Silanol Technology: 
Delivery Vehicle 
and 
Skin Structuring Agent
Silanol Technology:

- Bioavailable molecular structure centered around the Si atom
- Readily accepted by the skin’s own connective tissue
- Supports skin’s architecture and functions
- Capable of delivering active compounds and enhancing their activity
Silanol Technology

Silicon: the atom

Silicon
14 Si
28.1
Silicon for Skin & Hair

- Active part of pathway for synthesis of structure proteins
- Important for activation of enzymes
- Shown to be vital for skin strength & elasticity
- Silicon content in hair correlates with lower rate of hair loss and increased brightness

Silicon has been found to play a vital role in the formation and maintenance of connective tissue.

With age, the amount of silicon in connective tissue decreases **

Si-dependent pathways slow down

Skin architecture starts to decline

Silanol Technology

Silanol is stabilized in its monomeric active form by attaching bioactive molecules.

Silanol is prone to polymerization into biologically inactive silicone.

Silanol is stabilized in its monomeric active form by attaching bioactive molecules.
Exzymol’s original Silanol
Silanol core stabilized with Alginic Acid

\[
\text{Si} \quad \text{CH}_3 \quad \text{OH} \quad \text{OH} \quad \text{OH} \\
\text{Alginic Acid} \quad \text{Alginic Acid} \quad \text{Alginic Acid}
\]
Silanol Technology

METHYLSILANOL MANNURONATE

Silanol improves skin's architecture by:

- Stimulating collagen production

![Graph showing collagen production comparison between young and aged cells, with Silanol treatment showing increased collagen density in young skin as large bundles.](image-url)
METHYLSILANOL MANNURONATE

Silanol improves skin’s architecture by:

- Increasing skin cell proliferation

- Improving cellular communication – increases Keratinocytes’ ability to support Fibroblast activity

A = Fibroblasts alone, FCS
B = Keratinocyte action added
C = Silanol added 1%
D = Silanol added 1.5%
Active Silanols – Global Skin Care Benefits: Epidermis, DEJ, Dermis & Hypodermis

- **Epidermis**: Epidermal thickening & elasticity, hydration & protection, increased HA production, tyrosinase inhibition.
- **DEJ**: Improved cell communication and cohesion between layers. Increased expression of DEJ constituents: Laminin 5, Perlecan, Collagens IV and VII. Inhibits DEJ-originating age spots.
- **Dermis**: Collagen production and organization for boosting firmness, density, elasticity and flexibility. Moisturization & Osmoregulation. Delayed fibroblast senescence.
- **Hypodermis**: Microcirculation, lipolysis for firming & slimming, reduced lipogenesis.
Staining: Masson’s Trichrome

- Nuclei in blue / black
- Cytoplasm in pink
- Collagen fibers in blue green
ACTIVE SILANOLS TARGETING EPIDERMIS

Active Pendant Groups:

• Hyaluronic Acid – low MW (150-600 kDa)
• Hyaluronic Acid – high MW (> 2 MDa)
• Ascorbic Acid
• Salicylic Acid
• n-Acetyl Tyrosine
• Hydrolyzed Collagen
• Hydrolyzed Pearl Powder
Silanol core stabilized with low MW Hyaluronic Acid (150-600 kDa)
Silanol Technology

SILANETRIOL (and) HYALURONIC ACID

Silanol increases keratinocyte proliferation in HRE

- Control
- Si (50mg/L)

Keratinocyte proliferation (% of control)

+20%

Silanol increases keratinocytes’ ability to support fibroblast proliferation (cellular communication)

- Aged cells FCS 2%
- Si (10mg/L) FCS 2%
- Si (15mg/L) FCS 2%

Fibroblast proliferation (% of control)

+32%
+85%

SILANETRIOL (and) HYALURONIC ACID
Silanol increases HA production by keratinocytes

SILANETRIOL (and) HYALURONIC ACID
Silanol Technology

SILANETRIOL (and) HYALURONIC ACID

![Image of CD44 expression comparison](image)

- Control
- MTS 5%
- HA 5%
- Silanol-HA 5%

![Bar graph showing CD44 expression](image)

- Control
- MTS (5%)
- HA (5%)
- Silanol-HA (5%)

Expression increases by +26% with HA and +37% with Silanol-HA.
Silanol Technology

SILANETRIOL (and) HYALURONIC ACID

Epidermis thickening (HA)

- Silanol-HA 5% 9 days
- Control
- Silanol-HA (+39%)
- Anti-superficial wrinkles
- Hydration
- Protection

Collagen booster (Si)

- Collagen density (% of control)
  - Control
  - Silanol-HA (13x)
- Anti-deep wrinkles
- Firmness
- Elasticity
Silanol Technology

SILANETRIOL (and) HYALURONIC ACID

IN-VIVO Study

35 women 40-59 y.o.

