Dow Corning Corporation
Silicones for Industrial Fabric Coatings
Dow Corning Corporation

• A $2.75 billion global company formed in 1943 in Midland, Michigan.
• Company shares are equally owned by The Dow Chemical Company and Corning Incorporated.
• Approximately 9,000 employees worldwide.
Industry Segments Served by Dow Corning

- Aerospace
- Automotive
- Chemicals/Petrochemicals
- Construction
- Consumer Products
- Electrical/Electronics
- Food Processing
- Industrial Maintenance and Production
- Medical Products
- Paint and Coatings
- Personal, Household and Automotive Care
- Pharmaceuticals
- Plastics
- Pressure-sensitive Adhesives
- Textiles and Leather
A Measure of Satisfaction

- More than 10,000 products for 500 separate applications.
- More than 30,000 customers worldwide.
- 65 percent of business outside the U.S.
- Sales of $2.75 billion.
What are Industrial Textiles?

Textile materials and products manufactured primarily for their technical performance and functional properties rather than for their aesthetic or decorative characteristics.
Industrial Textile Coatings vs. Fashion Textile Coatings

Industrial Coatings
- Function > Form
- Mostly coatings
- Primarily Liquid Silicone Rubber (LSR)
- Solvent generally acceptable
- Room Temperature Vulcanizing (RTV) used as sealer/adhesive
- Specialty products

Fashion Coatings
- Form > Function
- Mostly finishes, but significant narrow fabric coatings
- Primarily RTVs
- Solvent may be acceptable
Industrial Textile Coatings Market Segmentation by Application

- Manufacturing and Processing
- Transportation
- Construction
- Sports and Leisure
- Personal and Property Protection
Other Industrial Textile Coating Applications

Contact your Dow Corning AETS or Sales professional to determine if silicones can meet your needs in other industrial textiles applications:

- Environmental protection textiles
- Packaging textiles  
  - used for temporary containment and storage of goods
- Inner lining textiles  
  - for (largely hidden) functional components of clothing and footwear
- Medical and Hygiene textile materials
- Geo-textiles  
  - used at or below ground level in the civil engineering industry
- Agricultural textiles  
  - used in activities to grow and harvest live products and foodstuffs
- Furnishing and decorative textile components
Industrial Textile Coatings
Manufacturing and Processing Applications

Applications
• Conveyor belts, industrial hose, beltings, gaskets
• Compensator bellows, diaphragms
• Insulation fabrics for tanks, pipes
• Bakery-release fabrics

Key Requirements
• Chemical resistance
• Thermal stability
• Fire resistance
• Good tear strength
• Waterproof
• Thermal insulation
• Food grade
• Blocking
Industrial Textile Coatings
Transportation Applications

Applications
• Airbags
• Belts, hoses, carpets, seating, interior trim and lining
• Convertible tops, truck covers and tarpaulins
• Boat hulls and internal fittings
• Inflatable boats and lifejackets

Key Requirements
• Thermal stability
• Chemical resistance
• Fire resistance
• UV resistance
• Good tear strength
• Abrasion resistant and durable
• Waterproof
• Thermal insulation
Industrial Textile Coatings
Construction Applications

Applications
• Architectural membranes, awnings, canopies, and marquees
• Roofing and waterproofing membranes
• Reinforcement of walls, facades, and concrete
• Breathable liners
• Firewalls and partitions
• Sewer and pipe linings

Key Requirements
• UV resistance
• Waterproof
• Fire resistance
• Good tear strength
• Thermal insulating
Industrial Textile Coatings
Sports and Leisure Applications

Applications
• Sailcloths, balloon fabrics, paragliders and parachutes
• Ropes (sailing, ballooning, climbing)
• Sports apparel
• Sleeping bags and tents
• Bags and soft-sided luggage

Key Requirements
• UV resistance
• Waterproof
• Transparent
• Fire resistance
• Good tear strength
• Abrasion resistant and durable
• Thermal insulating
• Thermal stability
Industrial Textile Coatings
Personal and Property Protection Applications

Applications
• Abrasion, ballistic and impact protection
• Biological, gas, and chemical protection
• Protective clothing and chemical-resistant gloves
• Fire and heat protection
• Extreme cold protection
• Electrostatic protection

Key Requirements
• Good tear strength
• Chemical and fire resistance
• Thermal stability
• Waterproof
• Thermal insulating
• Electrical insulating
What are Silicones?

