FILMS, TAPES AND RELEASE LINERS

Release the potential of silicone performance

Silicone release coatings from Dow
Meeting the needs of the global release coatings market

As a global leader in silicone chemistry, Dow innovation has always helped the industry develop the next standard. We’ve been exploring the potential of silicones since 1943. With our extensive global reach, we have the resources to deliver the broadest range of silicone offerings and solutions, along with the knowledge, technical support and service for all your release coating challenges, competitively priced and reliably supplied.

Solutions with silicones
From food and healthcare to graphic arts and labels, SYL-OFF™ brand silicone release coatings from Dow provide a range of technologies to deliver the right solution for any application.

This brochure will help you discover the many ways Dow can help you overcome your release coating challenges. We are with you throughout every step of your process—from choosing the right silicone release coating formulation and selecting the right equipment and coating technique for your substrate, to achieving success in your end-use applications. Dow will help you release the potential of silicone performance.
Silicone release coatings: from application to end use
Release coating delivery systems for different equipment and substrates

SYL-OFF™ silicone release coatings from Dow are applied at extremely low coating weights onto a wide range of substrate surfaces using many different coating techniques. The choice of coating technique is strongly influenced by the type of delivery system for the silicone release coating (solventless, solvent-based or emulsion). Optimal coating of the substrate requires the right coating process. Table 1, below, lists the SYL-OFF™ release coating delivery systems and notes the preferred processing equipment to achieve optimal coating.

**Substrate compatibility**
SYL-OFF™ silicone release coatings are well suited for a variety of substrates. Table 2, below, lists the SYL-OFF™ release coating families within each delivery system and notes their compatibility with a variety of substrate surfaces.

### Table 1: Preferred Processing Techniques

<table>
<thead>
<tr>
<th>SYL-OFF™ brand Release Coating Delivery System</th>
<th>Metered Coating (Meyer bar/rod coaters, direct gravure, air knife, squeeze roll, reverse roll, slot die extrusion)</th>
<th>Transfer Coating (3-roll differential offset gravure, 5- and 6-roll multi-roll coat)</th>
<th>Size Press (standard size press as well as film-press or metered size-press)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solventless</td>
<td>Secondary</td>
<td>Primary</td>
<td>Not recommended</td>
</tr>
<tr>
<td>Solvent-based</td>
<td>Primary</td>
<td>Not recommended</td>
<td>Not recommended</td>
</tr>
<tr>
<td>Emulsion</td>
<td>Primary</td>
<td>Secondary</td>
<td>Primary</td>
</tr>
</tbody>
</table>

**Primary** = Preferred coating technique for application  
**Secondary** = May be used, but not ideal

Contact your Dow representative for the coating formulation most suitable for your specific application.

### Table 2: Substrate Compatibility

<table>
<thead>
<tr>
<th>SYL-OFF™ brand Release Coating Family</th>
<th>Uncoated Papers</th>
<th>Coated Papers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Uncoated Kraft, MG/MF, etc.</td>
<td>Board</td>
</tr>
<tr>
<td>Solventless platinum</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>Solventless rhodium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solvent-based platinum</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>Solvent-based tin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emulsion</td>
<td>a</td>
<td>a</td>
</tr>
</tbody>
</table>

*= generally compatible with this group of substrates  
*= may be applied, but only on certain grades or within certain limitations

Contact your Dow representative for the coating formulation most suitable for your specific application.
Choose the right silicone release coating

The choice of SYL-OFF™ silicone release coating for your specific application depends not only on the available coating equipment and the substrate being used, but also on the desired release characteristics for the end-use application. (See Tables 1 and 2 in this brochure for guidance on the suitability of release coating delivery systems for specific substrate surfaces, equipment and applications.)

The performance characteristics of a laminate made using a silicone release coating can be controlled or modified to some degree through formulation and processing of the silicone. One key performance characteristic is the release profile, which can be influenced by choice of silicone system as depicted in the graph to the right. Other factors to consider are raw materials being used, such as the adhesive and substrates (both base and face substrate, where applicable).

The graph shows how different silicone coatings affect the release force as the laminate is separated at different speeds.
Overview of silicone delivery systems

Each of the SYL-OFF™ silicone release coating delivery systems – solventless, solvent-based, and emulsion – offers particular benefits based on application needs. There are also different families of SYL-OFF™ silicone release coatings within each delivery system that provide distinctive advantages depending on application, substrate or coating equipment. Table 3 compares the technologies.