Twice a day on face

5% Si-HA gel-cream

Test Vehicle

Water
Cetearyl Alcohol, Polysorbate 60
Cetyl Palmitate
Silanol-HA
Phenoxyethanol

Evaluations

- Dermatologist assessment
- Visia CR Imaging
- Primos Optical 3D
Silanol Technology

SILANETRIOL (and) HYALURONIC ACID

<table>
<thead>
<tr>
<th>Dermatologist assessment</th>
<th>Subjects with improvements</th>
<th>Average improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Moisturizing</strong></td>
<td>97.1%</td>
<td>37.5%</td>
</tr>
<tr>
<td><strong>Elasticity</strong></td>
<td>94.1%</td>
<td>14.3%</td>
</tr>
<tr>
<td><strong>Aging signs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(fatigue, radiance)</td>
<td>87.1%</td>
<td>7.4%</td>
</tr>
<tr>
<td><strong>Wrinkles</strong></td>
<td>90.3%</td>
<td>13.3%</td>
</tr>
<tr>
<td><strong>Texture</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(relief homogeneity)</td>
<td>100%</td>
<td>36.4%</td>
</tr>
<tr>
<td><strong>General appearance</strong></td>
<td>100%</td>
<td>36.4%</td>
</tr>
</tbody>
</table>
Silanol Technology

SILANETRIOL (and) HYALURONIC ACID

Volunteer n°23:

<table>
<thead>
<tr>
<th>Waviness</th>
<th>Roughness</th>
<th>Wrinkle depth</th>
<th>Wrinkle reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>-30%</td>
<td>-32%</td>
<td>-17%</td>
<td>-36%</td>
</tr>
</tbody>
</table>

Primos evaluation and images VISIA CR

Examples of significant results
Silanool Technology

SILANETRIOL (and) HYALURONIC ACID

Volunteer n°35
Best performance
massive wrinkles reduction and ovale lifting

T0

T28
# Silanol Technology

## SILANETRIOL (and) HYALURONIC ACID

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Primos evaluation and images VISIA CR</th>
<th>Subjects with significant improvements</th>
<th>Average improvement for subjects with significant results</th>
<th>Best improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin uniformity</td>
<td></td>
<td>72%</td>
<td>-24.2%</td>
<td>-36%</td>
</tr>
<tr>
<td>Wt - waviness</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skin smoothness</td>
<td></td>
<td>64%</td>
<td>-18%</td>
<td>-26%</td>
</tr>
<tr>
<td>Ra - roughness</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rz – depth of roughness</td>
<td></td>
<td>60%</td>
<td>-18.5%</td>
<td>-28%</td>
</tr>
<tr>
<td>Anti wrinkle</td>
<td></td>
<td>48%</td>
<td>-24.5%</td>
<td>-40%</td>
</tr>
<tr>
<td>Volume</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth</td>
<td></td>
<td>52%</td>
<td>-18%</td>
<td>-27%</td>
</tr>
<tr>
<td>Hydration</td>
<td></td>
<td>80%</td>
<td>+11.5%</td>
<td>+21.3%</td>
</tr>
<tr>
<td>Corneometer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Silanol Technology

DIMETHYLSILANOL HYALURONATE

Silanol core stabilized with high MW Hyaluronic Acid (> 2 MDa)
Silanol Technology

DIMETHYLSILANOL HYALURONATE

High-MW HA Silanol
✓ Restructuring activity of the Silanol
✓ Moisturizing properties of the Hyaluronic Acid

Summary of Test Results

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firmness</td>
<td>+12%</td>
</tr>
<tr>
<td>Elasticity</td>
<td>+14%</td>
</tr>
<tr>
<td>Hydration</td>
<td>+27%</td>
</tr>
<tr>
<td>Uniformity</td>
<td>+25%</td>
</tr>
</tbody>
</table>
DIMETHYLSILANOL HYALURONATE

High-MW HA Silanol

- Improves hydration better than pure HA
- Continues over 9 days after end of treatment

[Infra-red spectrometry]
ASCORBYL METHYL SILANOL PECTINATE

Silanol core stabilized with Ascorbic Acid
Silanol Technology

ASCORBYL METHYLSILANOL PECTINATE

Silanol technology:

- Delivers stabilized Ascorbic Acid to Epidermis
- Reinforces cell membranes against free radical activity
- Optimizes cutaneous restructuring effects of Ascorbic Acid
- Delivers tyrosinase inhibition
ASCORBYL METHYLSILANOL PECTINATE

Protects cutaneous cells:
- Higher bioavailability of ascorbic acid
- Free radical scavenging
- Strengthens cell membranes

ESR study
ACTIVE SILANOLS TARGETING DEJ

Active Pendant Group:

- Rhamnose
Silanol core stabilized with Rhamnose:

- Enables expression of specific DEJ functions
- Restores Dermal-Epidermal cohesion and thickness
- Increases keratinocyte proliferation in DEJ
- Boosts expression of Laminin-5, Perlecan, Collagens I, IV and VII
- Reduces formation of age spots originating in DEJ
TEM of DEJ transformations in aging skin

- Thinning of the lamina densa
- Loss of anchoring proteins
- Decreased skin cohesion
- Impaired cell communication
Silanol Technology