Unique Chemistry

Siloxane
Silicone Coatings
Features/Benefits

- Easy to process (one or two parts)
- Low shrinkage
- Can be 100% solids
- Anti-Slip or Anti-Friction
- Can be low volatiles
- Food contact applications possible (FDA, BGA)
- Easy to repair (compared to PTFE)
- Good release properties
- Wide temperature range (-50 to 300 C possible)
- Some skin contact applications
Silicone and Organic Coating Comparison

Advantages of Silicone Coatings

• Superior cold resistance (specialty Si grades can perform as low as -85°C).
• Better retention of tensile and elongation properties after heat aging.
• Relatively high surface friction (useful for some applications).
• Easy to process (many coating systems are 100 percent solids).
• Less chance of worker sensitization after repeated handling, especially compared to acrylics and urethanes.

Advantages of Organic Coatings

• Lower cost (except PTFE).
• Low dirt pick-up (PTFE, polyurethane, acrylic).
• High initial tensile strength.
• Good chemical resistance (PTFE, nitrile).
• Good heat resistance (PTFE).
• Low surface friction (PTFE).
• Recyclable (PVC).
Tensile Strength After Aging at 150°C

![Graph showing the tensile strength of different rubber materials after aging at 150°C.](chart)

- Silicone Rubber
- Neoprene
- Nitrile
- Butyl
Elongation at Break After Aging at 150°C

Exposure Time (days)

Silicone Rubber
Neoprene
Nitrile
Butyl
## Silicone and Organic Rubber Qualitative Comparison

<table>
<thead>
<tr>
<th>Property</th>
<th>Property Performance</th>
<th>PTFE</th>
<th>Si Rubber</th>
<th>PVC</th>
<th>Poly-urethane</th>
<th>Neoprene</th>
<th>Butyl Rubber</th>
<th>Nitrile Rubber</th>
<th>Natural Rubber</th>
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<td>Appearance</td>
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## Target Markets/Requirements

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<th>Silicone property: Application:</th>
<th>Thermal Stability</th>
<th>Fire Resistance</th>
<th>UV Resistance</th>
<th>Chemical Resistance</th>
<th>Good Tear Strength</th>
<th>Transparent</th>
<th>Water Proof</th>
<th>Thermal Insulation</th>
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<td>Hoses, Gaskets, Diaphragms</td>
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</table>
How to Apply a Coating
Process Examples

• Dip/Immersion Coating
• Kiss Roll (Lick Roll)
• Knife Coating (over air, roll or rubber sleeve)
• Rotogravure Coating
• Extrusion
• Spraying
• Others such as Bar Coating or Rotary Screen Printing
Coating Method Examples

Dip/Immersion Coating

Kiss Coating (Lick Roll)
Knife Coating

Knife Coating Methods

Knife over roll

Knife over gap

Knife over blanket
Gravure Delivery System

- Coating Feed Trough
- Cure Time
- Application Rate at 5-20 gsm
- Coating Delivery Function of Pressure and Peripheral Speed
Silicone Coating Chemistries for Industrial Textile Products

- **RTV**: Room Temperature Vulcanizing
  - Moisture Cure System
- **LSR**: Liquid Silicone Rubber
  - Heat Cure System
- **HCR**: High Consistency Rubber
  - Peroxide Cure System
- **Condensation Cure Coatings**
  - Solvent Dispersions
- **Auxiliary Products**
  - Water-based Elastomers
  - Silane Adhesion Promoters / Coupling Agents
  - Pigments Additives
  - Silicone Adhesives
RTV Elastomers
RTV
Typical Product Chemistry

- Si-OH + HOH + R - Si(AcO)$_3$ → R - Si - O - Si + 3AcOH + HOH

• Moisture cure system
• Acetic acid odor
• Skin times 3-10 minutes
• Cure dependent on humidity
RTV Elastomers

