PERSONAL CARE

Damaged-hair care

Enduring care and protection for damaged hair

Meet the need for longer-lasting hair care and protection

Repeated washing, combing and heat styling; bleaching and coloring; air pollution; and the sun's UV rays all conspire to damage the hair.

Damaged hair is frizzy… dry and dull… split and broken. It's also difficult to comb and style. No wonder there's a consistent need for hair care products that offer promise for long-lasting care and protection.

Restore hair's hydrophobic state

Many of today's hair repair solutions target damaged sites on the hair cuticle. However, selected DOWSIL™ silicones not only restore hair's hydrophobic state, but they also provide long-lasting conditioning and protect the entire shaft from hair breakage.

Forming a homogeneous silicone film that mimics the hydrophobic lipid layer on the cuticle of virgin hair, these silicones remain on the hair for long-lasting performance. Just as importantly, when used with a clarifying shampoo, they do not create buildup on the hair, even after repeated use.

Benefits of DOWSIL™ silicones for damaged hair:

- Restore hair's hydrophobic state
- Reduce combing forces
- Improve sensory profile
- Long-lasting performance
- Protection from hair breakage
- Homogeneous root-to-tip coverage
- No buildup
- Effective at low use levels

Featured products

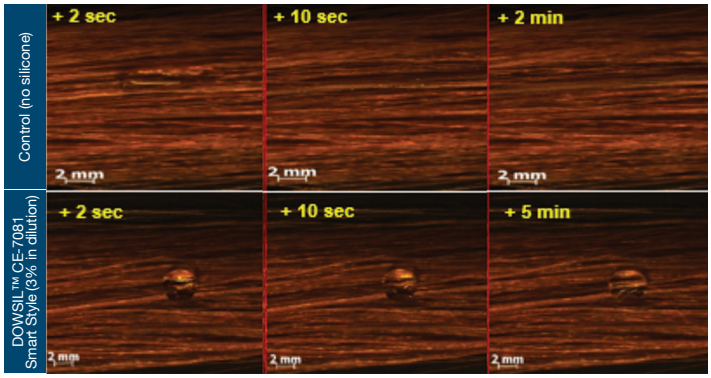
- DOWSIL™ CE-7081 Smart Style
- DOWSIL™ 969 Emulsion
- DOWSIL™ 8500 Conditioning Agent

Test results attest to the effectiveness of DOWSIL™ silicones

Specifically designed hair-care testing protocols were developed to assess different silicone technologies to determine which were most effective in delivering:

- A combination of hair restoration and protection through homogeneous coverage – not only of damaged sites on the hair, but also of the undamaged areas
- Hydrophobicity and conditioning benefits that last through multiple washes
- The potential to protect against many kinds of hair damage and to limit further damage

Figure 1: Water absorption test



Procedure: Water droplets were deposited on damaged hair tresses, and the time required for the water to be absorbed was measured.

Results: Tress treated with DOWSIL™ CE-7081 Smart Style demonstrated a much higher degree of hydrophobicity as evidenced by the longer time required for absorption.

The power to restore hair's hydrophobic state

Healthy hair is naturally hydrophobic. Using a combination of absorption and sink testing, Dow has demonstrated the ability of specific DOWSIL™ silicones to restore damaged hair's hydrophobic state.

Figure 2: Hair sink test

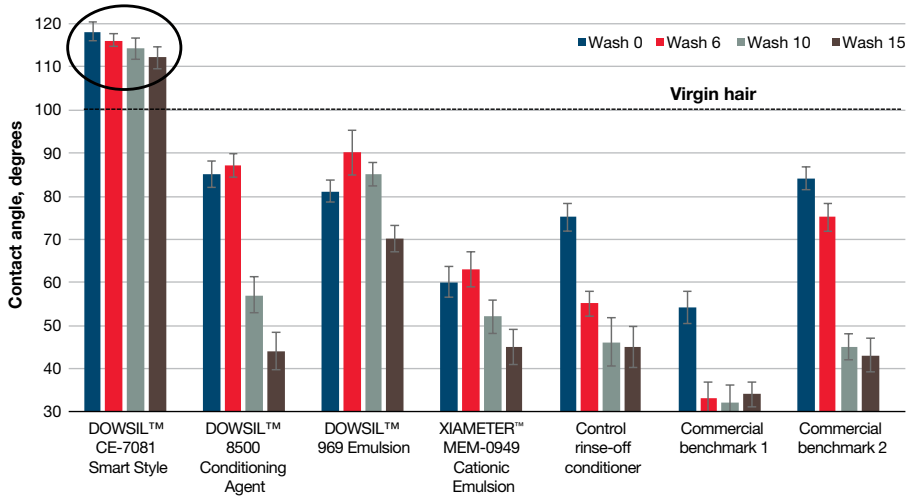
Procedure: Portions of hair tresses were released in beakers of water, and the hair's behavior was observed.

