



Dow Industrial Solutions

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## Dow Solvents and Additives for Coatings

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Dow Chemical is one of the world’s leading suppliers of coating additives, wetting agents, stabilizers, coalescents, solvents, neutralizers and intermediates. This brochure provides an overview of the products for the coatings industry from Dow Industrial Solutions. We invite you to review the product features, physical and performance properties, and detail application information in the following pages.

Dow Chemical promotes innovation in the coatings market, focusing on customers and aiming to solve the key problems in their formulations. Dow looks forward to working closely with you to provide innovative solutions and fully meet your application needs.

With Dow solutions, you also receive...

- A wide range of available chemistries
- Extensive applications expertise
- The knowledge and resources to innovate
- Active participation in and awareness of current regulations and legislation
- A global sales, distribution and technical support network
- Global supply from world-class manufacturing facilities
- The strength and stability of Dow for confidence and peace of mind

Recommendation of Dow Industrial Solutions products

Wetting agents	ECOSURF™, TERGITOL™, TRITON™ Including fatty alcohol polyethers, alkylphenol polyethers, and others
Stabilizers	TERGITOL™, TRITON™ Including fatty alcohol polyethers, EO/PO block polyethers, natural plant oil polyethers, alkylphenol polyethers, and others
Coalescents	DOWANOL™, DALPAD™, CARBITOL™, CELLOSOLVE™ Including glycol esters, glycol ethers, glycol ether esters
Solvents	Ester, Alcohol, Ketone, UCAR™ Including esters, alcohols, ketones, glycol ethers, glycol ether esters
Neutralizers	Alkanolamines
ntermediates	Ethyleneamines, Polyglycols

Industrial Coatings

Industrial coatings include container coatings, automotive coatings, coil coatings and can coatings which are applied on metal substrates, and also coatings for electronic consumer products and home appliances which are applied on plastic substrates, as well as roof coatings and floor coatings which are applied on buildings.

Dow offers products for various types of industrial coatings. For water based coatings, Dow provides coalescents for good film formation, co-solvents for formulation stability, and surfactants for substrate and pigment wetting. For solvent based coatings, Dow provides specialty and commodity solvents with various benefits such as good solvency for high solids formulations, low VOC, and the ability to impart good decorative effect to the final films.



Solvents for Solvent Based Industrial Coatings

Dow provides various glycol ether solvents for solvent based coating formulations with the following benefits:

- Provide resin solubility, fit for different types of resins
- Wide evaporation rate range for drying speed adjustment, options for both bake drying and normal drying
- High dilution ratio
- Low toxicity





Solvent	Chemical name	Boiling point (°C)	Evaporation rate (n-BuAc=1)	Flash point (°C, closed cup)	Features and applications
DOWANOL™ PM Glycol Ether	Propylene glycol mono methyl ether	120	0.62	31	<ul style="list-style-type: none"><li>• Good solubility with many resins</li><li>• Middle to slow evaporation rate</li><li>• Water miscible</li></ul>
DOWANOL™ PMA Glycol Ether	Propylene glycol mono methyl ether acetate	146	0.33	42	<ul style="list-style-type: none"><li>• Good resin solubility</li><li>• Middle to slow evaporation rate</li><li>• Aprotic solvent, compatible with 2K PU system</li></ul>
DOWANOL™ DPM Glycol Ether	Dipropylene glycol mono methyl ether	190	0.035	75	<ul style="list-style-type: none"><li>• Good solubility with many resins</li><li>• Slow evaporation rate, fit for baking process</li><li>• Water miscibility</li></ul>
DOWANOL™ PnP Glycol Ether	Propylene glycol mono n-propyl ether	149	0.21	48	<ul style="list-style-type: none"><li>• Good solubility with many resins</li><li>• Middle to slow evaporation rate</li></ul>
DOWANOL™ PnB Glycol Ether	Propylene glycol mono n-butyl ether	171	0.093	63	<ul style="list-style-type: none"><li>• Good solubility with many resins</li><li>• Slow evaporation rate</li></ul>
Butyl CELLOSOLVE™ Solvent	Ethylene glycol mono n-butyl ether	171	00.079	65	<ul style="list-style-type: none"><li>• Good solubility with many resins</li><li>• Slow evaporation rate</li><li>• Good anti-blushing</li></ul>
Butyl CARBITOL™ Solvent	Diethylene glycol mono n-butyl ether	230	0.004	99	<ul style="list-style-type: none"><li>• Good solubility with many resins</li><li>• Very slow evaporation rate</li><li>• Good anti-blushing</li></ul>
Butyl CELLOSOLVE™ Acetate	Ethylene glycol mono n-butyl ether acetate	192	0.04	74	<ul style="list-style-type: none"><li>• Good resin solubility</li><li>• Slow evaporation rate</li><li>• Aprotic solvent</li></ul>
Butyl CARBITOL™ Acetate	Diethylene glycol mono n-butyl ether acetate	245	<0.01	105	<ul style="list-style-type: none"><li>• Good resin solubility</li><li>• Very slow evaporation rate</li><li>• High viscosity</li><li>• Aprotic solvent</li></ul>
DOWANOL™ PGDA	Propylene glycol diacetate	191	0.036	86	<ul style="list-style-type: none"><li>• Slow drying, high solvency</li><li>• Aprotic solvent, compatible with 2K PU system</li><li>• High film gloss</li><li>• Widely used in automotive top coating and refinish coating</li></ul>
UCAR™ n-Propyl Propionate	n-Propyl Propionate	122	1.2	24	<ul style="list-style-type: none"><li>• Propionates with different evaporation rate</li><li>• High solvency</li><li>• Aprotic solvent, compatible with 2K PU system</li><li>• Low toxic replacement for aromatic solvents</li><li>• High odor threshold, lower sensitivity</li><li>• Widely used in automotive coatings, can coatings and marine coatings</li></ul>
UCAR™ n-Butyl Propionate	n-Butyl Propionate	145	0.45	38	
UCAR™ n-Pentyl Propionate	n-Pentyl Propionate	165	0.2	74	
UCAR™ Ester EEP	3-ethoxypropionic acid ethyl ester	170	0.1	59	<ul style="list-style-type: none"><li>• Slow drying, high solvency</li><li>• Easy evaporation</li><li>• Good leveling for high gloss</li><li>• Aprotic solvent, compatible with 2K PU system</li><li>• Widely used in automotive top coating and plastic coating</li></ul>
Diisobutyl Ketone (DIBK)	Diisobutyl Ketone	169	0.15	49	<ul style="list-style-type: none"><li>• Slow drying, high solvency</li><li>• Proper “attack” to plastic substrates</li><li>• Aprotic solvent, compatible with 2K PU system</li><li>• Widely used in automotive top coating and plastic coating</li></ul>