Features/Benefits

- Extreme temperature stability
- Chemical resistance
- Water resistance
- 100% solids
- Anti-slip at Low shore hardness
- Very resistant to liquid water and soaps
- Can produce flame resistant elastomers
- Some products are FDA/BGA approved
- Very good adhesion to glass, organic fibers, metal
RTV Application Methods

Extrusion (100% Solids)

Pump system with follower plate

Extrusion head at point of use
RTV Application Methods

Spraying

For uneven substrates

Dilute with solvent

Airless spraying is best

Air contact BEFORE application must be avoided. (Product skins over in 5-10 minutes.) RTV does not cure under nitrogen blanket.
RTV Application Methods

Cleaning

Uncured silicone can be cleaned by white spirits

Cured silicone is very difficult to remove (strong acid or base may be required)

Cured or uncured silicone may be removed by DIGESIL NC
(American Digesel Co., Tel. (201) 344-3600)
Textile Coatings
How to Cure an RTV

RTV reacts with moisture in air, so surface cures first. Avoid thick sections (> 5 mm) because they will not cure properly.

Cure time of 1 mm layer is +- 1 hour at room temperature. For faster curing, cure in atmospheric controlled room.

Coating cures faster at higher temperature and humidity (see curve).

Small amounts of acetic acid leaves the product; ventilation necessary.

Post-cure at high temperature improves properties.
Cure Speed in Relation to Temperature and Humidity

Temperature (°C) vs. Relative Humidity (%)

- Red line: 3 minutes
- Blue line: 10 minutes
- Green line: 15 minutes
- Cyan line: 23 minutes

1 mm coating thickness
Dow Corning® Global RTVs for Industrial Textiles

- *Dow Corning®* 732 Multi-Purpose Sealant
- *Dow Corning®* 734 Flowable Sealant
- *Dow Corning®* 3-3445 Red Flowable Elastomer
- *Dow Corning®* 3-3559 Semiflowable Textile Elastomer
# Global RTVs for Industrial Textiles

<table>
<thead>
<tr>
<th>Product &amp; Applications</th>
<th>Appearance</th>
<th>Viscosity cP</th>
<th>Hard. Duro. Shore A</th>
<th>Tensile strength psi (MPa)</th>
<th>Elong %</th>
<th>Skin Over (mins) *</th>
<th>Tack Free Time (mins)</th>
<th>Key Functions/Attributes</th>
</tr>
</thead>
</table>
| 732 Adhesive/Seam Sealer| Colorless paste          | 350 g/min    | 25                 | 325 (2.24)                | 600     | 5-10              | 20                   | •Non-slip  
•Good adhesion to fabric  
•High elongation  
•Good tear strength |
| 734 Adhesive/Seam Sealer| Colorless flowable       | 40,000       | 28                 | 220 (1.51)                | 300     | 9                 | 15                   | •Non-slip  
•Good adhesion to fabric  
•Good tear strength |
| 3-3445 Bake ware, high temp release coating for conveyor belts | Red | 40,000 | 25 | 218 (1.5) | 300 | 10 | •Chemical resistance  
•Low blocking  
•Thermal stability |
| 3-3559 Adhesive/Seam Sealer | Transparent semi-flowable | 48,000 (slightly thixotropic) | 20 | 174 (1.2) | 500 | 4** | •Non-slip  
•Good adhesion to fabric  
•High elongation  
•Good tear strength |
LSR Elastomers
LSR
Typical Property Chemistry

- Addition Cure Chemistry

\[
\text{-Si-H} + \text{CH}_2=\text{CH-Si-} \xrightarrow{\text{Pt}} \text{-Si-CH}_2\text{CH}_2\text{-Si-}
\]

- Accelerated by heat
- No by-products
- Catalyst easily poisoned
- Variable pot life
LSRs Features/Benefits

- Good adhesion to glass and polyamide
- Weathering resistance: flexible after 20 years of outdoor exposure (ATSM D518)
- No humidity required
- Can cure deep sections
- Heat cure
- Typically two-part systems
- Chemical inertness
- Chemical inertness
- Very good electrical insulator
- Additional cure chemistry
- Stiffing point is measured by ASTM D797
  - -55°C for most LSRs
  - Some phenyl LSRs can get down to -100°C
- Highly resistant to water, steam, weak acids and base, polar solvents and wide variety of chemicals
- Fats, oils, hydrocarbon and aromatic solvents cause swelling, but not permanent deterioration
- Attacked by strong acids and bases
Textile Coatings
How to Apply an LSR

