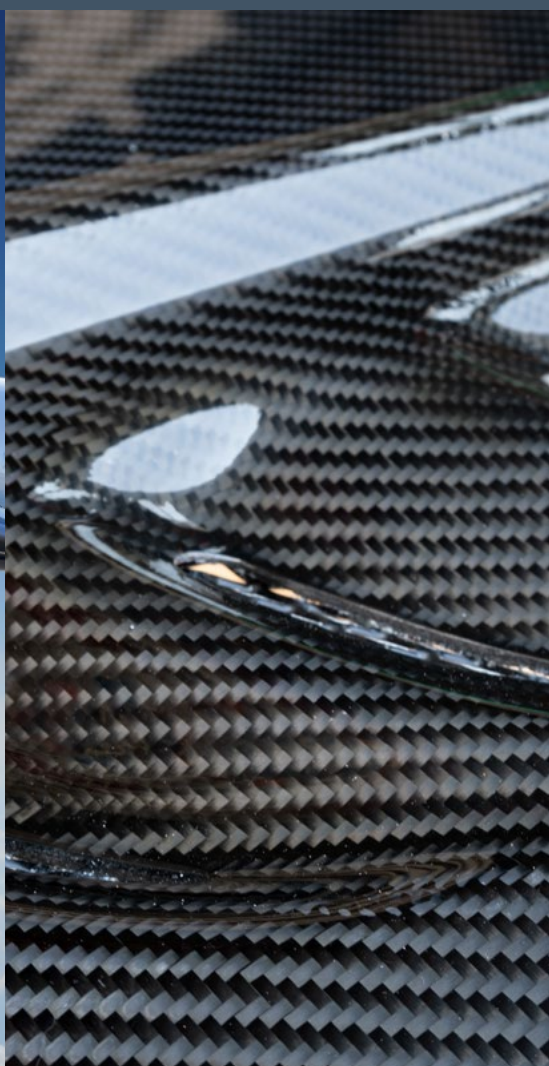
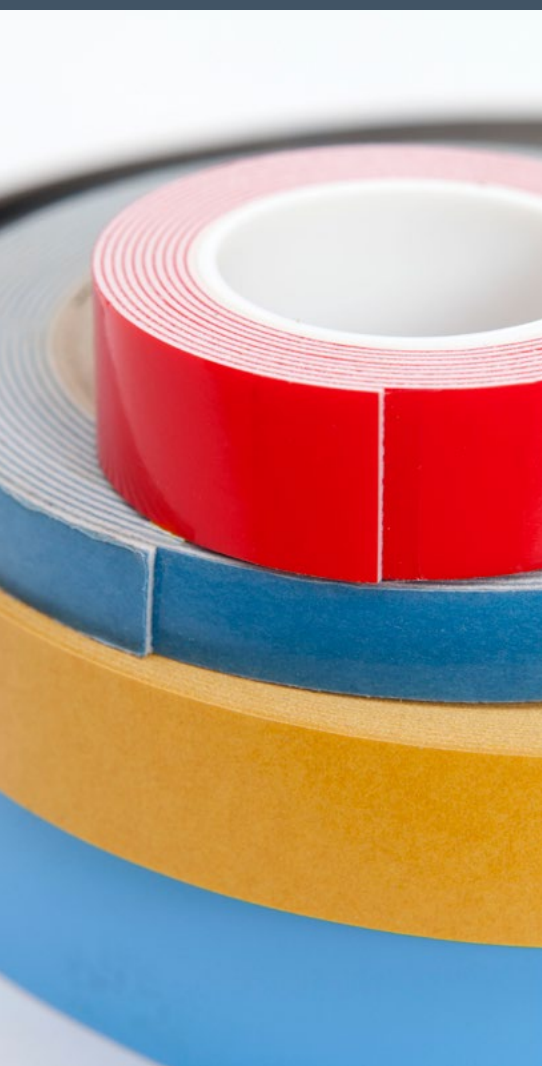


SYL-OFF™ Solventless, Rhodium-Catalyzed Silicone Release Coatings

Release system information guide



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General information

SYL-OFF™ brand Solventless, Rhodium-Catalyzed Silicone Release Coatings are based on pre-catalyzed 100 percent solids, vinyl-functional reactive siloxane polymers. When combined with their respective crosslinkers, these coatings cure via a thermally initiated addition reaction in the presence of heat. Web temperatures of greater than 150°C (300°F) are typically required.