## Coalescents, Co-solvents and Diluents for Water Based Industrial Coatings

Coalescents and co-solvents are very important components in water based industrial coatings. Coalescents can decrease the minimum film forming temperature of emulsions. They can soften and swell the polymer particles in emulsions and ensure the particles can deform and bond with each other at the application temperature, and eventually gather to form a uniform coating film. In addition, in water based industrial coatings, the use of appropriate coalescents and co-solvents can improve the performance of the coating film, including film appearance, drying time, flexibility, salt fog resistance, etc. Dow provides coalescents and co-solvents with different characteristics to meet different application requirements.

Coalescent	Chemical name	Boiling point (°C)	Evaporation rate (n-BuAc=1)	Solubility@25°C (wt%, In Water)	Features and applications
DOWANOL™ PnP Glycol Ether	Propylene Glycol n-Propyl Ether	149	0.21	∞	<ul style="list-style-type: none"><li>• Fast evaporation</li><li>• Water miscible</li><li>• Replacement of Butyl CELLOSOLVE™ Solvent</li></ul>
DOWANOL™ PnB Glycol Ether	Propylene Glycol n-Butyl Ether	171	0.093	5.5	<ul style="list-style-type: none"><li>• fast-middle evaporation</li><li>• Good coalescing efficiency</li><li>• Replacement of Butyl CELLOSOLVE™ Solvent</li><li>• Widely used in water based steel coatings, freight container coatings and automotive coatings.</li></ul>
DOWANOL™ DPnB Glycol Ether	Dipropylene Glycol n-Butyl Ether	230	0.006	4.5	<ul style="list-style-type: none"><li>• middle-slow evaporation</li><li>• Good coalescing efficiency</li><li>• Widely used in water based steel coatings, freight container coatings and automotive coatings</li></ul>
DOWANOL™ PPh Glycol Ether	Propylene Glycol Phenyl Ether	243	0.002	1	<ul style="list-style-type: none"><li>• Slow evaporation</li><li>• Increase gloss and improve leveling of coating film</li><li>• Widely used in water based freight container coatings and CED coatings</li></ul>
Hexyl CELLOSOLVE™ Solvent	Ethylene Glycol Hexyl Ether	208	<0.01	0.88	<ul style="list-style-type: none"><li>• High coalescing efficiency for high Tg resins</li><li>• Low VOC contribution with less dosage</li><li>• Widely used in CED coatings</li></ul>
Hexyl CARBITOL™ Solvent	Diethylene Glycol Hexyl Ether	259	<0.01	2	<ul style="list-style-type: none"><li>• High coalescing efficiency for high Tg resins</li><li>• Can be used in water based coatings for floor of freight containers</li></ul>
UCAR™ Filmer IBT	2,2,4-trimethyl-1, 3-pentanediol monoisobutyrate	255	<0.01	0.1	<ul style="list-style-type: none"><li>• Typical coalescent for acrylic coating</li><li>• Widely accepted performance</li></ul>

These properties are typical of the product, but should not be confused with, or regarded as, sales specifications.



Co-solvent	Chemical name	Boiling point (°C)	Evaporation rate (n-BuAc=1)	Solubility@25°C (wt%, In Water)	Features and applications
DOWANOL™ PM Glycol Ether	Propylene Glycol Methyl Ether	120	0.62	∞	<ul style="list-style-type: none"><li>• Fast evaporation</li><li>• Decrease coating viscosity</li><li>• Widely accepted performance</li></ul>
Butyl CELLOSOLVE™ Solvent	Ethylene Glycol n-Butyl Ether	171	0.079	∞	<ul style="list-style-type: none"><li>• fast-middle evaporation</li><li>• Decrease coating viscosity</li><li>• Widely accepted performance</li></ul>

These properties are typical of the product, but should not be confused with, or regarded as, sales specifications.

