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SPUR+* 1015 Prepolymer

MARKETING BULLETIN

SILANES - ADHESIVES & SEALANTS ADDITIVES

SPUR+ 1015 prepolymer is a silylated polyurethane resin for manufacturing one-part, moisture-curing sealants and adhesives. Plasticizer-free and of relatively low viscosity, it is an excellent base resin for low modulus sealants in building and construction applications where good elastic recovery is required.

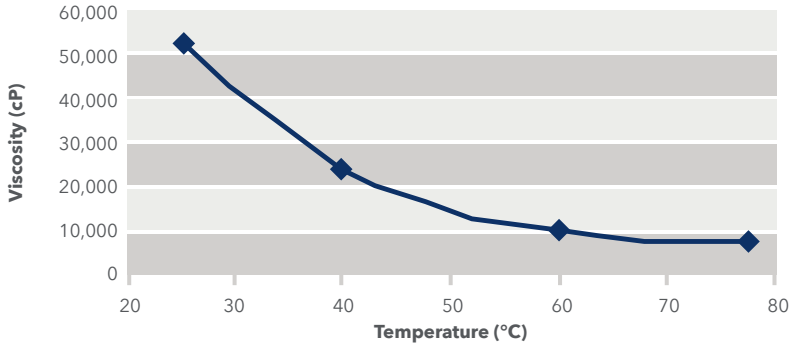
Key Features and Typical Benefits

- Broad formulation latitude
- Easy application characteristics
- Excellent adhesion to many surfaces without primer
- High durability indoors and outdoors
- Good water and chemical resistance
- High elastic recovery
- Long shelf life

Typical Physical Properties	
Appearance	Clear, viscous liquid
Viscosity cP at 25 °C	~ 50,000
Shelf Life	≥ 12 months
Tensile Strength (psi)	~75
Elongation (%)	~280
100% Modulus (psi)	~41
Shore A Hardness	~17

Typical properties are average data and are not to be used as or to develop specifications.

Figure 1: Viscosity vs. Temperature



*SPUR+ is a trademark of Momentive Performance Materials Inc.

Key Features of SPUR+ Prepolymer Technology

Silane-terminated polyurethanes have become increasingly attractive to manufacturers of adhesives, sealants and coatings. This high-performance hybrid technology is a result of the synergy between the silane-curing mechanism and polyurethane backbone properties.

Formulations based on SPUR+ prepolymers offer fast room-temperature cure and good durability: the sealants or adhesives are free of unreacted isocyanate. Benefits also include freedom from bubbling during cure and a broadening of the formulation latitude compared to conventional polyurethane technologies. SPUR+ prepolymers allow the formulator the use of a wide variety of additives and adhesion promoters to meet performance needs, including:

1. Good elasticity and durability
2. Primerless adhesion to both organic and inorganic, porous and non-porous substrates
3. Superior chemical resistance, such as to automotive fluids (*e.g.* glycols, motor and transmission fluids)
4. Minimal shrinkage
5. Excellent weatherability
6. Immediate paintability
7. Non-staining of porous substrates
8. Candidate for clear adhesives
9. Lower VOC formulated products

Performance of SPUR+ 1015 Prepolymer Sealants

The following generic sealant formulae may be used to evaluate the performance characteristics of SPUR+ prepolymers.

Ingredients (wt%)	Sealant A	Sealant B
SPUR+ 1015 prepolymer	23.1	22.9
Plasticizer (DIDP)	18.5	18.4
Moisture Scavenger (Silquest A-171* silane)	0.4	0.3
Calcium Carbonate	55.5	55.1
UV Stabilizers	0.5	0.5
Thixotropic Agent (SiO_2)	0.2	1.1
Colorant (such as TiO_2)	1.2	1.2
Adhesion Promoter (Silquest* A-1110 silane)	0.58	–
Adhesion Promoter (Silquest A-1120 silane)	–	0.57
Catalyst (dibutyltin dilaurate)	0.05	0.03

The mechanical properties are measured after curing the sealant for 2 weeks at 23°C/50% relative humidity and then tested according to ISO 37 or ASTM D 412 respectively for tensile strength and elongation, and ISO 868 or ASTM C 661 for hardness.

SPUR+ 1015 Sealant	Sealant A	Sealant B
Test Methods	ISO	ASTM
Tensile Strength at Break (psi)	313.3	214.6
Modulus at 100% Extension (psi)	137.8	100.0
Elongation at Break (%)	420	430
Hardness Shore A	37.3	36
Tack Free Time (hr.)	1	3

(These figures are intended as guideline, not specifications)

Adhesion is measured after curing the sample species for 2 weeks at 23°C/50% relative humidity, and tested according to ISO 8510-2 (dry adhesion) followed by water immersion for four days and one day at room temperature according to ISO 10591 (wet adhesion). For Sealant B, the peel strength is measured according to ASTM C 794 test method and tested soon after water immersion for seven days (wet adhesion).

Substrates†	Sealant A		Sealant B
	Dry Adhesion(1) (lbs/in / %CF)	Wet Adhesion(2) (lbs/in / %CF)	Wet Adhesion(3) (lbs/in / %CF)
Aluminum	12.4/100%CF	17.2/100%CF	22.4/100%CF
Anodized Aluminum (ALMg1) 5005A	11.8/100%CF	16.4/100%CF	n.d.
Galvanized Steel Dx51 D+Z275	16.1/100%CF	17.5/100%CF	n.d.
Glass	17.1/100%CF	19.1/100%CF	18.3/100%CF
PVC (standard)	20.5/100%CF	23.8/100%CF	18.4/100%CF
PVC (Komadur ES)	26.9/100%CF	n.d.	n.d.
Polycarbonate (Lexan 9030)	16.1/100%CF	n.d.	n.d.
ABS	n.d	n.d.	19.7/100%CF
Polystyrene	n.d	n.d.	22.0/100%CF
Concrete (method 1 in ISO13640)	12.5/50%CF	n.d.	n.d.
Concrete (method 2 in ISO13640)	9.1/30%CF	n.d.	n.d.
Concrete (from US markets)	n.d.	n.d.	22.4/25%CF (dry)

(These figures are intended as guideline, not specifications)
CF = cohesive failure
† Most of the testing substrates were kindly supplied by Rocholl Gmbh
(1) ISO 8510-2; (2) ISO 10591; (3) ASTM C-794

The results showed the SPUR+ 1015 sealants provide balanced mechanical properties and excellent adhesion to a wide range of substrates, both inorganic and organic. In addition to the above-mentioned advantages, this SPUR+ 1015 prepolymer provides additional features of non-yellowing and improved tack free and deep section cure performance. These performance advantages provide formulators with more freedom to optimize their products for market needs.

References

[1] Huang, M.W., Lacroix, C. and Waldman, B.A.; "A New Low Viscosity, Plasticizer Free SPUR+ Prepolymer", PU TECH 2005, New Delhi, India; *presented at A&SC fall convention* 2005.

[2] Huang, M.W. and Handel, R.; "New Developments in Silylated Polyurethane Technology"; *Adhesives, Age*, April 1999.

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Patent Status

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