- Packaging
  - Usually sold as two component system (called kits)
  - Mix ratios can vary from 1:1 to 10:1

- Mixing Equipment
  - For laboratory trials
    - LSR can be mixed with lab mixer or by hand. Pot life will vary with amount of inhibitor. To avoid air bubbles, the mixture must be put under vacuum before use.
  - In production
    - Mixing equipment is used. Static mixer is preferred above dynamic mixer (dynamic mixer can add too much heat or separate the filler).
Textile Coatings
How to Apply an LSR

• Application Equipment
  – Normal coating machines can be used.
  – For thick layers, knife over roll.
  – For fine layers (up to 40 g/m²), knife over air or silk-screen.
  – Addition of solvent makes thinner coatings possible.
  – Screen printing also is possible for some materials.
Typical LSR Coating Line

Static Mixer

Knife

Curing Oven

Part A Pump

Part B Pump

Take-up Roll
Textile Coatings
How to Cure an LSR

- Potlife of material varies with inhibitor/catalyst level. Generally, most LSRs have 24-hour potlife.
- Most LSR coatings cure in 1-2 minutes at 160-180°C. (Many organic systems are in solvent and require a temperature gradient to gently remove the solvent.)
- Recycling air is not a problem since LSRs don’t have any cure byproducts.
- No reaction byproducts, only very small amount (1-2 percent) of volatile silicones (cyclics).
- Catalyst of LSR can be poisoned by contaminants: Lewis bases (like amines, ammonia, neoprene, sulfur, mercap-tides, vinyl groups, Buna rubber).
- If the LSR Part B becomes contaminated with water, strong acids or bases, there is a potential for release of hydrogen gas.
<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Solution</th>
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</thead>
<tbody>
<tr>
<td>Poor adhesion</td>
<td>Platinum poisoning</td>
<td>• Check fabric/mixing equipment</td>
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<tr>
<td></td>
<td>Wrong choice of LSR</td>
<td>• Select correct LSR</td>
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<td></td>
<td>Insufficient cure</td>
<td>• Increase cure temperature/time</td>
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<tr>
<td>Bubbles in coating</td>
<td>Coating too thick</td>
<td>• Decrease knife gap</td>
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<td>Cure temperature too high</td>
<td>• Zone oven temperatures</td>
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<td>Air in mixed LSR</td>
<td>• De-air before coating</td>
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<td>Water in coating</td>
<td>• Attention to housekeeping</td>
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<td>Strike-through</td>
<td>Viscosity too low</td>
<td>• Use higher viscosity LSR or blend</td>
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<td>Knife gap too small</td>
<td>• Increase gap</td>
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<td></td>
<td>Cure too slow</td>
<td>• Increase cure temperature</td>
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<td>Variable coating properties</td>
<td>Contaminated fabric</td>
<td>• Replace fabric batch</td>
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<td>Off-ratio mixing</td>
<td>• Improve mixing efficiency</td>
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Dow Corning® Global LSRs for Industrial Textiles

- Dow Corning® 3605 LSR
- Dow Corning® 3640 LSR
- Dow Corning® 3631 LSR
- Dow Corning® 590 LSR
- Dow Corning® 4-2014 LSR
- Silastic® 9252/250P LSR
- Silastic® 9252/500P LSR
- Silastic® 9252/900P LSR
- Silastic® 9451-1000P LSR
- Silastic® 9151-200P LSR
- Silastic® 4-1380 LSR
# Liquid Silicone Rubbers

