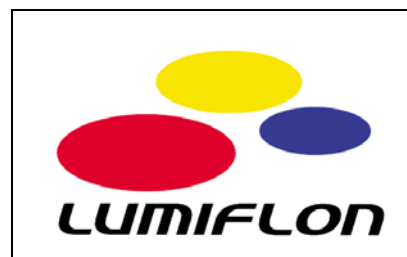


LUMIFLON® Technical Bulletin

FE-4400: Isocyanate Comparison



LUMIFLON fluoropolymer resins were developed in 1982 as the first solvent-soluble fluoropolymers in the world. LUMIFLON polymers consist of alternating fluoroethylene and alkyl vinyl ether segments (FEVE). The fluorinated segments provide outstanding UV stability, weather resistance, and chemical resistance, while the vinyl ether segments provide solvent compatibility and cross-linking sites. LUMIFLON resins are used to make ultra-weatherable coatings for architectural, aerospace, automotive, and industrial maintenance markets.

LUMIFLON FE-4400 is a water emulsion product that was developed to meet VOC and HAPS regulations on some solvents in the U. S. FE-4400 is hydroxyl functional, and can be crosslinked with water-dispersible polyisocyanates. Like other LUMIFLON resins, FE-4400 is used to produce coatings with high gloss and excellent durability.

This bulletin will compare the formulation and physical properties for two component coatings made with two different isocyanates, Bayhydur® 302 and Bayhydur 3100, both manufactured by Bayer.

Product Characteristics

- Moderate OH functionality
- Excellent weathering and chemical resistance
- High minimum film forming temperature
- Suitable for ambient cure and bake coatings
- Used in architectural and coil coatings

Typical Physical Properties LUMIFLON FE-4400

Physical Property	Typical Value
Appearance	Milky white liquid
Solids, wt. %	50%
pH	7-9
Ionic character	Anionic
Particle diameter	0.1-0.2 μm
Specific gravity, 25° C	1.16
Minimum film forming temperature, °C	55° C
Hydroxyl value, mg KOH/g-polymer	49



Bayhydur® Isocyanates

Bayhydur 302 is described as a water dispersible polyisocyanate based on hexamethylene diisocyanate (HDI), with an NCO content of about 17.3%. It is typically dispersed in an aqueous resin just prior to use. Bayhydur 3100 is a hydrophilic aliphatic polyisocyanate based on HDI which can be emulsified in the aqueous phase. Its NCO content is about 17.4%.

Standard formulations for each isocyanate crosslinker are shown below.

Standard Formulations for Two Component Coatings with LUMIFLON FE-4400

Coating Formulation Using Bayhydur 302			Coating Formulation Using Bayhydur 3100		
A. Pigment Paste			A. Pigment Paste		
Component	Trade Name	Parts by Weight	Component	Trade Name	Parts by Weight
Water	-	23.65	Water	-	21.60
Dispersant	Hydropalat 3275 ^a	3.60	Dispersant	BYK 190 ^c	8.40
Defoamer	Dehydran 1620 ^a	0.75	Defoamer	-	-
Pigment	Ti-Pure R-706 ^b	72.00	Pigment	CR-97 ^d	70.00
TOTAL	-	100.00	TOTAL	-	100.00
B. Let Down			B. Let Down		
Component	Trade Name	pbw	Component	Trade Name	pbw
Resin emulsion	LUMIFLON FE-4400	100.0	Resin emulsion	LUMIFLON FE-4400	70.9
Pigment paste	Described above	34.7	Pigment paste	Described above	25.5
Coalescent	Texanol ^e	7.5	Coalescent	Dowanol TpnB ^f	3.6
TOTAL	-	142.2			100.0
C. Coating Formulation			C. Coating Formulation		
Component	Trade Name	pbw	Component	Trade Name	pbw
Main pack	Described above	100.0	Main pack	Described above	100.0
Hardener	Bayhydur 302 ^g	7.5	Hardener	Bayhydur 3100 ^g	7.5
TOTAL	-	107.5			107.5

^a Cognis Corp.

^b DuPont

^c Byk Chemie

^d Ishihara Sangyou Co.

^e Eastman Chemical Co.

^f Dow Chemical Co., Tripropylene glycol mono-n-butyl ether

^g Bayer Corp.



Coating Properties of Fluorourethane

Physical Property	Test Method	Test Results	
		Bayhydur 302	Bayhydur 3100
Coating Thickness	-	30-40 μm	30-40 μm
Gloss	ISO 2813	55/81 (20°/60°)	58/84 (20°/60°)
Pencil Hardness	ASTM D3363	H	4H
Flexibility (Cupping Test)	ISO 1520	>6mm (Cracking)	>8mm (Cracking)
Impact Resistance	ASTM D2794 (Diameter=0.5 in.)	Intrusion: 0.5kg, >0.5m Extrusion: 0.5kg, >0.5m	Intrusion: 0.5kg, 1.0m Extrusion: 0.5kg, 1.0m
Cross-Cut Adhesion	ASTM D3359	5B	5B
Water Resistance (Immersion)	ISO 2812 (40° C, 24 hrs.)		
1. Adhesion	ASTM D3359	5B/5B-4B (Wet/Dry)	5B/5B-4B (Wet/Dry)
2. Blistering	ASTM D714/ISO 4628	<8 Dense/Density: 5, Size: 1	<8 Medium/Density: 3, Size: 1

Cure Cycle: 23° C, 7 days

Substrate: Aluminum panels prepared by acid chromating, 8 mm

Discussion of Test Results

The coating crosslinked with Bayhydur 3100 showed improvement over that cured with Bayhydur 302. The Bayhydur 3100 coating had a slight increase in gloss, a substantial increase in hardness while also improving in flexibility. In addition, the water resistance of the Bayhydur 3100 based coating was better. The results indicate that improvements in water-based LUMIFLON coatings can be achieved by changes in crosslinking agents.

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