Hardener diluent	Chemical name	Boiling point (°C)	Evaporation rate (n-BuAc=1)	Solubility@25°C (wt%, In Water)	Features and applications
DOWANOL™ PMA Glycol Ether	Propylene Glycol Methyl Ether Acetate	146	0.33	16.0	<ul style="list-style-type: none"><li>• Widely used diluent for the isocyanate hardener of solvent based 2K PU coatings. Can be used in water based system.</li><li>• Strong solubility</li></ul>
DOWANOL™ PGDA Glycol Ether	Propylene Glycol Diacetate	191	0.036	7.4	<ul style="list-style-type: none"><li>• Widely used diluent for the isocyanate hardener of water based 2K PU coatings</li><li>• Low odor and non-flammable</li><li>• Strong solubility</li><li>• Strictly controlled water content ensure the stability of hardener part.</li></ul>
PROGLYDE™ DMM Glycol Diether	Dipropylene Glycol Dimethyl Ether	175	0.013	35	<ul style="list-style-type: none"><li>• DMM can speed up the hardness development, and improve the transparency and gloss of film.</li><li>• PGDA can prolong the pot life</li><li>• PGDA has higher cost performance.</li></ul>

These properties are typical of the product, but should not be confused with, or regarded as, sales specifications.



## Surfactants for Water Based Industrial Coatings

Dow surfactants include ionic and non-ionic surfactants, which are widely used in water based industrial coatings to wet the pigments and substrate, and improve the stability of formulations.

If you need...	We recommend...	Because...
Pigment wetting agent (APEO)	TRITON™ X-100	<ul style="list-style-type: none"><li>• Excellent wetting ability</li><li>• Typical pigment wetting agent</li></ul>
Pigment wetting agent (non APEO)	TERGITOL™ 15-S-7, 15-S-9	<ul style="list-style-type: none"><li>• Excellent wetting ability</li><li>• Readily biodegradable</li></ul>
Low foam pigment wetting agent (APEO)	TRITON™ CF-10 (90%)	<ul style="list-style-type: none"><li>• Excellent wetting ability</li><li>• Low foam</li><li>• Improve Freeze/Thaw stability</li><li>• Improve color development</li></ul>
	TERGITOL™ CA-60, CA-90, CA-90 (90%)	<ul style="list-style-type: none"><li>• Superior wetting ability</li><li>• Quick foam collapse</li><li>• Readily biodegradable and low aquatic toxicity</li></ul>
	ECOSURF™ EH-6, EH-9, EH-9 (90%)	<ul style="list-style-type: none"><li>• Excellent wetting ability</li><li>• Quick foam collapse and low odor</li><li>• Readily biodegradable and low aquatic toxicity</li></ul>
	ECOSURF™ LF-30, LF-45	<ul style="list-style-type: none"><li>• Special structure with patent protection</li><li>• 100% active and easy handling</li><li>• Low foam</li><li>• Excellent wetting ability</li><li>• Improve color development</li></ul>
	TRITON™ DF-16	<ul style="list-style-type: none"><li>• Low foam</li><li>• Excellent wetting ability</li><li>• Improve Freeze/Thaw stability</li><li>• Readily biodegradable</li></ul>
Stabilizer (APEO)	TRITON™ X-405 (70%)	<ul style="list-style-type: none"><li>• Improve storage stability</li><li>• Improve color development</li></ul>
Stabilizer (non-APEO)	TERGITOL™ 15-S-40 (70%)	<ul style="list-style-type: none"><li>• Improve storage stability</li><li>• Readily biodegradable</li></ul>
	ECOSURF™ EH-40 (75%)	<ul style="list-style-type: none"><li>• Improve storage stability</li><li>• Improve color development</li><li>• Readily biodegradable and low aquatic toxicity</li></ul>
	TERGITOL™ ECO-20, ECO-36, ECO-40	<ul style="list-style-type: none"><li>• Improve storage stability</li><li>• Readily biodegradable</li></ul>
Stabilizer (EO/PO block polyether)	TERGITOL™ XD, XJ, XH	<ul style="list-style-type: none"><li>• EO/PO block polyether</li><li>• 100% active</li><li>• Effective pigment stabilizer</li><li>• Co-dispersant</li></ul>
Substrate wetting agent (ionic)	TRITON™ GR-5M (60%)	<ul style="list-style-type: none"><li>• Low static and dynamic surface tension</li><li>• Substrate wetting</li></ul>
Substrate wetting agent (non-ionic)	TERGITOL™ TMN-3, TMN-6 (90%), TMN-100X (90%) TRITON™ HW-1000	<ul style="list-style-type: none"><li>• Specialty alkoxylates</li><li>• Low static and dynamic surface tension</li><li>• Substrate wetting</li></ul>

These properties are typical of the product, but should not be confused with, or regarded as, sales specifications.



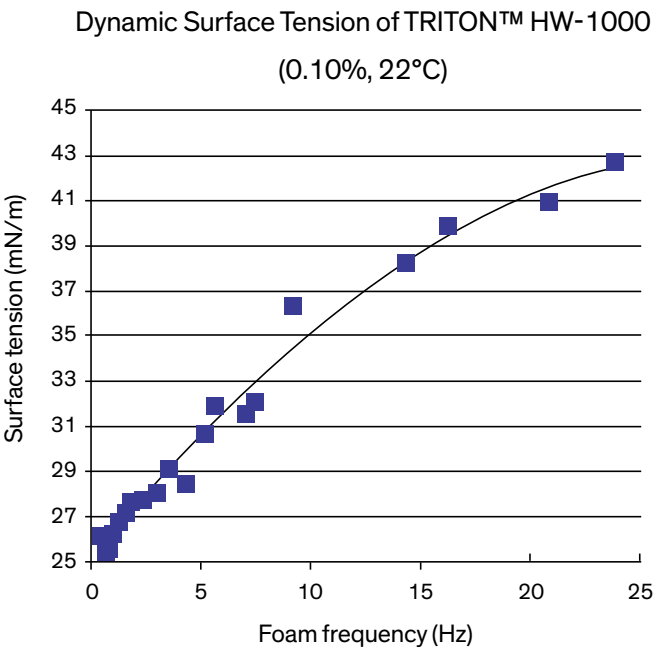
RECOMMENDATION: TRITON™ HW-1000 Surfactant