SILANETRIOL (and) RHAMNOSE

TEM of Explant: Treatment with Si-Rhamnose

Lamina densa

Anchoring fibers

Si-Rhamnose 5%

Si-Rhamnose 10%
Silanol Technology

SILANETRIOL (and) RHAMNOSE

Control

Si-Rhamnose (5%)
Silanol Technology

SILANETRIOL (and) RHAMNOSE

Control

Si-Rhamnose (5%)

Collagen IV (green)

Graph showing Collagen IV expression:
- Control: 0.0
- Si-Rhamnose (5%): +17%

Graph showing Collagen VII expression:
- Control: 100%
- MTS (eq 10%): +20%
- Rhamnose (eq 10%): 75%
- Si-Rhamnose (5%): +55%
Age spot mechanisms:
- KGF
- Melanin leakage

Si-Rhamnose:
- Reinforces DEJ
- Prevents melanin leakage
- Stimulates Perlecan (scavenges KGF)

Mature skin:
- melanin clusters due to KGF permeation

Si-Rhamnose (5%)
- prevention of melanin clusters
Silanol Technology

SILANETRIOL (and) RHAMNOSE

IN-VIVO Study

35 women 40-59 y.o.
Twice a day on face
5% Si-Rhamnose gel-cream

Evaluations

- Dermatologist assessment
- Visia CR Imaging
- Primos Optical 3D

Summary of Results

- Skin relief – ave 45% improvement
- Firmness – ave 10% increase
- Elasticity – ave 15% increase
- Redness reduced ave 19%
- Brown spots reduced ave 13%
- Luminosity improved ave 33%
Silanol Technology

SILANETRIOL (and) RHAMNOSE

Primos imaging:
Improvement in skin architecture – significant wrinkle reduction and smoothing
Silanol Technology

SILANETRIOL (and) RHAMNOSE

Visia analysis:
Reduction in brown spots
➢ Average 13%
➢ Maximum 30%
ACTIVE SILANOLS TARGETING Dermis

Active Pendant Groups:

- Hydroxyproline
- Lactic Acid
- Trehalose
Silanol Technology

METHYLSILANOL HYDROXYPROLINE ASPARTATE

Silanol core stabilized with Hydroxyproline
(a precursor of collagen)
- Optimizes tissue production (e.g. for scars)
- Tissue reinforcement for elasticity (anti-stretchmark)
- Body firming
- Delays fibroblast senescence
METHYLSILANOL HYDROXYPROLINE ASPARTATE

Delays fibroblast senescence

Healthy fibroblasts

Senescent fibroblasts

![Graph showing divided cells over time with Si-HPr (0.4%) compared to control.](image-url)
METHYLSILANOL HYDROXYPROLINE ASPARTATE

Optimizes skin reparation

Collagen fibers are packed, the skin less elastic

Restoration of an optimal inter-fibrillar space for improved skin elasticity and flexibility
ACTIVE SILANOLS TARGETING Hypodermis

Active Pendant Groups:

• Caffeine
• Theophylline Alginate
• L-Arginine
• Acefylline (Acetyloxy Theophylline)
Silanol Technology

SILOXANETRIOL ALGINATE (and) CAFFEINE

Silanol core stabilized with Caffeine
✓ Slimming & Anti-Cellulite
✓ Firming & Tightening – body, face, neck
✓ Eye Contouring
✓ Activates microcirculation
Silanol Technology

SILOXANETRIOL ALGINATE (and) CAFFEINE

Bioavailability vs Caffeine

- **+20% penetration rate**
  - Caffeine: 5%
  - Si-Caffeine: 7%

- **+15% available caffeine**
  - Caffeine: 60%
  - Si-Caffeine: 75%

- **+22% lipolytic stimulation**
  - Control: 0.5
  - Caffeine: 1.5
  - Si-Caffeine: 2.0
Silanol Technology

SILOXANETRIOL ALGINATE (and) CAFFEINE

Lipolysis Activation

Lipogenesis Inhibition

Si-Caffeine

Control 3% 4%

-40 -30 -20 -10 0

-37%
Silanol Technology

SILOXANETRIOL ALGINATE (and) CAFFEINE

IN-VIVO Study

10 women 25-43 y.o. → 10 weeks

4% Si-Caffeine gel-cream

Circumference (cm)

- Placebo
- 50mg Si/L

-3.5cm
-4.4cm
-1.7cm
-0.6cm
Silanol Technology

Active Silanols – Global Skin Care Benefits: Epidermis, DEJ, Dermis & Hypodermis

**Epidermis**
- Epidermal thickening & elasticity, hydration & protection, increased HA production, tyrosinase inhibition.
- Improved cell communication and cohesion between layers. Increased expression of DEJ constituents: Laminin 5, Perlecan, Collagens IV and VII. Inhibits DEJ-originating age spots.

**Dermis**
- Collagen production and organization for boosting firmness, density, elasticity and flexibility. Moisturization & Osmoregulation. Delayed fibroblast senescence.

**Hypodermis**
- Microcirculation, lipolysis for firming & slimming, reduced lipogenesis.
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Integrity Ingredients Corporation

“Where Quality and Service Meet”