

VORAMER™ MN 2314 Prepolymer



Polyurethane sealants are well established in industrial and infrastructure markets due to their workability, flexibility, mechanical properties and good adhesion to a variety of substrates. One-component sealants formulated using Dow's VORAMER™ MN 2314 prepolymer provide desirable processing and reactivity for use in moisture-cure systems. Potential applications include infrastructure and civil engineering applications such as roadway construction. This guide provides preliminary formulations for a range of low to medium modulus and elongation one-component sealants based on VORAMER MN 2314.

VORAMER™ MN 2314 Prepolymer for Sealant Applications

VORAMER MN 2314 is a partially formulated polyurethane prepolymer suitable for use in one-component sealant formulations, particularly for low modulus industrial and infrastructure

applications. At 1.33 - 1.66% NCO and ~10 - 16 Pa-s at 23 °C, this polyether-based prepolymer system provides the necessary balance between ease of processing and reactivity. Cured films of various formulations were made by mixing VORAMER MN 2314 with ground calcium carbonate (CaCO₃) filler, diisononyl phthalate (DINP) plasticizer and 2,2'-dimorpholinodiethylether (DMDEE) catalyst, then degassing the mixture under vacuum. The films were cast at 50 mil thickness on a polypropylene substrate and cured for at least 7 days at ~25 °C. Typical mechanical properties for some representative formulations are shown in Table 1.

Table 1

Typical properties of cured 1K formulated sealants based on VORAMER™ MN 2314.

FORMULATION	Components (parts by weight)			Mechanical Properties (D1708)		
	VORAMER™ MN 2314 (Prepolymer)	Ground CaCO ₃ (Filler)	DINP (Plasticizer)	Tensile Strength (psi)	Elongation (%)	Stress @ 100% (psi)
1	100	–	–	240	564	58
2	56	44	–	116	415	61
3	50	25	25	179	748	39

Traditional additives are compatible with VORAMER™ MN 2314, such as moisture scavengers, antioxidants, UV stabilizers, pigments and rheology modifiers. Additionally, monol additives may be used to modify the crosslinking of the final system. Examples of the effects of adding monols are shown in Table 2.

Cured films were prepared by mixing VORAMER MN 2314 with CaCO₃, DINP, and a monol additive. The components were mixed to allow for reaction of the monol with the isocyanate. DMDEE catalyst was then added and mixed, and the mixture was degassed under vacuum. 50 mil thick film samples were then cast and cured as previously described. It should be noted that the effect on the mechanical properties was dependent on the composition of the monol, where monol A, which is a nearly 800 MW PO monol, reduced the sealant modulus, and monol B, which is a nearly 600 MW EO monol, increased the tensile properties overall.

Table 2

Typical properties of VORAMER™ MN 2314 1K system formulated with monol additives to modify modulus.

FORMULATION	Components (parts by weight)				Mechanical Properties (D1708)		
	VORAMER™ MN 2314 (Prepolymer)	Ground CaCO ₃ (Filler)	DINP (Plasticizer)	Monol (A or B)	Tensile Strength (psi)	Elongation (%)	Stress @ 100% (psi)
4	62.5	25	12.5	–	100	358	48
5	54	32	11	A:3	93	412	42
6	52	31	10	A:7	93	479	34
7	56	22	11	B:11	215	622	54

H-Blocks were prepared with a VORAMER MN 2314 formulated system according to ASTM C719. These systems showed excellent adhesion to concrete at 150% extension maintained for 24 hours at 25 °C.

Summary

VORAMER MN 2314 is a versatile partially formulated isocyanate prepolymer that is easily processable and well suited for one-component moisture-cured systems. The low viscosity of the system allows for formulation of sealants having self-leveling to non-sag characteristics. The low NCO% provides a balance of reactivity so the user has time to dispense and tool the product, if necessary, and limits excessive bubbling due to CO₂ evolution. Dow’s VORAMER MN 2314 prepolymer shows excellent adhesion to concrete without the need for adhesion promoters and is well suited for infrastructure and civil engineering applications such as roadway construction.

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