Features

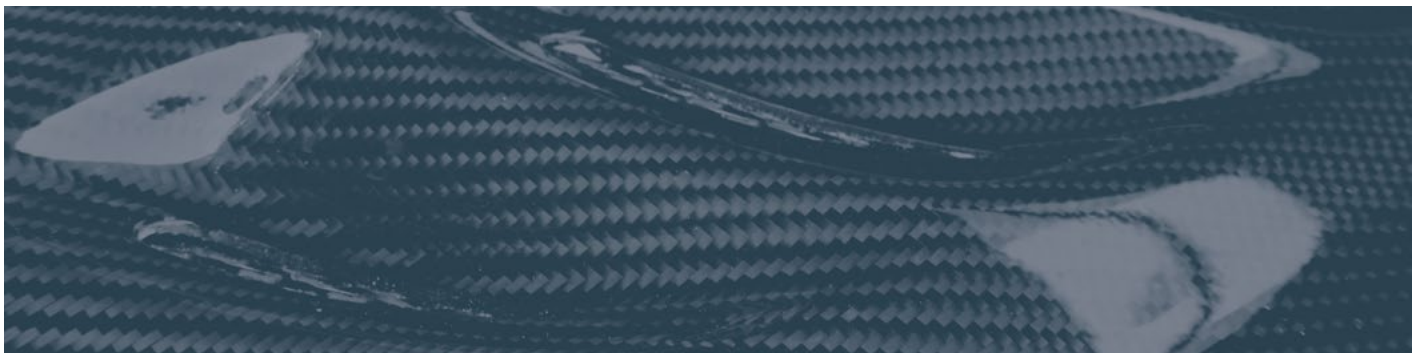
- Does not interact with most adhesives; excellent acrylic adhesive compatibility
- Extremely robust cure chemistry – highly resistant to poisoning; minimal substrate inhibition
- Premium (easy) release
- Cured coatings are generally tough, durable, nonblocking and nonmigratory
- Minimal post-cure
- Solventless processing

Physical properties

SYL-OFF™ Solventless, Rhodium-Catalyzed Silicone Release Coatings are provided in a range of viscosities suitable for processing with equipment typically used for solventless silicone coatings. They are clear to slightly hazy and yellow in color.

Applications

- Release liners for pressure sensitive adhesive laminates and tapes
- One-sided or double-sided applications with differential release
- Can be used on clay-coated papers where inhibition is observed with Pt-systems
- General industrial release papers



Product range details

The SYL-OFF™ Solventless, Rhodium-Catalyzed Silicone Release Coating products listed below are available worldwide and meet the majority of global industry requirements. However, they represent only a portion of Dow's silicone release technology. Contact your Dow representative for information about other, locally available product options.

Base coating:

SYL-OFF™ 7044 Coating	A 100 percent active solids, pre-catalyzed coating containing a medium viscosity vinyl multifunctional silicone polymer. Formulated with rhodium catalyst and a bath life extender. Recommended for maximum release stability. Cured coating is relatively hard. Offers premium (easy) release with a release profile that is relatively flat across the peel speed range.
SYL-OFF™ SL 7824 Coating	A 100 percent active solids medium viscosity, multifunctional reactive siloxane polymer containing a bath life extender and a rhodium catalyst. Lower rhodium catalyst level compared to SYL-OFF™ 7044 Coating.