TRITON™ HW-1000 Surfactant is a non-APEO based and non-silicone-based surfactant. It meets the growing need for water based formulations in multiple industries and for faster processing requirement. TRITON™ HW-1000 features superior wetting and leveling performance along with low foaming property. It effectively reduces the surface tension of water based coatings under both static and dynamic status. The coatings with TRITON™ HW-1000 therefore are capable to wet various substrates more successfully, reducing mirror effect and improving the gloss and smoothness of coating films. Better coating flow ability and rapid pigment dispersion capability has also been found in customer-driven tests.

Typical Physical Properties of TRITON™ HW-1000

Actives % / Solvent	100
Cloud Point <sup>1</sup>	Not applicable due to partial solubility in water
HLB <sup>2</sup>	Approximately 10
Surface Tension <sup>3</sup>	25.8
Foam Height <sup>4</sup>	15 / 5
Pour Point	-57°C
Form <sup>5</sup>	Liquid
pH, (6H2O+10IPA)	5.0-8.0
Viscosity at 40°C (104°F), cP	18
Specific Gravity (H2O = 1)	0.96 @20 °C Calculated.
Flast Pt, Closed Cup, ASTM D93	163 °C (325°F)

Note: Date in this table represent typical properties and not to be construed with specifications. <sup>1</sup> Cloud point: °C, 1% Aqueous, <sup>2</sup> HLB Range: <10 w/o emulsifier, >10 o/w emulsifier, <sup>3</sup> Surface tension: dynes/cm at 0.1% actives, 25°C, <sup>4</sup> Ross-Miles foam height: mm at 0.1 wt% actives 25°C, initial / 5 minutes, <sup>5</sup> Form at 25°C



Wood Coatings

Wood coatings are applied onto wood made furniture, doors and windows, toys, decorative parts, etc., both indoor and outdoor. There are solvent based and water based wood coatings available based on different technologies. Due to more strict VOC regulations and environmental pressure, moving to water based product is one of the key trends for wood coatings.

For wood coatings applications, Dow mainly offers:

- Solvent for solvent based wood coating
- Coalescent for water based wood coatings
- Diluent of isocyanate hardener for water based 2K PU wood coating

Solvents for Solvent Based Wood Coatings

Solvent-based wood coatings are well developed based on different resins including nitrocellulose, alkyds, acrylics, and polyurethane.

Dow offers various glycol ethers and acetates for solvent based wood coatings.

- DOWANOL™ PM, DPM, PMA, DPMA, PnB
- Butyl CELLOSOLVE™ Solvent, Butyl CARBITOL™ Solvent, Butyl CELLOSOLVE™ Acetate, Butyl CARBITOL™ Acetate

Benefits from these solvents are:

- Good solubility with various resins, high dilution ratio
- Slow evaporation rate helps control blushing
- Aprotic solvents available that are compatible with 2K-PU systems
- Low toxicity and biodegradable

Solvent	Chemical name	Boiling point (°C)	Evaporation rate (n-BuAc=1)	Flash point (°C, closed cup)
DOWANOL™ PM Glycol Ether	Propylene glycol mono methyl ether	120	0.62	31
DOWANOL™ DPM Glycol Ether	Dipropylene glycol mono methyl ether	190	0.035	75
DOWANOL™ PMA Glycol Ether	Propylene glycol mono methyl ether acetate	146	0.33	42
DOWANOL™ DPMA Glycol Ether	Dipropylene glycol mono methyl ether acetate	209	0.015	86
DOWANOL™ PnB Glycol Ether	Propylene glycol mono n-butyl ether	171	0.093	63
Butyl CELLOSOLVE™ Solvent	Ethylene glycol mono n-butyl ether	171	0.079	65
Butyl CARBITOL™ Solvent	Diethylene glycol mono n-butyl ether	230	0.004	99
Butyl CELLOSOLVE™ Acetate	Ethylene glycol mono n-butyl ether acetate	192	0.04	74
Butyl CARBITOL™ Acetate	Diethylene glycol mono n-butyl ether acetate	245	<0.01	105

These properties are typical of the product, but should not be confused with, or regarded as, sales specifications.



