Industrial Coatings Resins

HYBRIDUR® 870 Polymer Dispersion

DESCRIPTION

HYBRIDUR 870 Polymer Dispersion is an NMP-free, anionically-stabilized urethane-acrylic hybrid polymer dispersion. HYBRIDUR 870 exhibits rapid dry, excellent wetting, adhesion and barrier properties when used in air dried coatings. Further performance improvements can be obtained employing heat-cure or using additional crosslinkers. HYBRIDUR 870 provides typical polyurethane dispersion performance at improved economics.

HYBRIDUR 870 can be used for both clear and pigmented coating applications for interior and exterior exposure on a variety of substrates such as metal, wood, concrete and plastic. Performance of HYBRIDUR 870 based coatings is comparable to NMP containing grades such as HYBRIDUR 570.

ADVANTAGES

- NMP free and solvent free for maximum formulation latitude
- Excellent balance mechanical and chemical properties for all-round use
- Excellent wetting and adhesion (including plastics)

APPLICATIONS

- Primer and topcoats on variety of substrates (metal, wood, plastics and concrete)
- Airless and conventional spray and roller applied coatings

SHELF LIFE

At least 18 months from the date of manufacture in the original sealed container stored undercover at ambient temperature away from excessive heat and humidity.

STORAGE AND HANDLING

Refer to the Safety Data Sheet for HYBRIDUR 870 Polymer Dispersion.

TYPICAL PROPERTIES

Appearance	Milky White Dispersion
Solids [%]	35-41
Viscosity[2] @ 25°C [mPa.s]	50-150
pH @ 21 °C	7.5-9.0
Acid Number [mgKOH/g] (calculated)	16
Specific Gravity @ 21°C, [g/ml]	1.03
Particle Size	Colloidal
Particle Charge	Anionic
Stabilising Amine	TEA

TYPICAL HANDLING PROPERTIES

MFFT[4] [°C]	25
Solvent [%]	< 0.1
VOC [g/l] (TEA)	11
Typical cure schedule	2- 7 days

TYPICAL PERFORMANCE PROPERTIES[1]

Gloss[2] 60°	75-85
Persoz Hardness[3], 25°C [s]	95
MFFT[4] [°C]	<4
Tensile Strength[5], [MPa]	18.0
Tensile Modulus[5], [GPa]	0.3
Tensile Elongation[5] [%]	250
Direct Impact Resistance[6] [kg.cm]	>185
Reverse Impact Resistance[6] [kg.cm]	>185
Double Rubs[7] [Film Break Through]	
Isopropyl alcohol	50
2-butanone (MEK)	>200

Footnotes:
(1) For details see formulation H870 CT02
(2) ASTM D 523
(3) ASTM D 4366
(4) ASTM D 2354 (55 µm DFT)
(5) ASTM D 638 (150 µm DFT)
(6) ASTM D 2794 (60 µm DFT, S36i steel panels)
(7) ASTM D 4752

FORMULATING HYBRIDUR 870 POLYMER DISPERSIONS

This supplementary information provides general formulation recommendations for Hybridur 870 Polymer Dispersion and starting point formulations for general purpose clear coats, primers and white topcoat. Formulation adjustments might be required for specific application conditions.

FILM FORMATION CO-SOLVENTS

As with any polymer dispersion the right choice of co-solvents is critical to achieve maximum performance properties. Optimum performance with Hybridur 870 Dispersion is achieved with a combination of at least one hydrophilic and one hydrophobic co-solvent. From the range of hydrophobic co-solvents DPnB (dipropylene glycol n-butyl ether), Texanol Ester Alcohol or TPnB (tripropylene glycol n-butyl ether) are recommended. Recommendations for thr hydrophilic co-solvents include Proglyde DMM (dipropylene glycol dimethyl ether) or smaller propylene glycol ethers such as TPM (tripropylene glycol methyl ether) or if desired NMP (N-methylpyrrolidone). A combination of 6% of hydrophilic and 7% hydrophobic co-solvent (based on dispersion weight) is recommended for film formation under ambient conditions. Final coating performance is influenced by the choice of co-solvents. General trends are described below.

