

TeraBond™

U.S. Patent No. 11,273,120



Bond Multiplier • Natural Reactive Repair

Actera
science-backed beauty

TeraBond is a reactive repair system that covalently bonds to broken disulfide bonds and repairs keratin fibers in human hair. Whether combined with salon treatments or used at home for daily protection, TeraBond reduces damage and maintains the hair's native structure and strength.

Other Plex technologies use controversial ethoxylated chemicals (e.g. diglycol, PEGs) that may contain 1,4-dioxane, but TeraBond is 100% natural, safe, and renewable.

INCI

Aspergillus Ferment (and) Arginine

Physical Description

White powder

Uses

Salon services where developers and neutralizers (peroxides or enzyme oxidizers) are used; can also be used for at-home maintenance treatments (shampoo, conditioner, masks).

- Bleaching, balayage, highlights
- Demi and permanent color
- Perms or hair relaxer treatments

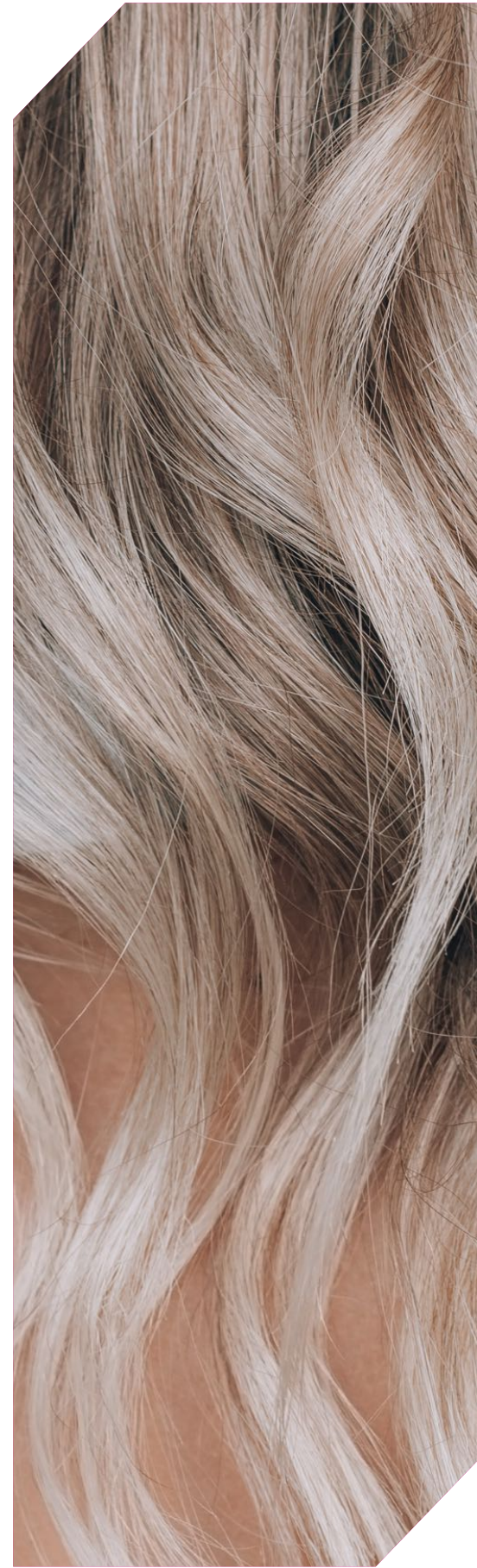
Sustainability & Flexibility

TeraBond is a powder, five times more concentrated than Olaplex® Step 1. It can be added directly to salon processes or used in at-home maintenance products.

Benefits

There are numerous benefits to using TeraBond in salon formulations:

- Repairs 50% of broken disulfide bonds
- Increases sheen and strength
- Reduces porosity and repels moisture
- Conditions without quats or silicones
- 100% natural and safe
- Clean INCI name



The Science of Damage

A vital part of strength and structure comes from the bonds within the cortex, specifically disulfide bonds -- sulfur to sulfur covalent bonds between keratin proteins.

Chemical treatments, coloring, bleaching, use of hot tools, UV exposure, and pollution can cause damage to the hair fiber in several ways:



Disulfide Bonds
(intact & broken)