<table>
<thead>
<tr>
<th>Product and Applications</th>
<th>Visc. mPa.s</th>
<th>Color</th>
<th>Hardness Duro. Shore A</th>
<th>Tensile strength MPa</th>
<th>Elong. %</th>
<th>Tear strength kN/m</th>
<th>Features/ Benefits</th>
</tr>
</thead>
</table>
| **DC 3605**              | 30,000      | Translucent clear | 35 | 8.3 | 500 | 16 | • 530C Degradation temp  
  • Thermal stability/insulation  
  • Fire resistance  
  • UV resistance  
  • Good tear strength  
  • General purpose |
| Fabrics: Glass, nylon  
  Tents  
  Compensator bellows  
  Industrial insulation wrap | | | | | | | |
| **DC 3640**              | 20,000      | Off-white | 60 | 7.0 | 150 | 11 | • Thermal stability/insulation  
  • Fire resistance  
  • Heat protection.  
  • Low friction |
| Fabrics: Glass, nylon  
  Compensator bellows  
  Protective clothing | | | | | | | |
| **DC 4-1380**            | 15,000 – 23,000 | Off-white | 55 – 62 | 6.3 | 160 | • Low blocking  
  • Thermal stability  
  • Flame resistance  
  • Weather resistance  
  • ~3640, higher fabric tear |
| Fabrics: Polyester, nylon, glass  
  Conveyor belts  
  Industrial insulation wraps  
  Protective clothing  
  Compensator bellows | | | | | | | |
## Liquid Silicone Rubbers (cont)

<table>
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<th>Hardness Duro. Shore A</th>
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<th>Elong. %</th>
<th>Tear strength kN/m</th>
<th>Features/ Benefits</th>
</tr>
</thead>
</table>
| **DC 9151-200P** Fabrics: Polyester, glass Industrial insulation wraps Welding blankets | 15,000 | White | 39 | 1.4 | 275 | 3 | • Flame resistance  
• Weather resistance.  
• Reduce fraying  
• Low Cost |
| **DC 3631** Fabrics: Polyester, nylon glass Protective gloves (high grip) Flexible fabrics Industrial insulation wraps | 100,000 | Clear | 20 | 5 | 800 | 16 | • Fast cure  
• Non-slip  
• Good adhesion to fabric  
• High elongation  
• Good tear strength  
• Wash durability |
| **DC 9451-1000P** Fabrics: Glass Industrial insulation wraps Welding blankets | 170,000 | White | 33 | 1.1 | 320 | 17 | • Heat protection  
• Flame resistance  
• Reduce fraying  
• Low cost  
• High visc. Version of 9151 |
| **DC 9252-250P** Fabrics: Nylon, glass Conveyor belts Protective clothing flexible & comfortable | 25,000 | Clear | 36 | 4.1 | 280 | 6 | • Thermal stability  
• Heat protection  
• Flame resistance  
• High clarity |
<table>
<thead>
<tr>
<th>Product and Applications</th>
<th>Visc. mPa.s</th>
<th>Color</th>
<th>Hardness Duro. Shore A</th>
<th>Tensile strength MPa</th>
<th>Elong. %</th>
<th>Tear strength kN/m</th>
<th>Features/ Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DC 9252-500P</strong>&lt;br&gt;Fabrics: Nylon, glass&lt;br&gt;Industrial insulation wraps&lt;br&gt;Conveyor belts Protective clothing</td>
<td>50,000</td>
<td>Clear</td>
<td>40</td>
<td>6.0</td>
<td>300</td>
<td>8</td>
<td>• Thermal stability&lt;br&gt;• Heat protection&lt;br&gt;• Flame resistance&lt;br&gt;• High clarity</td>
</tr>
<tr>
<td><strong>DC 9252-900P</strong>&lt;br&gt;Fabrics: Nylon, glass&lt;br&gt;Conveyor belts Protective clothing</td>
<td>90,000</td>
<td>Clear</td>
<td>40</td>
<td>6.9</td>
<td>450</td>
<td>15</td>
<td>• 400°C degradation temperature&lt;br&gt;• Thermal stability&lt;br&gt;• Heat protection&lt;br&gt;• Flame resistance&lt;br&gt;• High clarity</td>
</tr>
<tr>
<td><strong>DC 590 (US &amp; EUR)</strong>&lt;br&gt;Fabrics: Glass Hoses, gaskets, diaphragms Protective clothing</td>
<td>100,000</td>
<td>Off-white</td>
<td>37</td>
<td>6.9</td>
<td>540</td>
<td>17</td>
<td>• Thermal stability&lt;br&gt;• Fire resistance&lt;br&gt;• Chemical resistance&lt;br&gt;• Waterproof&lt;br&gt;• Heat protection</td>
</tr>
</tbody>
</table>
Dow Corning® Global LSRs for Industrial Airbag Applications