- TPnB and Texanol provide good water resistance but result in slower property development
- DPM should be avoided due to poor film formation
- NMP improves water resistance

Generally, best results are achieved when co-solvents and surfactants are pre-blended prior to the addition to the Hybridur 870 Polymer Dispersion.

ADDITIVES FOR DISPERSING, WETTING AND FOAM CONTROL

Hybridur 870 Dispersion is surfactant-free. For wetting and spreading, the addition of Surfynol® 420 or Surfynol 440 provides good appearance in topcoat formulations. Surfynol DF-58, DF-62 or Byk-024 at 0.1% (total formulation weight) have shown to be effective for defoaming in topcoats. Generally, it is beneficial to avoid additives that contain mineral oils or DPM solvent, as these will result in lower gloss.

Hybridur 870 Dispersions accepts pre-dispersed pigments. For high-gloss coatings, a resin-free-grind of TiO2 with Surfynol CT-171 or Disperbyk-190 is recommended.

Viscosity modifiers should be kept to a minimum. However, where they must be employed, associative thickeners such as Acrysol RM-2020NPR in combination with Acrysol RM-8W can be incorporated at a 10:1 ratio or, alternatively, Tafigel PUR-60 can be used. The addition of less than 1% should be sufficient. Full viscosity development may take 12 hours.

UV stabilizer may be added to improve protection of the coating and substrate. Good results have been achieved using a blend of 1.0% Tinuvin 384 and 0.5% Tinuvin 292 dissolved in co-solvent and surfactant, before adding to 100 parts of the Hybridur 870 Dispersion.

PERFORMANCE ENHANCEMENT THROUGH HEAT-CURE AND CROSSLINKING

In general, heating can be employed to enhance performance of Hybridur polymer films. Twenty minutes at 100 to 125°C or 5 minutes at 150 °C and a five to ten minute flash time prior to heating is recommended.

Barrier properties can be further enhanced by use of additional crosslinkers. Crosslinkers that are suitable in combination with Hybridur dispersions are polyaziridines, carbodiimides, epoxies, epoxysilanes and appropriate metal ions.

CLEAN-UP

Processing and application equipment used for Hybridur coatings should be cleaned immediately after use before the coating dries. For best results, rinse and flush thoroughly with water using mechanical agitation such as brushing or wiping if possible. This may be followed by a thorough rinse and flush with acetone or methanol. Hybridur coatings that have dried may require a thorough wipe with a methanolsoaked towel.

TRADEMARKS AND SUPPLIERS

Surfynol® DF-58, DF-62, 420, 440, CT-171	
Surfynol® DF-66, CT-231	
Envirogem® AD01	Evonik
Acrysol® RM-2020NPR, RM-8W	Rohm and Haas
Dowanol® DPNB, TPM; Proglyde® DMM	Dow Chemical
Byk®-024; Disperbyk®-190	Byk-Chemie
Tafigel® PUR 60, PUR 61	Münzing Chemie GmbH
Texanol® Ester Alcohol	Eastman Chemical
Tinuvin® 384, 292	Ciba Specialty Chemicals
Ti-Pure® R-706, R-960	DuPont
Kemira® 650	Kemira Pigments
Talc 10M2	Luzenac
Micro	Sachtleben

STARTING POINT FORMULATION

GLOSSY CLEAR COAT

			HY870MCTO1
Blend		**Weight (%)**	**Volume (%)**
1. Hybridur 870 Dispersion	Evonik	90.10	89.20
2. Proglyde DMM	Dow	5.50	6.20
3. Dowanol DPnB	Dow	2.20	2.40
4. Texanol Ester Alcohol	Eastman Chemical	2.00	2.05
5. Surfynol 420	Evonik	0.10	0.05
6. Surfynol DF-58	Evonik	0.10	0.10
TOTAL		**100.00**	**100.00**
Pre-blend components 2-6 and add slowly while stirring to Hybridur 870(1)			
Calculated technical data			
Weight solids [%]	36	PVC [%]	0
Volume solids [%]	34	VOC [g/l]	108
Density [g/ml]	1.0		