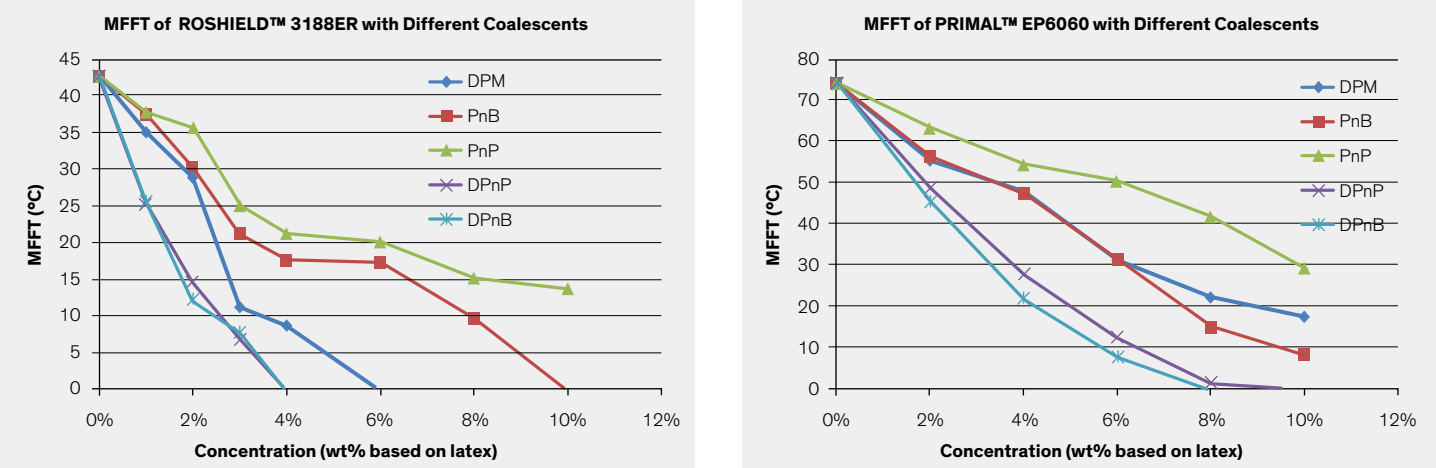
### Coalescents for Water Based Wood Coatings

DOWANOL™ DPM Glycol Ether + DOWANOL™ DPnB Glycol Ether is a typical combination for water based acrylic wood coatings with excellent performance, such as stability, sanding property, hardness development and block resistance. In addition, Dow offers various glycol ethers for more options.

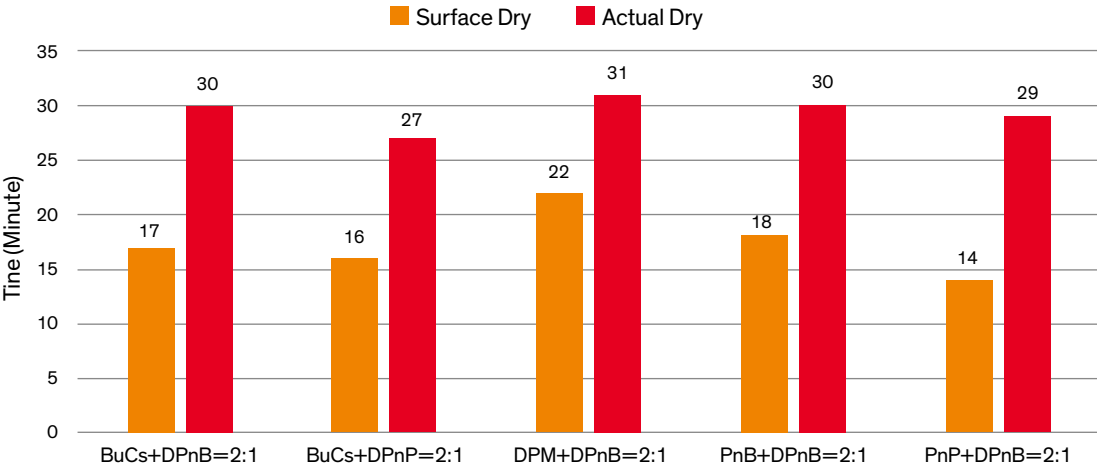
Coalescent	Chemical name	Boiling point (°C)	Evaporation rate (n-BuAc= 1)	Solubility@25°C (wt%, In Water)
DOWANOL™ PnP Glycol Ether	Propylene Glycol n-Propyl Ether	149	0.21	∞
DOWANOL™ PnB Glycol Ether	Propylene Glycol n-Butyl Ether	171	0.093	5.5
Butyl CELLOSOLVE™ Solvent	Ethylene Glycol n-Butyl Ether	171	0.079	∞
DOWANOL™ DPM Glycol Ether	Dipropylene Glycol Methyl Ether	190	0.035	∞
DOWANOL™ DPnP Glycol Ether	Dipropylene Glycol n-Propyl Ether	213	0.014	19.6
DOWANOL™ DPnB Glycol Ether	Dipropylene Glycol n-Butyl Ether	230	0.006	4.5
DOWANOL™ TPnB Glycol Ether	Tripropylene Glycol n-Butyl Ether	274	0.0004	4.5

These properties are typical of the product, but should not be confused with, or regarded as, sales specifications.

### MFFT Reduction with Different Coalescents



### Dry time of coating films with different Coalescents



\* BuCs: Butyl CELLOSOLVE™ Solvent

### Diluent of isocyanate hardener for water based 2K PU wood coatings

Dow offers the following solvents as diluents for isocyanate hardener for water based 2K PU wood coatings. Same note for table below

Hardener diluent	Chemical name	Boiling point (°C)	Evaporation rate (n-BuAc= 1)	Solubility@25°C (wt%, In Water)	Features and applications
DOWANOL™ PMA Glycol Ether	Propylene Glycol Methyl Ether Acetate	146	0.33	16.0	<ul style="list-style-type: none"><li>Widely used diluent for the isocyanate hardener of solvent based 2K PU coating. Can be used in water based system.</li><li>Strong solubility</li></ul>
DOWANOL™ PGDA Glycol Ether	Propylene Glycol Diacetate	191	0.036	7.4	<ul style="list-style-type: none"><li>Widely used diluent for the isocyanate hardener of water based 2K PU coating</li><li>Low odor and non-flammable</li><li>Strong solubility</li><li>Strictly controlled water content ensure the stability of hardener part.</li></ul>
PROGLYDE™ DMM Glycol Ether	Dipropylene Glycol Dimethyl Ether	175	0.013	35	<ul style="list-style-type: none"><li>DMM can speed up the hardness development, and improve the transparent and gloss of film.</li><li>PGDA can prolong the pot life</li><li>PGDA has higher cost performance.</li></ul>

These properties are typical of the product, but should not be confused with, or regarded as, sales specifications.