- *Dow Corning® 3625 LSR*
- *Dow Corning® 3730 LSR*
- *Dow Corning® 3715 Top Coat*
# Liquid Silicone Rubbers for Air Bags

<table>
<thead>
<tr>
<th>Product and Applications</th>
<th>Visc. mPa.s</th>
<th>Color</th>
<th>Hardness Duro. Shore A</th>
<th>Tensile Strength N/mm² (psi)</th>
<th>Elong. %</th>
<th>Tear Strength N/mm (ppi)</th>
<th>Features/Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC 3625</td>
<td>23,000 mixed 50,000 PT A 350 PT B 5:1 Mix ratio</td>
<td>Off White Opaque Mixed PT A: Off White PT B: Clear</td>
<td>60</td>
<td>7 (1015)</td>
<td>150</td>
<td>13 (74)</td>
<td>• low friction surface • low viscosity • Resists humidity aging (&gt;70°C, &gt;80%RH, &gt;2wks) • fast curing • -137 Tg oC • 369 oC degradation Temp • 26% LOI</td>
</tr>
<tr>
<td>DC 3730</td>
<td>180,000 mixed 180,000 PT A 180,000 PT B 1:1 Mix ratio</td>
<td>Transparent/Colorless PT A, B and mixed</td>
<td>30</td>
<td>8.0 (1160)</td>
<td>500</td>
<td>40 (227)</td>
<td>• Flexibility for folding &amp; packaging • Lower thermal conductivity to resist heat spread • Easily applied at &lt;35g/m² on 470dtex fabric • High tear strength at seams</td>
</tr>
<tr>
<td>DC 3715</td>
<td>4,000 mixed 30,000 Base 30 Curing Agent 7:3 Mix ratio</td>
<td>Off White Mixed: Base: Off White Opaque Paste Curing Agent: Clear, transparent Liquid</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>• Low surface friction • Very thin coating (5-20 gsm)</td>
</tr>
</tbody>
</table>
High Consistency Rubbers
HCR Peroxide Cure System
Typical Product Chemistry

1) Peroxide Initiation

\[
ROOR \xrightarrow{\text{HEAT}} 2RO^\cdot
\]

2) \(-\text{Si-} \, \text{CH}_3 + \text{CH}_2=\text{CH-}\text{Si-} \xrightarrow{\text{RO}^\cdot} -\text{Si-} \cdot \text{CHCH}_2\text{CH}_2\text{-Si-}\)
HCRs Features/Benefits

- Can use high molecular weight polymers and high filler loadings
- Rubber is typically solvated for coating applications
- Applied via calendaring (producing sheets of rubber of uniform thickness)
- Physical properties vary greatly with gum type, filler level, peroxide type, etc.
- Conventional system
- Finite shelf life
- Applied via solvent dispersion (typically toluene)
- Cure rate can be varied by peroxide type, concentration, temperature and level of vinyl in the polymer
- Heat activated cure system. Peroxide causes crosslinking of organic groups via free radical addition
Dow Corning® HCRs for Industrial Textiles

- *Dow Corning® HS-30*
- *Dow Corning® 4-4758 HCR*
- *Dow Corning® 4-4768 HCR*
## Examples of Dow Corning HCRs

<table>
<thead>
<tr>
<th>Product</th>
<th>Durometer, Shore A</th>
<th>Tensile Strength, psi (Mpa)</th>
<th>Elongation, %</th>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Dow Corning® HS-30</em></td>
<td>31</td>
<td>8.54 (1240)</td>
<td>1000</td>
<td>• S.G. 1.13&lt;br&gt;• Brittle Point – 73C&lt;br&gt;• Tear: 35 ppi (200 kN/m)</td>
</tr>
<tr>
<td><em>Dow Corning® 4-4758 HCR</em></td>
<td>35</td>
<td>7.5 (1085)</td>
<td>647</td>
<td>• S.G. 1.10&lt;br&gt;• Brittle Point – 73C</td>
</tr>
<tr>
<td><em>Dow Corning® 4-4768 HCR</em></td>
<td>71</td>
<td>9.2 (1339)</td>
<td>280</td>
<td>• S.G. 1.20&lt;br&gt;• Brittle Point –73C</td>
</tr>
</tbody>
</table>
Condensation Cure Products
Condensation Cure Products
Typical Product Chemistry