**Solventless** – 100% solids blends of silicone polymers, typical viscosity of 200 – 800 cP.s.

**Solvent-based** – dispersions of silicones in organic solvents. Initial viscosity of ~40,000 cPs may be reduced by adding more solvent.

**Emulsion** – dispersions of silicone oils in water. Typical viscosity ~40 cPs; usually further diluted in water to coat.

<table>
<thead>
<tr>
<th>Substrates</th>
<th>Solventless</th>
<th>Solvent-based</th>
<th>Emulsion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substrates</td>
<td>Least versatile but still suitable for highly calendered papers, some coated papers and films.</td>
<td>Generally applied to many different substrates, good anchorage. Solvent choice may be adapted to specific substrates.</td>
<td>Usable on a broad range of substrates.</td>
</tr>
<tr>
<td>Typical Application Solids</td>
<td>100% (may be diluted in solvent if needed)</td>
<td>100% (may be diluted in solvent if needed)</td>
<td>Up to 12 wt %</td>
</tr>
<tr>
<td>Typical Coat Weight</td>
<td>1.0 - 2.0 g/m²</td>
<td>1.0 - 2.0 g/m²</td>
<td>0.5 - 1.3 g/m²</td>
</tr>
<tr>
<td>Cure – Typical Curing Temperature</td>
<td>80 - 180°C</td>
<td>140 - 200°C</td>
<td>80 - 180°C</td>
</tr>
<tr>
<td>Cure Time/ Dwell Time</td>
<td>2 - 10 sec</td>
<td>2 - 10 sec</td>
<td>5 - 10 sec</td>
</tr>
<tr>
<td>Typical Line Speed</td>
<td>100 - 800 m/min</td>
<td>100 - 400 m/min</td>
<td>50 - 300 m/min</td>
</tr>
<tr>
<td>Comments/Features</td>
<td>Widest product range selection. May require additives for good anchorage performance on filmic surfaces.</td>
<td>Specifically suitable for release of most aggressive adhesives. Require higher temperatures to cure.</td>
<td>Can be applied at very low coat weight. Line speed may be limited by LEL requirements for solvent. EHS concerns and expensive solvent recovery systems.</td>
</tr>
</tbody>
</table>

For more information or specific questions about Dow chemistries, please contact your Dow representative.
Achieve the right silicone performance for your application

The following charts start with the basic formulation for the specific delivery system and substrate, then provide a range of SYL-OFF™ silicone release coating product options to customize performance based on your specific application needs.

Performance modification of silicone
Platinum solventless coatings for paper

Your Dow representative will help you select the coating formulation most suitable for your specific application.

**Basic Formulation**
SYL-OFF™ SL 160 Coating – 100 pbw
SYL-OFF™ 7682-000 Crosslinker – 3.8 pbw
SYL-OFF™ 4000 Catalyst – 1.2 pbw

pbw = parts by weight

**Modification**

- **Change release profile/level**
  - SYL-OFF™ SL 200 Coating – Lower release force at lower peel speed
  - SYL-OFF™ SL 400 Coating – Intermediate release force at low speed
  - SYL-OFF™ SL 181 Coating – Flat release profile for high speed converting

- **Increase release level**
  - SYL-OFF™ SL10 Release Modifier – General purpose for low levels of modification
  - SYL-OFF™ SL 35 Release Modifier – Higher performance for intermediate modification, formulated without olefin
  - SYL-OFF™ SL 40 Release Modifier – High efficiency with good anchorage
  - SYL-OFF™ SL 18 Release Modifier – High efficiency, formulated without olefin

- **Change cure performance**
  - SYL-OFF™ SL 8 Crosslinker – Good anchorage and mist reduction with no impact on cure speed
  - SYL-OFF™ SL 9 Crosslinker – Excellent anchorage along with mist reduction
  - SYL-OFF™ SL 11 Crosslinker – Fastest cure at ultra-low platinum levels
  - SYL-OFF™ SL 12 Crosslinker – Fast cure at ultra-low platinum levels with improved anchorage for challenging substrates

- **Control misting**
  - Instead of SYL-OFF™ SL 160 Coating, use SYL-OFF™ SL 161 Coating – Includes anti-misting additive
  - Instead of SYL-OFF™ SL 200 Coating, use SYL-OFF™ SL 201 Coating – Same release performance but longer thin-film bath life

- **Improve thin film bathlife**
  - Instead of SYL-OFF™ SL 160 Coating, use SYL-OFF™ SL 560 Coating
  - Instead of SYL-OFF™ SL 200 Coating, use SYL-OFF™ SL 600 Coating
  - Instead of SYL-OFF™ SL 400 Coating, use SYL-OFF™ SL 800 Coating
  - Instead of SYL-OFF™ SL 181 Coating, use SYL-OFF™ SL 581 Coating