Results: Damaged hair treated with the dilution of DOWSIL™ CE-7081 Smart Style remained on top of the water, demonstrating hydrophobicity.

The ability to achieve more durable hair hydrophobicity

Water contact angle is an excellent indicator of hydrophobicity. The greater the contact angle, the more hydrophobic the substrate. In testing, damaged hair treated with DOWSIL™ silicones retained a greater degree of hydrophobicity over multiple washes than the control and commercial benchmarks. Similar benefits were observed when testing at 0.5% and 1% silicone active levels in rinse-off conditioner.

Figure 3: Contact angle on hair treated with rinse-off conditioners containing 2% silicone active



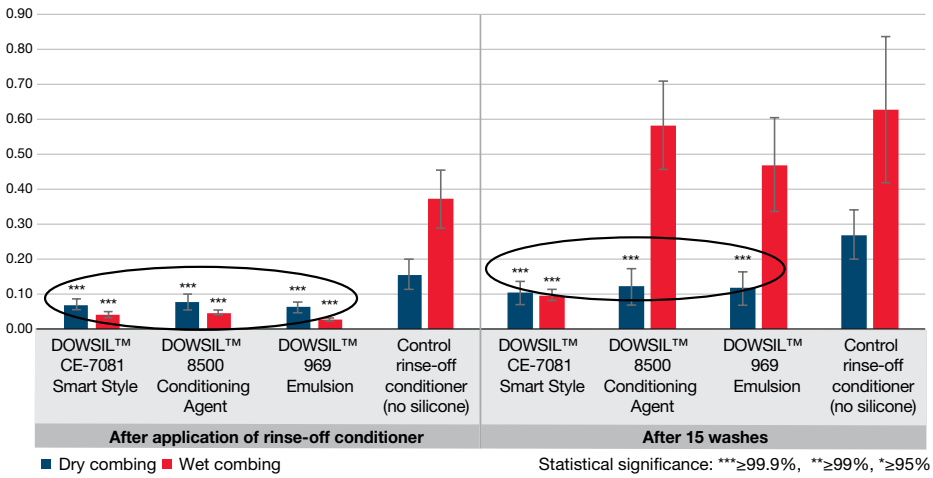
Procedure: Measurements of contact angle were taken between a water drop and the surface of bleached hair tresses treated with rinse-off conditioner containing 2% silicone active versus the surface of tresses treated with a control conditioner (no silicone) and with two commercial benchmarks. The measurements were repeated after 6, 10 and 15 washes with diluted surfactant solution.

Results: Tresses treated with DOWSIL™ silicones demonstrated durable hair hydrophobicity compared to tresses treated with the control or with the commercial benchmarks; additionally, this benefit was maintained up to 15 washes.

The benefit of long-lasting conditioning

Efficient conditioning reduces combing forces and can help reduce hair breakage over time.

Figure 4: Wet and dry combing forces on bleached hair



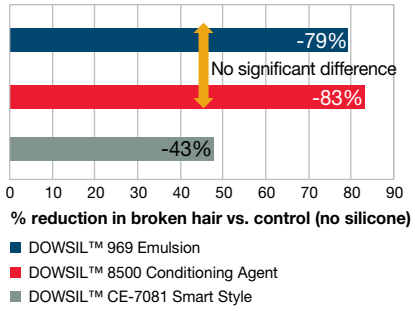
Procedure: Tresses of bleached hair were treated with rinse-off conditioner containing 2% silicone active versus tresses treated with a control rinse-off conditioner (no silicone). Combing forces were measured using a Dia-Stron automated combing instrument; measurements were repeated after 15 washes with diluted surfactant solution.