GLOSSY CLEAR COAT, LOW VOC

		HY870CTO2
Blend		**Weight (%)**
1. Hybridur 870 Dispersion	Evonik	95.6
2. Dowanol TPnB	Dow Chemical	2.4
3. EnviroGem AD01	Evonik	1.9
4. Surfynol DF-58	Evonik	0.1
TOTAL		**100.00**
Pre-blend components 2-4 and add slowly while stirring to Hybridur 870		
Calculated technical data		
Weight solids [%]	41	
Volume solids [%]	38	
Density [g/ml]	1.0	
PVC [%]	0	
VOC [g/l]	36	
Coating performance data		
Gloss 60°	80	
Persoz Hardness [s]	101	
MFFT [°C]	<4	
Impact resistance [cm/kg] Direct and Reverse	>185	
Tensile Strength [MPa]	10.8	
Tensile Modulus [GPa]	0.3	
Tensile Elongation [%]	245	
Double Rubs IPA	75	

GLOSSY CLEAR COAT, LOW VOC

		HY870CTO3
Blend		**Weight (%)**
1. Hybridur 870 Dispersion	Evonik	95.6
2. Dowanol DPnB	Dow Chemical	2.4
3. EnviroGem AD01	Evonik	1.9
4. Surfynol DF-58	Evonik	0.1
TOTAL		**100.00**
Pre-blend components 2-4 and add slowly while stirring to Hybridur 870		
Calculated technical data		
Weight solids [%]	41	
Volume solids [%]	38	
Density [g/ml]	1.0	
PVC [%]	0	
VOC [g/l]	36	
Coating performance data		
Viscosity at 23°C [mPa.s]	150	
Gloss 60°	90	

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WHITE GLOSS TOPCOAT

			HY870MWTO1
Grind		**Weight (%)**	**Volume (%)**
1. D.I. water		2.20	2.60
2. Disperbyk 190	Byk Chemie	2.60	2.95
3. Surfynol DF-58	Evonik	0.05	0.05
4. Ti-Pure R706	DuPont	21.40	6.40
5. D.I. water	Evonik	1.90	2.30
Letdown			
6. Hybridur 870	Evonik	64.75	76.50
7. Proglyde DMM	Dow	4.00	5.30
8. Dowanol DPnB	Dow	1.60	2.00
9. Texanol Ester Alcohol	Eastman Chemical	1.40	1.80
10. Surfynol DF-58	Evonik	0.05	0.05
11. Surfynol 420	Evonik	0.05	0.05
TOTAL		**100.00**	**100.00**

- After grinding components 1-4, add water (5)
- Slowly add mixture of components 1-5 to Hybridur 870 (6) while stirring
- Pre-blend components 7-11 and add slowly while stirring

Calculated technical data			
Weight solids [%]	48	PVC [%]	17
Volume solids [%]	37	VOC [g/l]	93
Density [g/ml]	1.2		

Coating performance data:	
Gloss 60°	84
Persoz hardness [s]	78
Reverse impact resistance [cm/kg]	>185
Dry tape adhesion (ASTM D 3359)	4A
Dry scrape [kg] (ASTM D 2179A)	>10.5
Double rubs IPA	50
Double rubs MEK	>200

WHITE TOPCOAT

			HY870MWTO2
Grind		**Weight (%)**	**Volume (%)**
1. D.I. water		4.50	5.48
2. Surfynol DF-66	Evonik	0.15	0.18
3. Surfynol CT-231	Evonik	1.55	1.84
4. Kemira 650	Kemira Pigments	14.00	4.26
5. Talc 10M2	Luzenac	5.25	2.24
6. Sachtleben micro	Sachtleben	3.50	0.97
7. Tafigel PUR-61	Münzing Chemie	0.20	0.23
8. D.I. water		5.00	6.09
Letdown			
9. Hybridur 870	Evonik	60.75	71.85
10. Dowanol DPnB	Dow	4.50	6.09
11. Surfynol DF-66	Evonik	0.10	0.12
12. Surfynol 420	Evonik	0.50	0.65
TOTAL		**100.00**	**100.00**

- After grinding components 1-7, add water (8)
- Slowly add mixture of components 1-8 to Hybridur 870 (9) while stirring
- Pre-blend components 10-12 and add slowly while stirring

Calculated technical data			
Weight solids [%]	49	PVC [%]	19
Volume solids [%]	39	VOC [g/l]	65
Density [g/ml]	1.2		

Coating performance data:	
Viscosity at 23°C [mPa.s]	600
Gloss 60°	40

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