Crosslinkers:

SYL-OFF™ 7048 Crosslinker	A 100 percent solids crosslinker that is suitable for use with most SYL-OFF™ Solventless and Solvent-Based Coatings. Recommended where optimum anchorage to substrate is required.
SYL-OFF™ 7678 Crosslinker	A 100 percent active solids silicone crosslinker. Suitable for use with most SYL-OFF™ Solventless and Solvent-Based Coatings. Recommended where optimum cure performance and bath life are required.
SYL-OFF™ SL 8 Crosslinker	A 100 percent solids crosslinker that contains an anti-mist additive. Recommended for high speed lines.
SYL-OFF™ 7682-055 Crosslinker	A 100 percent solids silicone crosslinker. Suitable for use with most SYL-OFF™ Solventless and Solvent-Based Coatings. Recommended where optimum cure performance and bath life are required.

Release modifier:

SYL-OFF™ 7069 Release Modifier	A 100 percent active solids, pre-catalyzed, high-viscosity release modifier. Formulated with rhodium catalyst and a bath life extender. General purpose release modifier recommended for use with SYL-OFF™ 7044 Coating and for SYL-OFF™ SL 7824 Coating.
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High-speed process aids:

SYL-OFF™ 7137 High Speed Crosslinker	A silicone fluid used as an additive to reduce misting during high-speed silicone roll coating. Designed to have no adverse effect on coating properties. Contains reactive SiH groups that crosslink with the coating during cure. Suitable for use with silicone coatings that use SYL-OFF™ 7048 Crosslinker.
SYL-OFF™ 7138 High Speed Crosslinker	A silicone fluid used as an additive to reduce misting during high-speed silicone roll coating. Designed to have no adverse effect on coating properties. Contains reactive SiH groups that crosslink with the coating during cure. Suitable for use with silicone coatings that use SYL-OFF™ 7678 Crosslinker.

Product handling information

Substrates

SYL-OFF™ Solventless, Rhodium-Catalyzed Silicone Release Coatings have been successfully applied to uncoated papers, including board and parchment; coated papers, including super-calendered and clay-coated krafts; and metal foil.

Because of cure temperature requirements, these coatings are not suited for use on temperature-sensitive substrates such as plastic films.

Of all the currently available thermal solventless coating systems, rhodium-catalyzed coatings are the least sensitive to substrate inhibition. However, substrates must be tested carefully before use, as some precoats found on glassine, super-calendered krafts and clay-coated krafts can affect the cure rate of the silicone coating.

Application equipment

SYL-OFF™ Solventless, Rhodium-Catalyzed Silicone Release Coatings are designed to be applied using precision coating equipment such as three-roll offset differential gravure and multi-roll smooth roll coaters.

Solventless coatings may also be blended with aliphatic solvents to a desired solids concentration and applied using conventional solvent coating equipment.

Coat weight

Without experimentation, it is difficult to establish precise recommendations for the correct amount of silicone coating to be deposited on the substrate. Pick-up values are entirely dependent on the coating equipment used, equipment operation and substrate.

A recommended starting point is 1 g per m² (0.62 lb per 3,000 sq ft ream); this can be adjusted to meet substrate and end-use applications. Coating trials should be conducted for each substrate and coating formulation used.

Coat weight can be varied by changing the coating parameters, the coating technique and/or the concentration of silicone in the bath. Coating trials should be conducted for each substrate used.

Bath life

Under normal ambient conditions, SYL-OFF™ Solventless, Rhodium Catalyzed Silicone Release Coatings have a dynamic formulated bath life of at least 8 hours. The formulated bath may be stored for longer periods if refrigerated.

Bath life varies depending on the coating formulation and the test method used. Bath life trials should be conducted for each formulation.

Formulation advice

Crosslinker: Coating ratio

Good cure can be achieved with crosslinker:coating (measured and calculated as moles SiH:moles Vi) ratios ranging from 1.1:1 to 2:1.

Release modifier (High release)

To achieve tighter release, SYL-OFF™ 7069 Release Modifier can be used at any level up to 100 percent in place of SYL-OFF™ 7044 Coating or SYL-OFF™ 7824 Coating.