\[
\begin{align*}
-Si-H + HO-Si- & \rightarrow Sn \rightarrow -Si-O-Si- + H_2^+ \\
-Si-OH + HO-Si- & \rightarrow Sn \rightarrow -Si-O-Si- + H_2O
\end{align*}
\]
Condensation Cure Products

Features/Benefits

- Solvent/water is removed before curing occurs
- Fast curing
- Inexpensive systems
- Cure can be accelerated by heat, catalysts, crosslinkers, inhibitors and promoters
- Polymer type determines the structure of the cured product
- A branched polymer will result in a resinous material
- A linear polymer will result in an elastomeric material
- Common for solvent dispersion and water-based materials
Dow Corning
Condensation Cure Products

• Solvent-based Products
  – *Dow Corning*® FC 227 TS
  – *Dow Corning*® LS 4325 System
  – *Dow Corning*® LS 4326 System
## Dow Corning Solvent-based Products for Industrial Textiles

<table>
<thead>
<tr>
<th>Product</th>
<th>Viscosity</th>
<th>Color</th>
<th>Properties</th>
<th>Feature/ Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dow Corning® FC 227 TS</strong></td>
<td>15,000 mPa.s</td>
<td>Clear, transparent</td>
<td>35% Solids&lt;br&gt;S.G. 0.88&lt;br&gt;Flash Point 5C&lt;br&gt;23A Catalyst and Syloff 297 optional</td>
<td>• Solvent-based (toluene)&lt;br&gt;• Light coat weights&lt;br&gt;• Application: Garment Coating</td>
</tr>
<tr>
<td><strong>Dow Corning® LS 4325</strong></td>
<td>24,000 cP</td>
<td>Clear</td>
<td>30% Solids&lt;br&gt;Bath &lt; 8 hr&lt;br&gt;Cure: 1 min @ 150C, (15 gsm coating)</td>
<td>• Solvent-based (toluene)&lt;br&gt;• Water repellent&lt;br&gt;• Anti-fray&lt;br&gt;• Heat stability&lt;br&gt;• Paper Touch, General Hand Modification with 100% Silicone Coating or Blends with PU, Acrylic or Wax&lt;br&gt;• Application: Tent and Garment Coating</td>
</tr>
<tr>
<td><strong>Dow Corning® LS 4326</strong></td>
<td>6,000 cP</td>
<td>Clear</td>
<td>30% Solids&lt;br&gt;Bath &lt; 12 hr&lt;br&gt;Cure: 1 min @ 150C, (15 gsm coating)</td>
<td>• Solvent-based (toluene)&lt;br&gt;• Water repellent&lt;br&gt;• Anti-fray&lt;br&gt;• Heat stability&lt;br&gt;• Paper Touch, General Hand Modification with 100% Silicone Coating or Blends with PU, Acrylic or Wax&lt;br&gt;• Application: Garment Coating</td>
</tr>
</tbody>
</table>

---

**Feature/ Benefits**

- Solvent-based (toluene)
- Light coat weights
- Application: Garment Coating
- Water repellent
- Anti-fray
- Heat stability
- Paper Touch, General Hand Modification with 100% Silicone Coating or Blends with PU, Acrylic or Wax
- Application: Tent and Garment Coating

---

**Dow Corning®**

- LS 4325
- FC 227 TS

**Dow Corning Solvent-based Products for Industrial Textiles**
Auxiliary Silicone Products
Dow Corning Auxiliary Silicone Products for Industrial Textiles

- Water-based Elastomers
- Silane Adhesion Promoters / Coupling Agents
- Pigments Additives
- Silicone Adhesives
# Dow Corning Water-based Elastomers for Industrial Textiles