### Dilution capability comparison of different diluents for a typical isocyanate hardener (HDI)

Hardener: diluent = 3: 2 (weight)

	DOWANOL™ PMA	PROGLYDE™ DMM	DOWANOL™ PGDA
viscosity* (viscosity cup-4#)	17"	17"	26"

These properties are typical of the product, but should not be confused with, or regarded as, sales specifications.

\* Lower viscosity, higher dilution capability.



# Architectural Coatings

Architectural coatings include interior and exterior wall coatings, and are widely used for building decoration and protection. Dow offers the following additives for architectural coating formulations.

In architectural coatings, Dow mainly offers:

- Coalescents for film formation and to achieve better coating film performances.
- Surfactants for pigment wetting and effective dispersion, color acceptance and formulation stability improvement.

## Coalescents

All emulsions used in architectural coatings have a minimum film forming temperature (MFFT). Usually a coalescent is needed to reduce the MFFT by softening or swelling the polymer particles in the emulsions, making them easier to deform and adhere to each other when aggregated, and ensuring a uniform film formation under the application temperature. The use of a proper coalescent can improve film performances such as water resistance, scrub resistance, gloss, and hardness development. Dow offers coalescents with different features to meet specific customers' requirements and recent VOC regulations.

Coalescent	Physical Properties	Features
UCART™ Filmer IBT	Boiling point: 255°C Water solubility*: 0.1wt%	<ul style="list-style-type: none"><li>• Widely accepted performance</li><li>• Compatible with most formulations</li></ul>
DAPLAD™ C	Boiling point: 274°C Water solubility: 4.5wt%	<ul style="list-style-type: none"><li>• Low odor</li><li>• High film forming efficiency</li><li>• Improve anti-cracking under low temperature drying</li><li>• Fast film hardness development</li></ul>
DALPAD™ H	Boiling point: 259°C Water solubility: 2.0wt%	<ul style="list-style-type: none"><li>• Low odor</li><li>• High film forming efficiency</li><li>• Increase scrub resistance</li><li>• Fast film hardness development</li></ul>
DALPAD™ 292	Boiling point: 292°C Water solubility: <1.0wt%	<ul style="list-style-type: none"><li>• For low odor/low VOC emission coating in Asia Pacific</li><li>• Very high film forming efficiency</li><li>• Significantly improve scrub resistance</li><li>• Increase film hardness</li></ul>

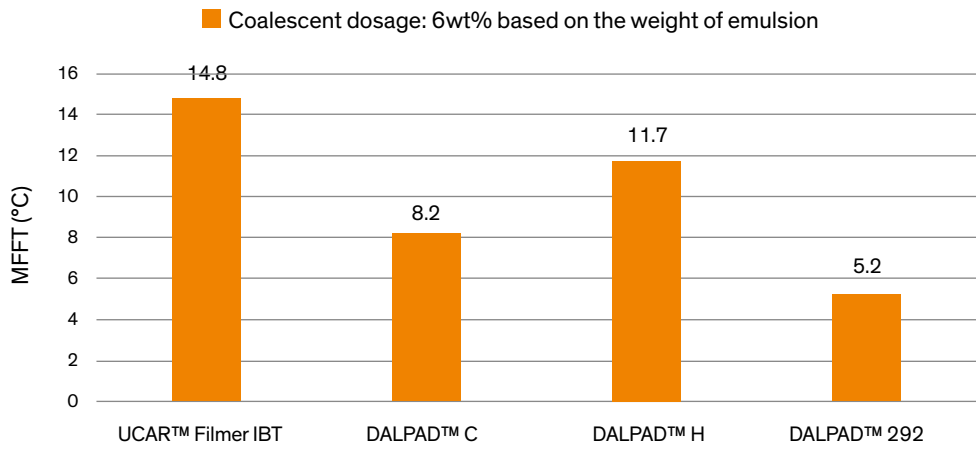
These properties are typical of the product, but should not be confused with, or regarded as, sales specifications.