Bath preparation

System components should be mixed in the following order and stirred for 20 to 30 minutes (total) to ensure homogeneity:

1. Blend the base release polymer and the release modifier (if required).
2. Add the crosslinker.
3. Mix well.



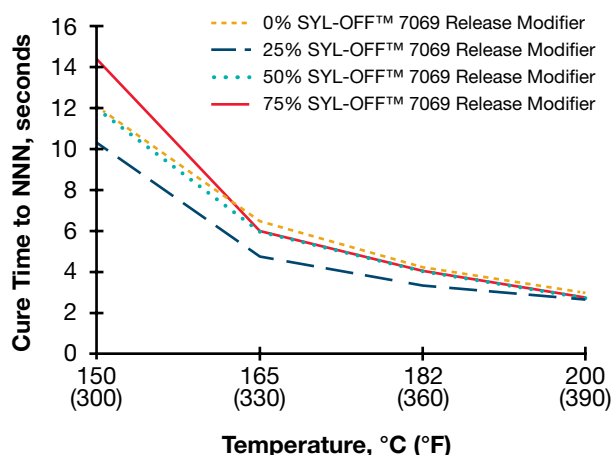
Application information

Cure performance

Time, temperature, type and age of the substrate, coat weight and degree of surface penetration can all affect the cure performance of SYL-OFF™ Solventless, Rhodium-Catalyzed Silicone Release Coatings.

Figures 1 and 2 compare the cure time vs. oven temperature required for formulations based on SYL-OFF™ 7044 Coating and various levels of SYL-OFF™ 7069 Release Modifier to achieve NNN (no smear, no rub-off, no migration). The formulations in Figure 1 contain SYL-OFF™ 7048 Crosslinker, while the formulations in Figure 2 utilize SYL-OFF™ 7678 Crosslinker.

Figure 1. Cure performance of SYL-OFF™ 7044 Coating and SYL-OFF™ 7048 Crosslinker – time to NNN at various temperatures.

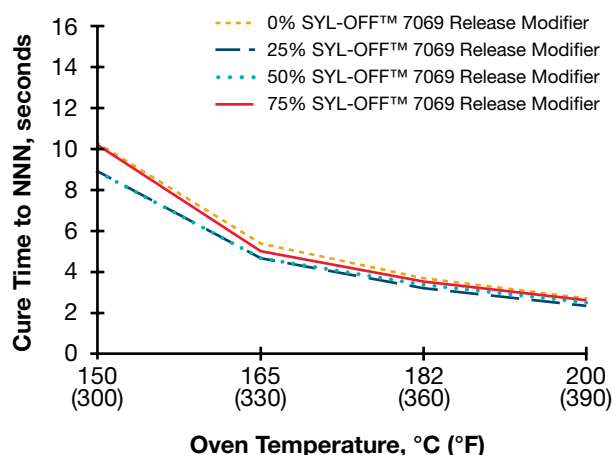


Test conditions: Coating applied to a super-calendered kraft base sheet and cured until NNN.

As a general rule, formulations with SYL-OFF™ 7678 Crosslinker cure more quickly at lower temperatures than those with SYL-OFF™ 7048 Crosslinker and are less affected by the level of SYL-OFF™ 7069 Release Modifier.

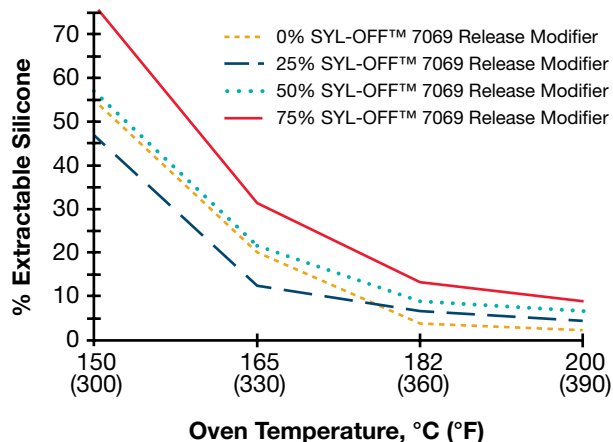
Figures 3 and 4 compare the cure performance of the same coating formulations in terms of percent extractables (amount of uncured silicone that can be extracted from a cured sample). Formulations containing SYL-OFF™ 7048 Crosslinker exhibit slightly higher levels of extractables across the cure temperature range.