<table>
<thead>
<tr>
<th>Product</th>
<th>Viscosity (mPa.s)</th>
<th>Color</th>
<th>Properties</th>
<th>Feature/ Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dow Corning® ET 4327 Emulsion</strong></td>
<td>Emulsion</td>
<td>White</td>
<td>35% Solids</td>
<td>• Flexibility treatment for glass</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>S.G. 1.00</td>
<td>• Lubricates prior to PTFE coating</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Flash Point 31C</td>
<td>• Water repellent</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• High temperature resistance (288C)</td>
</tr>
<tr>
<td><strong>Dow Corning® 84 Additive</strong></td>
<td>700</td>
<td>White</td>
<td>60% Solids</td>
<td>• Water repellent</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>S.G. 1.10</td>
<td>• Anti-fray</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Heat stability</td>
</tr>
<tr>
<td><strong>Dow Corning® 85 Additive</strong></td>
<td>40,000</td>
<td>White</td>
<td>60% Solids</td>
<td>• Water repellent</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>S.G. 1.10</td>
<td>• Anti-fray</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Heat stability</td>
</tr>
</tbody>
</table>
Dow Corning Silane Adhesion Promoters for Textile Coatings

Silane Structure: \( R - \text{Si} - X_3 \)

- \( R \) = Organofunctional group
- \( X \) = Hydrolyzable groups which are converted to silanols

Features/Benefits

- Textile coatings will adhere well to open textile structures via mechanical anchoring.
- For closed textile structures or difficult-to-adhere substrates, a silane adhesion promoter can be used to provide chemical adhesion (not FDA approved).
- Very good adhesion to glass fiber.
- Post-curing at 150-200 deg C for best adhesion to metal
Dow Corning® brand Silanes for Industrial Textiles

<table>
<thead>
<tr>
<th>Product</th>
<th>Usefulness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dow Corning® Z-6020 Silane</td>
<td>Epoxies, Phenolics, Melamines, Nylons, PVC, Acrylics, Urethanes, Nitrile Rubbers</td>
</tr>
<tr>
<td>Dow Corning® Z-6030 Silane</td>
<td>Unsaturated Polyesters, Acrylics, EVA</td>
</tr>
<tr>
<td>Dow Corning® Z-6032 Silane</td>
<td>Fiberglass, Polyester, Epoxies, Styrenics, PP, PE</td>
</tr>
<tr>
<td>Dow Corning® Z-6040 Silane</td>
<td>Epoxies, Urethanes, Acrylics, PBT, Polysulfides</td>
</tr>
<tr>
<td>Dow Corning® Z-6070 Silane</td>
<td>Epoxies, Phenolics, Melamines, Nylons, PVC, Acrylics, Urethanes, Nitrile Rubbers</td>
</tr>
<tr>
<td>Dow Corning® Z-6075 Silane</td>
<td>Polyesters, Polyolefins, EPDM</td>
</tr>
</tbody>
</table>
Pigment Additives for Industrial Textiles

Products
- LPX: 11 colors
- FDA 21CFR 177.2600 for white, red and gray
- Red iron oxide MB improves the temperature resistance, until 300°C.
- Black MB, or A1(OH)3 can improve flame retardancy
- Contact Your DC AETS or Sales Representative for product recommendations to meet specific product application needs.

Application Usage
- Additives are typically used in masterbatch form; i.e., additive is dispersed in a silicone polymer and typically added to the LSR Part A component.
- Additives can be used in RTVs if the RTV is in a solvent solution. Otherwise, the masterbatch would have to be incorporated as a part B component using a dispensing system.
Dow Corning® Q5-8401 Adhesive

• Properties
  – Viscosity (mPa.s) – 140,000
  – Color – Grey
  – Durometer – 55 Shore A
  – Tensile strength (Mpa) – 5.5
  – Elongation (%) - 185
  – Tear strength (kN/m) - 16

• Features/Benefits
  – Suitable for hot press applications (e.g. 160°C/10 seconds)
  – Heat-curing addition cure
  – 2 part product
  – Solventless

• Applications
  – Adhesive; used to adhere silicone coated fabric to silicone coated fabric.
Dow Corning
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