\*water solubility @25°C, wt%, in water

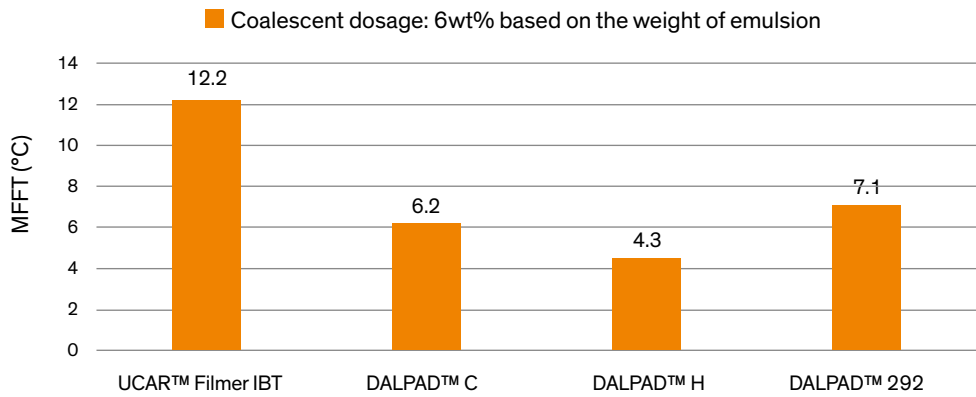


## MFFT Reduction with Different Coalescents

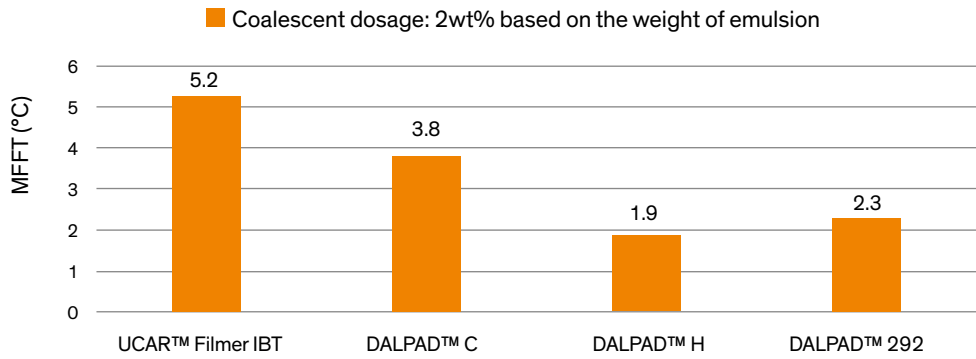
PRIMAL™ AS-380 (Styrene-acrylic emulsion, MFFT~58°C)



DIRTSHIELD™ K2 (Pure-acrylic emulsion, MFFT~55°C)



ROVACE™ 662 (Vinyl acetate-acrylic emulsion, MFFT~10°C)





RECOMMENDATION: DALPAD™ 292

DALPAD™ 292 is a new Dow coalescent for water based coatings. It is a glycol ether ester, with very low odor and high boiling point. It can help coating formulators to develop high-end, environment friendly, low odor and low VOC emission coatings with high film performance. DALPAD™ 292 can be used as a high performance coalescent in water based architectural coatings, wood coatings and industrial coatings, and as a general solvent in coating formulation development.

The odor of DALPAD™ 292 is very low and mild. Its boiling point is 292°C and it does not contribute to VOC\*. It provides an excellent solution for the development of high-end environment friendly coatings with lower odor and VOC emission.

\* The VOC standards include but not limited to JG/T481-2015(China), AgBB-2012(German), ISO 16000-6:2004(EU).

Basic physical properties of DALPAD™ 292

Physical Properties	Value
Appearance	Clear liquid
Boiling point, 760mmHg	292°C
Flash point (closed cup)	146.2°C
Freeze point	< -80°C
Vapor pressure, 20°C	0.00029mmHg
Evaporation Rate (n-Butyl Acetate=1)	0.000146

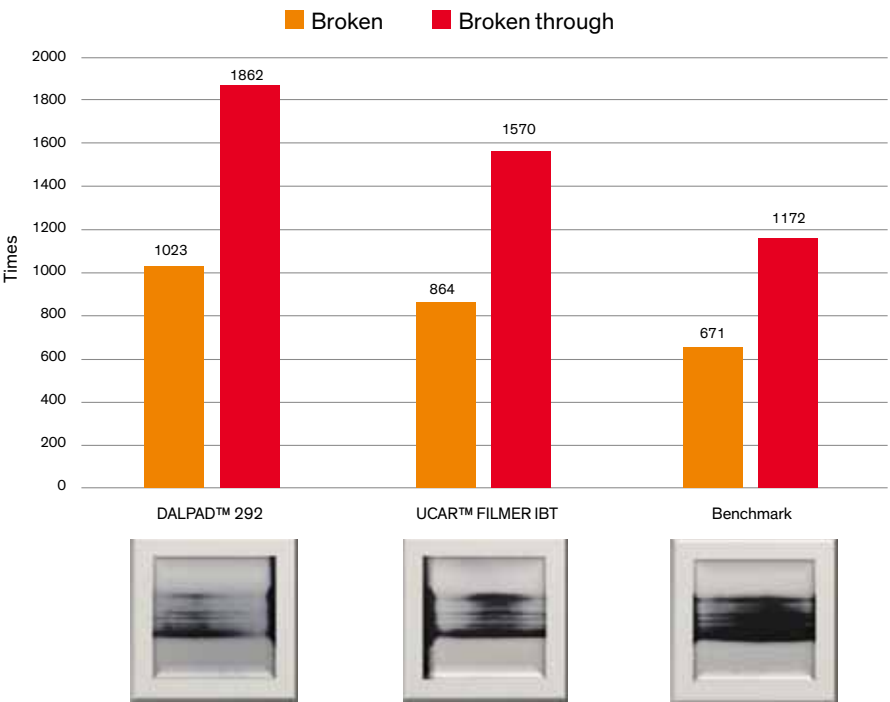
These properties are typical of the product, but should not be confused with, or regarded as, sales specifications.