Figure 2. Cure performance of SYL-OFF™ 7044 Coating and SYL-OFF™ 7678 Crosslinker – time to NNN at various temperatures.



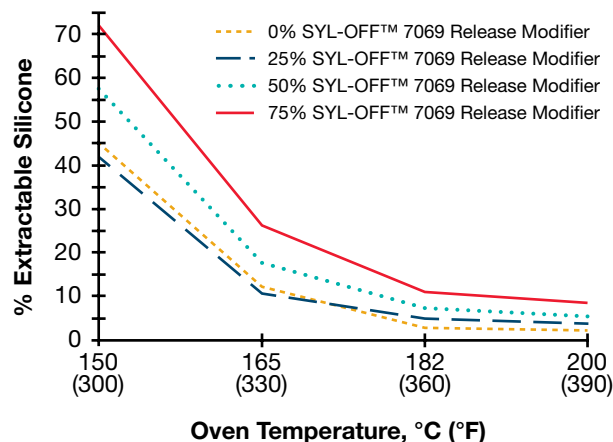
Test conditions: Coating applied to a super-calendered kraft base sheet; coat weight 1.1 g per m² (0.8 lb per 3,000 sq ft ream); 6-second cure.

Figure 3. Cure performance of SYL-OFF™ 7044 Coating and SYL-OFF™ 7048 Crosslinker – % extractables.



Test conditions: Coating applied to a super-calendered kraft base sheet and cured until NNN.

Figure 4. Cure performance of SYL-OFF™ 7044 Coating and SYL-OFF™ 7678 Crosslinker – % extractables.

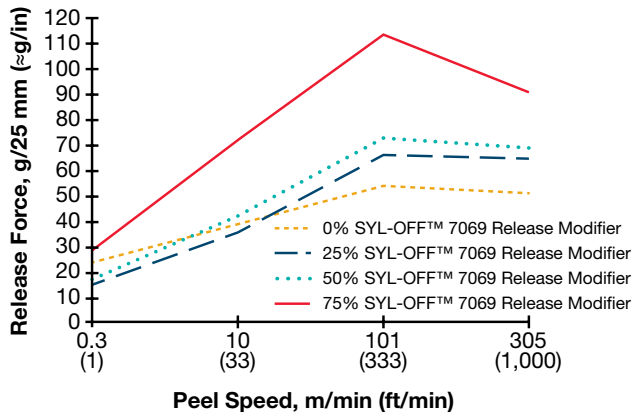


Test conditions: Coating applied to a super-calendered kraft base sheet; coat weight 1.1 g per m² (0.8 lb per 3,000 sq ft ream); 6-second cure.

Optimizing cure performance

It may be possible to reduce cure time, lower cure temperature or improve the completeness of cure by adjusting the crosslinker:coating (SiH:VI) ratio. This is accomplished by increasing or decreasing the amount of crosslinker. However, the higher the crosslinker loading, the greater the potential for bath life to be reduced.

Figure 5. Release force profiles of SYL-OFF™ 7044 Coating and SYL-OFF™ 7048 Crosslinker with SYL-OFF™ 7069 Release Modifier – acrylic adhesive.

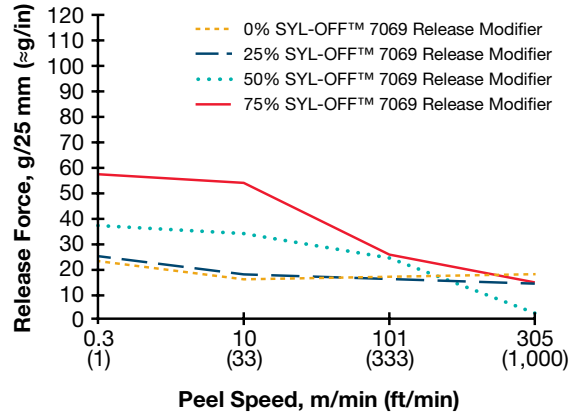


Test conditions: Release from tesa 7475 acrylic tape; coating applied to a super-calendered base sheet and cured at 200°C (390°F) for 15 seconds; 1-day liner aging and 1-day laminate aging at room temperature; liner pulled from laminate at 180°.