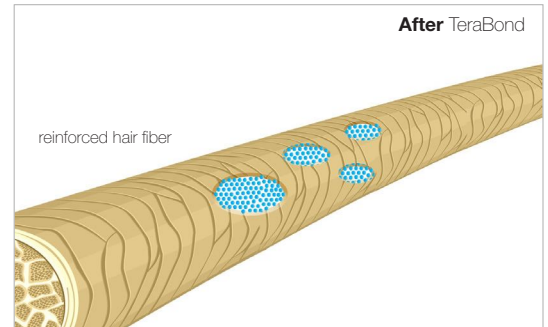
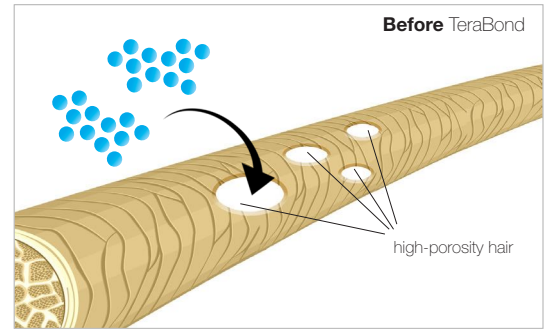
1. Breaking of disulfide bonds forming free thiol groups
2. Lifting/weakening of the protective outer layer known as the cuticle
3. Degradation of melanin leading to voids in the hair fiber increasing porosity
4. Damage of proteins leading to additional voids, compounding porosity, and decreased hydrophobicity of hair (impaired humidity resistance)

Synergistic Repair with TeraBond

Damaged fibers can lead to fragile, lifeless hair that doesn't take or retain color evenly, appears dull, and breaks easily. Particularly in curly hair types, damage can lead to loss of natural curl pattern and limp texture.

TeraBond can help repair the hair fiber from the inside out by:

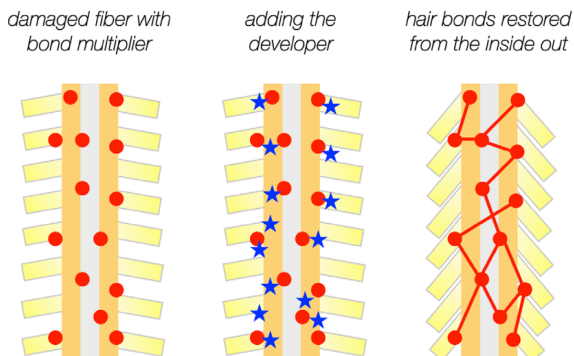
1. **Repairing broken bonds between proteins:** restore hair shape, structure, and strength
2. **Filling voids:** reduce porosity, increase hydrophobicity, increase humidity-resistance
3. **Soothing the cuticle:** improve shine, combability, and reinforce the hair fiber's protective shield
4. **Controlling oxidation:** slow the rate of oxidation during chemical treatments to reduce damage to the hair



TeraBond Polymerization Mechanism



How TeraBond Works



TeraBond (red dot) TeraBond is a reactive bond multiplier that repairs hair from the inside out.

oxidizing agent (blue star) Oxidizing agents:
 • peroxides, activators, developers,
 • heat and UV light.

hair bonding (red line) The results are chemical bonds that:
 • heal broken disulfide bonds
 • seal loose ionic bonds
 • form long molecular chains (polymer) inside the hair, fixing damaged keratin fibers
 • reduces porosity and increases humidity resistance by filling gaps in the fiber

Covalent Bonding Study

Harsh oxidative processes like bleaching can break disulfide bonds which disrupts the protein structure of the hair and weakens hair fibers. Damage can be reversed when these bonds are reformed by TeraBond.

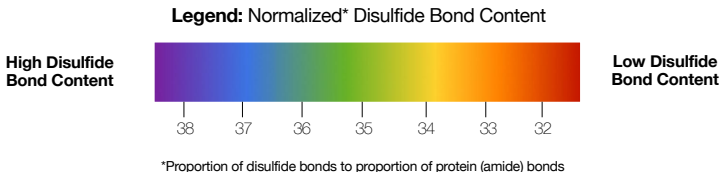
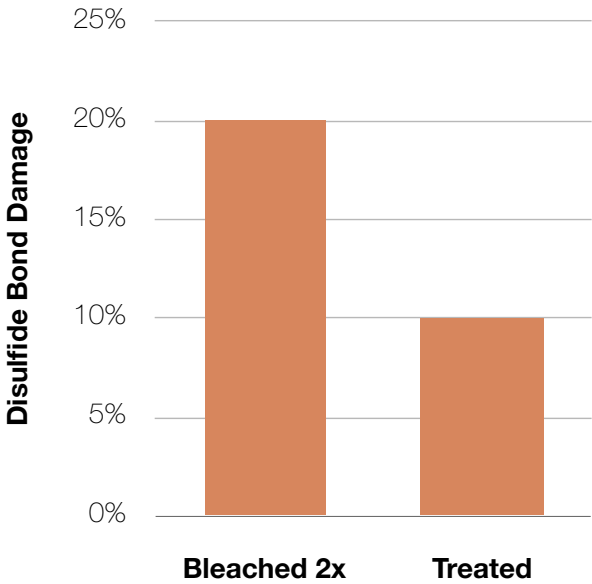
Design

- Performed at Textile Research Institute, Princeton, NJ
- Confocal Raman Spectroscopy: captures hair structure data from surface of hair down to a depth of 25 microns
- WITec Alpha-300R confocal Raman microscope
- Hair fibers tested: virgin, bleached, and treated (bleached + TeraBond)

Regeneration of Disulfide Bonds with TeraBond Treatment



TeraBond Repairs 50% of Broken Disulfide Bonds



Average disulfide bond content measured at the surface of hair fiber to a depth of 25 u in virgin, bleached, and treated tresses.