Results: Rinse-off conditioner containing DOWSIL™ silicones significantly reduced both wet and dry combing forces compared to the control; additionally, the dry combing force reduction benefit persisted after 15 washes.

Protection against breakage

Anti-breakage is one of the most popular claims made for damage care products. The film formed by silicone on the hair can prevent damage caused by everyday grooming – thus significantly reducing hair breakage.

Figure 5: Repeated combing test
DOWSIL™ silicones (2% active) in rinse-off conditioner



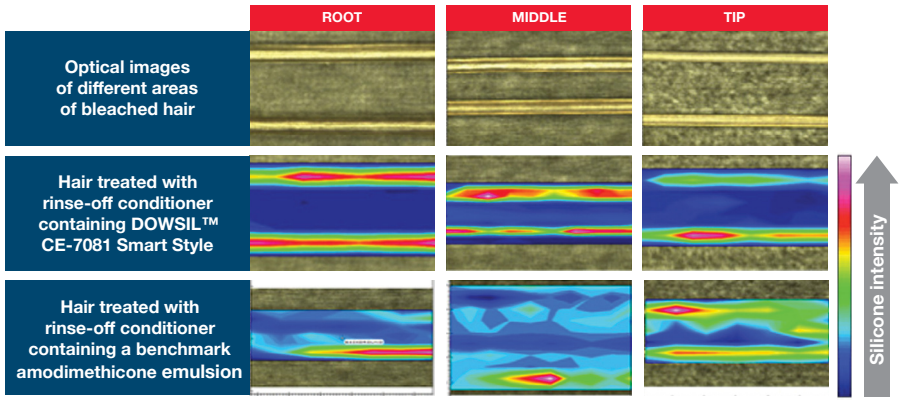
Procedure: Bleached hair tresses were treated with rinse-off conditioner containing 2% silicone active and with a control rinse-off conditioner (no silicone). Treated tresses were subjected to 10,000 comb strokes at a speed of 80 strokes/minute; the broken hairs were weighed, and percent reduction in broken hair (versus the control) was calculated.

Results: Tresses treated with rinse-off conditioner containing DOWSIL™ silicones displayed significantly less breakage than the tress treated with the control.

Homogeneous silicone coverage

Silicone deposition is a key element of hair protection. DOWSIL™ Silicones offer damage care and protection by depositing homogeneously – from the root of the hair to the tip.

Figure 6: Fourier transform infrared spectroscopy (FT-IR) analysis of silicone distribution and quantification
Chemical distribution of Si-C band (1,258 cm^{-1}) for the root, middle and tip regions of bleached hair



Procedure: Bleached hair was treated with rinse-off conditioner containing 2% active silicone. Using FT-IR analysis, multiple hair fibers were analyzed to determine the distribution of silicone deposited on different regions of the hair.

Results: DOWSIL™ CE-7081 Smart Style deposited more homogeneously among the hair fibers than the benchmark.

Featured DOWSIL™ silicones

Product	INCI name	Additional benefits
DOWSIL™ CE-7081 Smart Style	Silicone Quaternium-16/Glycidoxy Dimethicone Crosspolymer (and) Undeceth-11 (and) Undeceth-5	• Wet and dry combing • Friction reduction • Improve sensory performance (smoothness, friction and glide) • Flexible hold • Curl definition and retention • Frizz control • Long-lasting color protection
DOWSIL™ 969 Emulsion	Amodimethicone (and) Cetrimonium Chloride (and) Trideceth-3 (and) Trideceth-15	• Wet and dry combing • Heat protection • Ease of styling • Long-lasting styling • Fast drying
DOWSIL™ 8500 Conditioning Agent	Bis (C13-15 Alkoxy) PG Amodimethicone	• Wet and dry combing • Volume • Color protection • Enriched foam lather • Improve sensory performance (glide, combing, friction and smoothness) • Fly-away reduction • Heat protection • Shine • Enable clear formulations

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