- **Improve anchorage**
  - SYL-OFF™ SL 9176 Anchorage Additive – For PET films
  - SYL-OFF™ 297 Anchorage Additive – General purpose
Modification of Silicone Performance
Platinum Solventless Coatings for Films

**Basic Formulation**
SYL-OFF™ SL 9106 Coating – 97.6 pbw
SYL-OFF™ SL 7028 Crosslinker or SYL-OFF™ 7048 Crosslinker – 3.5 pbw
SYL-OFF™ 4000 Catalyst – 4.0 pbw
SYL-OFF™ SL 9176 Anchorage Additive – 2 pbw
pbw = parts by weight

**Modification**

- **Change Release Profile/Level**
  - SYL-OFF™ SL 200 Coating – Lower release force at lower peel speed
  - SYL-OFF™ SL 160 Coating – Flatter release profile where anchorage is not an issue

- **Increase Release Level**
  - SYL-OFF™ SL 10 Release Modifier – General purpose for low levels of modification where anchorage to filmic substrate is not an issue
  - SYL-OFF™ SL 9156 Release Modifier – High-efficiency with good anchorage to filmic surfaces

- **Change Cure Performance**
  - SYL-OFF™ 7678 Crosslinker – Fast cure
  - SYL-OFF™ 7689 Crosslinker – Good anchorage on challenging substrates

**Modification of Silicone Performance**
Rhodium Solventless Coatings for Use with Challenging Adhesives

**Basic Formulation**
SYL-OFF™ 7044 Coating – 97 pbw
SYL-OFF™ SL 7028 Crosslinker or SYL-OFF™ 7048 Crosslinker – 3 pbw
pbw = parts by weight

**Modification**

- **Increase Release Level**
  - SYL-OFF™ 7069 Release Modifier – General purpose

- **Change Cure Performance**
  - SYL-OFF™ SL 7824 Coating – Faster cure at lower levels of catalyst

Your Dow representative will help you select the coating formulation most suitable for your specific application.
Modification of Silicone Performance
Platinum Emulsion Coatings for Paper

Modification

Basic Formulation
SYL-OFF™ EM 7990 Emulsion Coating – 95 pbw
SYL-OFF™ EM 7975 Catalyst Emulsion – 5 pbw
Water – Dilute as needed

pbw = parts by weight

Modification

Change Release Profile/Level
SYL-OFF™ 7950 Emulsion Coating – Superior anchorage
SYL-OFF™ 7920 Emulsion Coating – Superior anchorage and bath life
SYL-OFF™ 7978 Emulsion Coating – Superior food/bakery release and improved runnability on paper machines

Increase Release Level
SYL-OFF™ EM 7931 Release Modifier – High-efficiency for a full range of modification

Change Cure Performance
SYL-OFF™ 7923 Catalyst Emulsion – For fast cure
SYL-OFF™ 7924 Catalyst Emulsion – Extend bath life of final formulation

Additives to Change Performance
SYL-OFF™ EM 7989 Antifoam – Control build-up of foam during processing of the emulsion formulation
DOWSIL™ 67 Additive – Modification of the wetting behavior of the coating bath on the substrate surface
CMC/HEC – Thickeners to modify the viscosity of the coating bath and wetting behavior

Modification of Silicone Performance
Platinum Emulsion Coatings for Films

Modification

Basic Formulation
SYL-OFF™ EM 7934 Emulsion Coating – 90 pbw
SYL-OFF™ EM 7975 Catalyst Emulsion – 10 pbw
Water – Dilute as needed

pbw = parts by weight

Modification

Change Cure Performance
SYL-OFF™ EM 7935 Emulsion Coating – In-line film coating
SYL-OFF™ EM 7945 Emulsion Coating – Off-line film coating with fast or lower temperature cure

Change Release Profile/Level
SYL-OFF™ EM 7931 Release Modifier – High-efficiency for a full range of modification

Increase Release Level
SYL-OFF™ EM 7989 Antifoam – Control build-up of foam during processing of the emulsion formulation
DOWSIL™ 67 Additive – Modification of the wetting behavior of the coating bath on the substrate surface
CMC/HEC – Thickeners to modify the viscosity of the coating bath and wetting behavior

Additive to Change Performance
SYL-OFF™ EM 7934 Emulsion Coating – In-line film coating
SYL-OFF™ EM 7945 Emulsion Coating – Off-line film coating with fast or lower temperature cure