Hair Bleaching

Materials

- TeraBond: 8.5% solution in water
- Olaplex #1: used according to packaging instructions
- Bleach + Developer

Procedure

- Virgin black hair tresses were bleached with 40 vol developer for 50 minutes 5 times in a row, followed by an extreme 3-hour bleaching
- Tresses were **untreated**, **TeraBond-treated**, and **Olaplex-treated**
- TeraBond treated tresses were prepared by stirring the 8.5% solution in water with bleach + developer to make a paste.
- Paste was applied to the tresses, and after bleaching process described above, tresses were rinsed and air-dried
- Visual assessment was done by trained panelists

Results

- Untreated tresses were extremely damaged
- Olaplex tresses showed signs of repair
- TeraBond tresses showed even more signs of repair



Qualitative Assessment

	No Treatment	TeraBond	Olaplex
Ease of Combing	2/10	9/10	8/10
Breakage w/ Combing	Yes	None	None
Natural Fiber Wave	1/10	7/10	5/10
Visibly Smooth	No	Yes	Yes

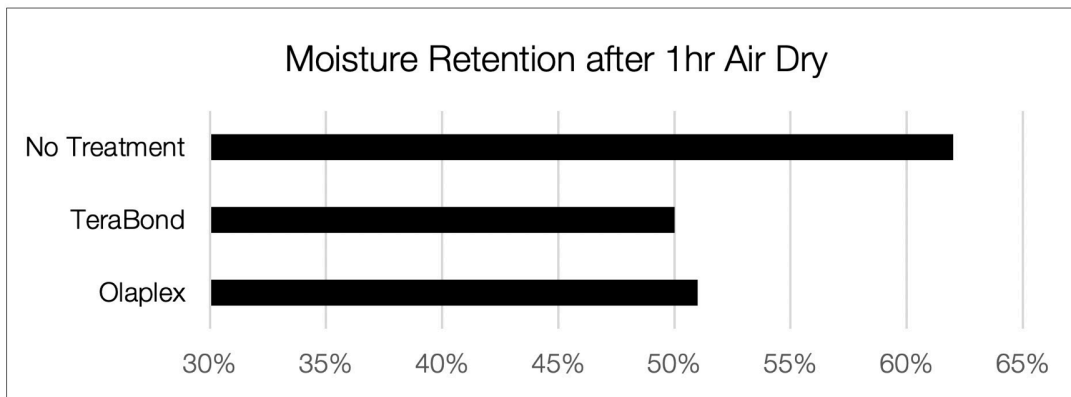
Hair Porosity

Procedure

- Bleached untreated and treated tresses were washed and then allowed to air dry for 1 hour
- Tresses were weighed while wet and again after 1 hour drying time

Results

- TeraBond- and Olaplex-treated tresses repelled moisture much more than the non-treated tresses
- Results show that TeraBond reduces hair porosity by repairing keratin bonds that fill voids in the hair shaft - allowing hair to repel moisture



Color Treatment



Untreated Tress

- Dull, blurred (diffracted) shine band
- Thinner fibers and lower tress volume (thin and flat)

Bond Multiplier Tresses

- TeraBond and Olaplex create distinct, bright white shine bands
- Visibly thicker individual fibers and tress volume

Color Fastness

Red-dyed, untreated, and treated tresses were washed with typical shampoo and then rinsed. Color runoff was visually evaluated by trained panelists.

Untreated and Olaplex-treated dyed tresses had high levels of dye removed from the hair during washing shown by the runoff.

TeraBond treated tresses had no color runoff and therefore no dye removed from the tresses during washing.



Testing Results Summary

- Visible repair: softer, smoother, shinier strands
- Fewer broken fibers
- Less swelling, more hydrophobic hair
- Faster drying, less porosity
- Improved color retention
- Competitive performance vs traditional Plex technologies

Formulation Guidelines

Note: 8.5% of TeraBond is completely soluble in water

For Salon Use (Reactive System):

- Use Level: 8.5% in water
- RT water to be used for dissolving TeraBond powder
- Shake or mix then visually ensure TeraBond powder is dissolved

For Daily/Weekly Maintenance:

- Use Level: 2-8.5%
- Add to water phase and dissolve (should go in at room temperature)
- Can use heat if necessary
- Higher use levels may result in lower viscosities (adjust thickeners to desired final viscosity)

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