Technical Data Sheet

SilForce™ FSR2000

SilForce* FSR2000 Release Coating

Description

The Silforce FSR2000 system is a multi-component, addition cure, thermal solventless release coating system designed for use in the manufacture of release liners for silicone pressure sensitive adhesive applications. SilGrip PSA6574 pressure sensitive adhesive is a high performance phenyl silicone PSA that should be used in conjunction with the FSR2000 release system to provide stable aged release.

The FSR2000 release coating is a fluorosilicone polymer containing platinum catalyst. Standard silicone inhibitors and crosslinkers can be used to control bath life and cure the system respectively. A typical system could include:

- FSR2000 Fluorosilicone base polymer with platinum catalyst
- SL6040-D1 Inhibitor
- SS4300c Homopolymer crosslinker

Key Features and Benefits

- Stable aged release against PSA6574 pressure sensitive adhesive
- Differential release possible with high vinyl silicone polymer additive
- Good uniform coverage
- Fast cure at low temperatures
- Cost effectiveness

Typical Physical Properties

Property	Value
Appearance	Light yellow oil
Viscosity (cstk at 25°C)	230
Density (lb/gal)	8.6

Patent Status
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Product Safety, Handling and Storage
The warranty period of FSR2000 release coating is 12 months from date of shipment from Momentive Performance Materials if stored in the original unopened container at 25°C (77°F). Containers must be kept tightly closed when not in use.

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Processing Recommendations

APPLICATION AND CURE

Silforce FSR2000 release coating is supplied with platinum catalyst incorporated into the base polymer. However, an inhibitor and a crosslinker must be added to control bath life and obtain cure respectively. The converter has flexibility in the final release formulation that is actually used. As a starting point for evaluation, however, the following typical formulation could be considered:

- 100 parts FSR2000 base polymer/catalyst
- 0.5 parts SL6040-D1 inhibitor
- 4 parts SS4300c crosslinker

To ensure consistent results and maximize bath life, the components should be mixed just before use in the following order:

1. Weigh and add the base polymer/catalyst (FSR2000) and inhibitor (SL6040-D1) into a clean, rust-free container/mixing vessel.

2. Mix for 5 to 10 minutes with a high velocity air mixer at moderate speed.
3. Weigh and add the crosslinker (SS4300c) to the above mix.
4. Mix again (as described in step 2 above) to ensure homogeneity.

The working life of the activated bath varies depending on inhibitor level and ambient conditions. In general, the suggested starting formulation above will have a bath life of approximately 8 hours.
The FSR2000 release system can be applied by any of the methods now being used commercially for solventless silicone. These include three roll differential offset gravure and various smooth roll configurations.

Heat should be applied immediately after coating to initiate cure. Best results are obtained with zoned ovens with the first zone operating at 90-120°C (200-250°F) to allow the coating to level and form a continuous film before cure is initiated. Subsequent zones should be sufficiently high to achieve a minimum exit web temperature of approximately 107°C (225°F). Actual temperatures required for complete cure will be highly dependent on machine conditions. In general, minimum web temperature must be maintained a finite time to obtain complete cure. This time is dependent on oven length and air velocity.

Approximate curing times as a function of oven air temperature for the starting formulation cited previously are shown in Table 1:

Table 1
Approximate Cure Times as a Function of Oven Air Temperature

Temperature	Minimum Cure Time (sec)
93°C (200°F)	30
107°C (225°F)	22
120°C (250°F)	10
135°C (275°F)	7
149°C (300°F)	5

The FSR2000 release coating system is suitable for a variety of paper, plastic, and plastic laminated substrates. These include supercalendared kraft, glassine, clay

coated kraft, polyethylene coated kraft, polyester films, etc.

Coating weight will depend on the hold out and resolution of the surface, but generally 0.8-1.6 g/m ^{2} (0.5-1.0 lbs/3000ft ^{2}) will provide a continuous silicone film.

Coating weights are determined by X-ray fluorescence. For machine trials a simple, inexpensive method to calculate coating weight is available from Momentive Performance Materials.

RELEASE VALUES

Crosslinker level can have an impact on release values as shown in Table 2 below. The table shows release values obtained using two levels of crosslinker (SS4300c) against PSA6574 pressure sensitive adhesive. Conditions are listed below. This information is intended to be used only as a general guide.

Table 2
Effect of Crosslinker Level on Release

SS4300c Crosslinker Level(%)	3.3	5.0
Initial Release(g/in)	5	5
20 hr/70°C Release (g/in)	5	7
1 wk/70°C Release (g/in)	7	9

Conditions:

- Substrate: Kammerer AV100 Glassine
- Equipment: Dixon Pilot Coater, 3-Roll Differential Offset Gravure
- Coat weight: Approximately 1.1 lb/ream
- Cure time/temp: 12 sec/350°F
- Adhesive: PSA6574 transfer coated on lab coater, approximately 2 mil build (dry), adhesive dried 2 min/300°F
- Release test: 300 in/min, 180° peel

If differential release is desired, use of a high vinyl linear silicone polymer can increase

release levels of the FSR2000 release system. Typical formulations may include up to 30% SL6500 vinyl silicone polymer. Such formulations may double the release value of FSR2000 release system against PSA6574 pressure sensitive adhesive. Such applications should be carefully evaluated since increased levels of SL6500 vinyl silicone polymer may adversely affect release stability.

The application method and catalysis of the SilGrip PSA6574 pressure sensitive adhesive also can affect release levels. In general, lower release values are obtained with direct coating of the PSA6574 to the face stock, followed by lamination to the cured FSR2000 release coating. Generally, higher release values are seen when the PSA6574 is coated on the cured FSR2000 release coating and then transferred to the face stock.

Additionally, catalysis of PSA6574 with benzoyl peroxide (BPO) will generally result in higher release values.

Table 3 below indicates the effect of the PSA6574 pressure sensitive adhesive catalysis and coating method on release values. Again, this is informational only. Coating conditions are listed below the table.

Table 3
Release Values as a Function of PSA6574Coating Method and Catalysis

BPO Concen.(%)	Coating Method	Initial Release (g/in)	20 hr/70°C Release (g/in)	1 wk/70°C Release (g/in)
0	Transfer	4	4	7
2	Transfer	7	8	38
2	Direct	2	2	2

Conditions :

- Substrate: Kammerer AV100 glassine
- Equipment: Dixon Pilot Coater, 3-Roll Differential Offset Gravure
- Coat Weight: Approximately 0.95 lb/ream
- Cure Time/Temp: 12 sec/350°F
- Adhesive: PSA6574 coated and catalyzed as indicated in Table 3, catalyzed

adhesive cured at 350°F/2 min, uncatalyzed adhesive dried at 300°F/2 min, approximately 2 mil dry adhesive build

- Release test: 300 in/min, 180° peel

Limitations

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