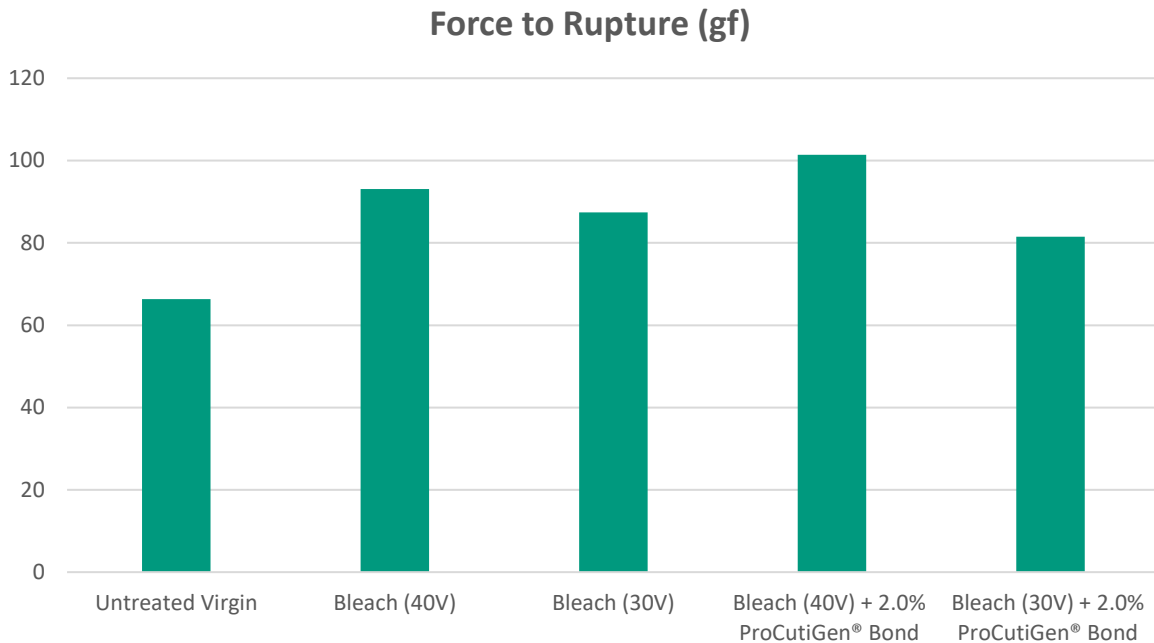


Figure 3. Force to rupture, is the force measured in gram-force (gf) necessary to rupture the hair

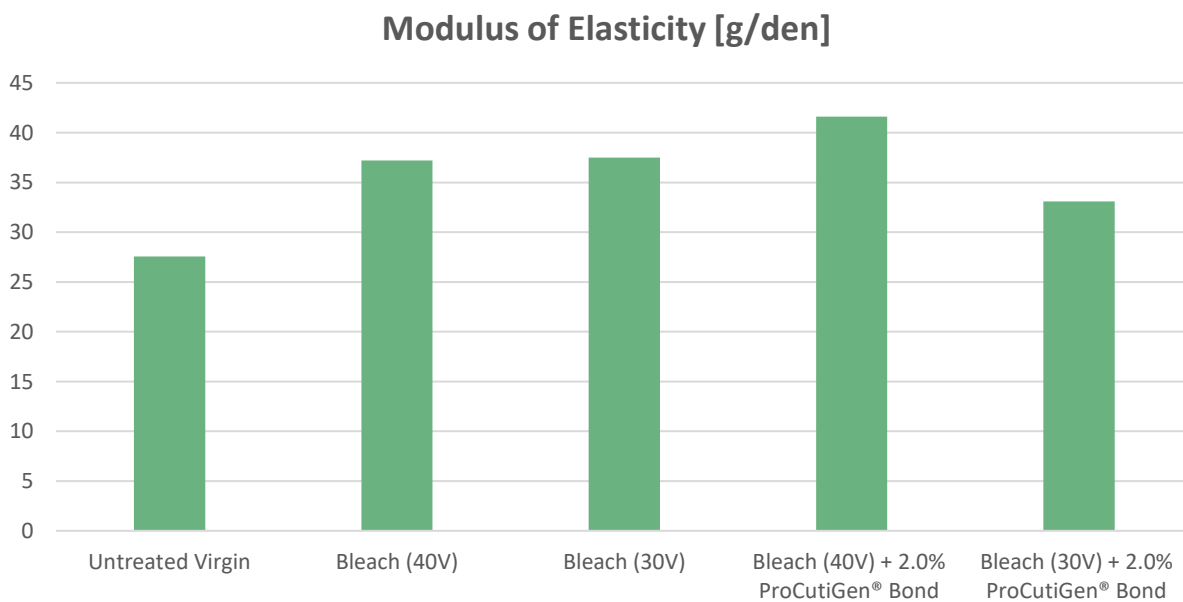


Figure 4. Modulus of Elasticity (Young's Modulus) is the ratio of tensile stress to tensile strain (gf/den)



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Discussion

Tensile strength is defined as the resistance of a material to break under tension. Gaston College Textile Technology Center assessed the following tensile strength factors; Tenacity, Elongation at Break, Force to Rupture, and Modulus of Elasticity (Young's) on untreated virgin hair, Bleach (30V), Bleach (40V), Bleach (40V) + 2.0% **ProCutiGen® Bond**, and Bleach (30V) + 2.0% **ProCutiGen® Bond**.

Tenacity is the customary measure of strength of a fiber usually defined as the ultimate (breaking) force of the fiber (in gram-force units) divided by the denier. The results above indicate that hair treated with bleach + **ProCutiGen® Bond** elicited results similar to that of untreated hair with less than one point difference after treatment.

Elongation at break, also known as fracture strain, is the ratio between changed length and initial length after breakage of the test specimen expressing the capability of a material to resist changes of shape without crack formation, how much a hair fiber will stretch before it breaks. Fibers that are weaker and less resistant to breakage have a greater elongation at break (%). Both the results for 40V and 30V treated hair with **ProCutiGen® Bond** exhibited and improved elongation at break compared to bleached hair alone.

Force to rupture, is the force measured in gram-force (gf) necessary to rupture the hair. How long it takes to break the hair fiber No significant improvement was exhibited using **ProCutiGen® Bond** on this parameter.

Modulus of Elasticity (Young's modulus) describes tensile elasticity, or the tendency of the hair to deform along an axis when opposing forces are applied along that axis; it is defined as the ratio of tensile stress to tensile strain (gf/den). No significant improvement is exhibited in terms of Modulus of Elasticity on hair treated with Bleach + **ProCutiGen® Bond**.

Parameters tested within this set of data are solely based on linear stress applied to the hair. Linear stress applied as a direct parallel force is not the ideal measure of real word stress and strain applied to the hair on a daily basis. In turn, **ProCutiGen® Bond** offered superior results in the category of tenacity and elongation at break. **ProCutiGen® Bond** offers lasting protection and chemical "burn" prevention to promote healthy cuticles resistant to breakage.