Release performance

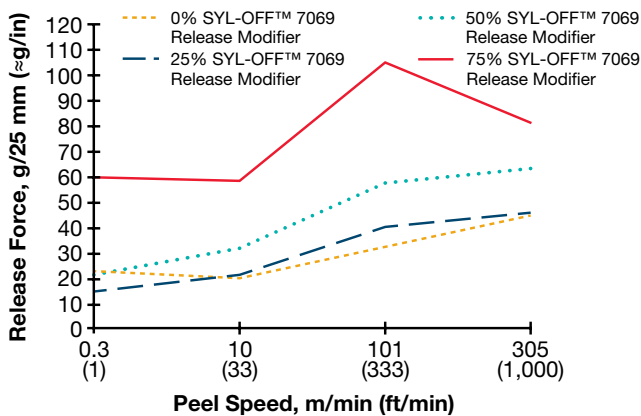
Figures 5 through 7 compare the release performance of SYL-OFF™ 7044 Coating with SYL-OFF™ 7048 Crosslinker against three adhesive types – acrylic, solvent-based rubber and hot melt. These figures also demonstrate the effect of increasing levels of SYL-OFF™ 7069 Release Modifier has on release force profiles.

Figure 6. Release force profiles of SYL-OFF™ 7044 Coating and SYL-OFF™ 7048 Crosslinker with SYL-OFF™ 7069 Release Modifier – rubber adhesive.



Test conditions: Release from tesa 7476 rubber tape; coating applied to a super-calendered base sheet and cured at 200°C (390°F) for 15 seconds; 1-day liner aging and 1-day laminate aging at room temperature; liner pulled from laminate at 180°.

Figure 7. Release force profiles of SYL-OFF™ 7044 Coating and SYL-OFF™ 7048 Crosslinker with SYL-OFF™ 7069 Release Modifier – hot melt adhesive.



Test conditions: Release hot melt tape; coating applied to a super-calendered base sheet and cured at 200°C (390°F) for 15 seconds; 1-day liner aging and 1-day laminate aging at room temperature; liner pulled from laminate at 180°.

Formulation suggestions

Formulations

SYL-OFF™ Solventless, Rhodium-Catalyzed Silicone Release Coating components can be combined and adjusted in several ways to meet various processing and performance challenges. The typical formulations that follow are intended merely to serve as reference points for further discussion. Dow does not warrant their merchantability, fitness for use, performance, efficacy, safety or freedom from patent infringement. It is your responsibility to thoroughly test any formulation before use.

For specific formulation advice, contact your Dow technical service representative.

Table 1: Typical formulation information

	Formulation (all with SYL-OFF™)	(A) Easy release formula	(B) Easy release formula	(C) Tight release formula, 50% modifier	(D) Tightest release formula, 100% modifier	(E) Balance of fast cure and anchorage	(F) Anti-mist formulation	(G) Tight release formula, 50% modifier, with high speed XL
		Best anchorage	Faster cure					
Coating	7044	100	100	50		100	100	50
Release Modifier	7069			50	100			50
Crosslinkers	7048	5.06		5.75	6.45			5.75
	7682-055					6.69		
	SL 8						6.57	
	7678		7.51					
High Speed Process Aids	7137 High							1

Numerical values refer to parts (by weight) per 100 parts of coating or modifier; SiH:Vi ratio 1.5:1

For information and assistance

For product data sheets, selection guides and an overview of Dow's comprehensive line of products and services for the pressure sensitive industry, visit www.dow.com/psi.

Food contact information

Certifications available upon request. For specific details, please contact Dow as regulations vary from country to country.

Limitations

These products are neither tested nor represented as suitable for medical or pharmaceutical uses.

Health and environmental information

To support customers in their product safety needs, Dow has an extensive Product Stewardship organization and a team of Health, Environment and Regulatory Affairs specialists available in each area. For further information, please consult your local Dow representative.

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