Your Dow representative will help you select the coating formulation most suitable for your specific application.
Modification of Silicone Performance
Platinum Solvent-based Coatings for Paper and Films

**Contact your local Dow representative for availability of this material in your area**

**Certain organotin catalysts are less suitable for the European Union due to their REACH status. Please contact your Dow representative for information on the use of organotin catalysts in the EU.**

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**Modification**

**Change Cure Performance**

- SYL-OFF™ SB 7458 Coating – Faster cure with low release force; particularly suitable for filmic substrates
- SYL-OFF™ 7450 Release Coating – Lower release force
- SYL-OFF™ 7046 Coating – Higher release force and improved wetting on non-polar surfaces

**Increase Release Level**

- SYL-OFF™ 7210 Release Modifier – High-efficiency for high release force range of modification
- SYL-OFF™ 7200 Low Release Force Additive – High-efficiency for low release force range of modification

**Change Wetting On Films**

- For coating polar surfaces (PET, PC), petroleum solvent can be replaced with a combination of ethyl acetate, methyl ethyl ketone
- For coating non-polar surfaces (LDPE, HDPE, OPP), petroleum solvent can be replaced with pure heptane and hexane for better wetting

**Additives to Change Performance**

- SYL-OFF™ 297 Anchorage Additive – Increases anchorage to filmic surfaces
- SYL-OFF™ 4000 Catalyst – Improves cure speed at lower temperatures
- SYL-OFF™ SL 9176 Anchorage Additive – Improves anchorage on PET film

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**Modification**

**Change Cure Performance**

- SYL-OFF™ SB 2792* Coating – Better release
- SYL-OFF™ 7075 Coating – Tighter release

**Increase Release Level**

- SYL-OFF™ C4-2109 Fast-Cure Additive – Accelerates cure speed

**Change Wetting On Films**

- For coating polar surfaces (PET, PC), toluene and IPA solvent can be added (replacing heptane)
- For coating non-polar surfaces (LDPE, HDPE, OPP), petroleum solvent can be replaced with pure heptane and hexane for better wetting
- For coating other non-polar surfaces (LDPE, HDPE, OPP), a combination of heptane and hexane may be used for better wetting

**Additives to Change Performance**

- SYL-OFF™ 297 Anchorage Additive – Increases anchorage to filmic surfaces
- Isopropanol (IPA), methylethylketone (MEK) or acetic acid may be added to improve bath life
- SYL-OFF™ 2-7131 Fast-Cure Additive – Accelerates cure speed

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**Basic Formulation**

**SYL-OFF™ 7362** Coating – 99 pbw
**SYL-OFF™ 7387** Crosslinker or **SYL-OFF™ 7215** Crosslinker – 1 pbw
Toluene solvent – dilute as needed

**SYL-OFF™ 7382** Coating – 99 pbw
**SYL-OFF™ 7300** Catalyst** – 2.7 pbw
**SYL-OFF™ 7048** Crosslinker – 2.9 pbw
Heptane solvent – dilute as needed

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**Basic Formulation**

**SYL-OFF™ 2794** Coating* – 94.4 pbw
**SYL-OFF™ 2700** Catalyst** – 2.7 pbw
**SYL-OFF™ 7048** Crosslinker – 2.9 pbw
Heptane solvent – dilute as needed

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Select the right delivery system

SYL-OFF™ silicone release coatings from Dow are used in many different applications and require specific silicone delivery systems to achieve optimal results. The following table lists a variety of typical SYL-OFF™ silicone release coating applications and the recommended delivery systems for each application.

Table 4: Applications and Delivery Systems

<table>
<thead>
<tr>
<th>Application</th>
<th>Solventless</th>
<th>Solvent-based</th>
<th>Emulsion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Platinum</td>
<td>Rhodium</td>
<td>Tin</td>
</tr>
<tr>
<td></td>
<td>Catalyzed</td>
<td>Catalyzed</td>
<td>Catalyzed</td>
</tr>
<tr>
<td>Labels</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>Tapes with Release Liner</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>Graphic Arts</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>Composite Release</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>Hygiene Release</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>Envelope Release</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>Bakery Paper</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>Roofing (Self-Adhesive)</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>Medical Tapes/Labels</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
</tbody>
</table>

* = this delivery system is recommended and typically used for this application
\* = this delivery system can be used, but may not achieve optimal results

Your Dow representative will help you select the coating formulation most suitable for your specific application.
For more information

For product data sheets, selection guides and an overview of Dow’s comprehensive line of products and services for the Films, Tapes and Release Liners industry, visit our website: www.dow.com.