Performance Summary of DALPAD™ 292

- Low and mild odor
- No contribution to VOC emission in coating formulation
- High efficiency to reduce MFFT
- Excellent scrub resistance and significant hardness improvement of coating film
- Helps to enhance coating gloss
- No influence on opacity, heat storage stability and freeze-thaw stability

DALPAD™ 292 can improve the scrub resistance of the coating film. (Coalescent dosage is based on the dosage which can decrease the MFFT of the emulsion to 5°C, and the standard scrub media was used in the test.)

Scrub resistance of the architectural coating with different coalescents  
(40%PVC interial wall coating)



Surfactants

Wetting agents

In a typical architectural coating formulation, various pigments and fillers are used for different purposes. Effective dispersion of pigments, dyes, and fillers are a key factor to ensure good and stable coating quality, uniform color development, and excellent film appearance and performances. A good wetting agent can provide fast wetting of pigment surfaces and bring water and dispersant into the space between aggregated particles, thus improving dispersion efficiency, and maintaining the formulation stability. Wetting agents also play a key role in color development and formulation stability when tinting with different colorant dispersions.

Dow offers the following surfactants as common wetting agents for architectural coatings:

Wetting agent	Type	Features	Physical properties						
			Active%	Appearance <sup>(1)</sup>	HLB	CMC <sup>(2)</sup> / surface tension <sup>(3)</sup>	Foam height <sup>(4)</sup>	Cloud point <sup>(5)</sup>	Pour point <sup>(6)</sup>
TRITON™ X-100	APEO	• Excellent wetting ability • Typical pigment wetting agent	100	Liquid	13.4	189/33	128/107	66	1
TERGITOL™ 15-S-7	Non-APEO	• Excellent wetting ability • Readily biodegradable	100	Liquid	12.1	38/30	117/28	37	1
TERGITOL™ 15-S-9	Non-APEO		100	Liquid	13.3	52/30	124/43	60	9

These properties are typical of the product, but should not be confused with, or regarded as, sales specifications.

- (1) Appearance at 25°C;
- (2) Critical micelle concentration: ppm at 25°C;
- (3) Surface tension: dynes/cm at 1% actives, 25°C
- (4) Ross-Miles foam height: mm at 0.1 wt% actives, 25°C, initial / 5 minutes;
- (5) Cloud point: °C, 1 wt% actives;
- (6) pour point: °C







Dow offers the following surfactants as low foam wetting agents for architectural coatings:

Wetting agent	Type	Features	Physical properties						
			Active%	Appearance <sup>(1)</sup>	HLB	CMC <sup>(2)</sup> /surface tension <sup>(3)</sup>	Foam height <sup>(4)</sup>	Cloud point <sup>(5)</sup>	Pour point <sup>(6)</sup>
TRITON™ CF-10 (90%)	APEO	<ul style="list-style-type: none"><li>• Low foam</li><li>• Excellent wetting ability</li><li>• Improve freeze thaw stability</li><li>• Improve color development</li></ul>	90	liquid	12.6	75/36	60/10	28	-1
TRITON™ DF-16	Non-APEO	<ul style="list-style-type: none"><li>• Low foam</li><li>• Excellent wetting ability</li><li>• Improve freeze thaw stability</li><li>• Readily biodegradable</li></ul>	100	liquid	11.6	530/30	65/10	36	-6
TERGITOL™ CA-60	Non-APEO	<ul style="list-style-type: none"><li>• Super wetting ability</li><li>• Quick foam collapse</li><li>• Readily biodegradable and low aquatic toxicity</li></ul>	100	liquid	11-12	-/29.5	35/5	40	5
TERGITOL™ CA-90			100	liquid	13-14	-/30.5	65/5	61	16
TERGITOL™ CA-90 (90%)			90	liquid	13-14	-/30.5	65/5	61	-5
ECOSURF™ EH-6	Non-APEO	<ul style="list-style-type: none"><li>• Excellent wetting ability</li><li>• Quick foam collapse and low odor</li><li>• Readily biodegradable and low aquatic toxicity</li></ul>	100	liquid	10.8	914/30	20/0	40	5
ECOSURF™ EH-9			100	liquid	12.5	1066/31	60/0	61	16
ECOSURF™ EH-9 (90%)			90	liquid	12.5	1066/31	60/0	61	-5
ECOSURF™ LF-30	Non-APEO	<ul style="list-style-type: none"><li>• 100% active and easy handling</li><li>• Low foam</li><li>• Excellent wetting ability</li><li>• Improve color development</li></ul>	100	liquid	11	26/30	60/5	30	-5
ECOSURF™ LF-45			100	liquid	12	28/32	120/10	45	6

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- (1) Appearance at 25°C
- (2) Critical micelle concentration: ppm at 25°C
- (3) Surface tension: dynes/cm at 1% actives, 25°C
- (4) Ross-Miles foam height: mm at 0.1 wt% actives, 25°C, initial / 5 minutes
- (5) Cloud point: °C, 1 wt% actives aqueous solution
- (6) pour point: °C

## Stabilizers

High HLB surfactants contain a long EO chain which can provide effective steric effect and protect the polymer particles improving the heat storage stability and freeze-thaw stability of the coating formulations.

Dow offers the following surfactants as stabilizers for architectural coatings:

Stabilizer	Type	Features	Physical properties						
			Active%	Appearance <sup>(1)</sup>	HLB	CMC <sup>(2)</sup> /surface tension <sup>(3)</sup>	Foam height <sup>(4)</sup>	Cloud point <sup>(5)</sup>	Pour point <sup>(6)</sup>
TRITON™ X-405 (70%)	APEO	<ul style="list-style-type: none"><li>• Improve storage stability</li><li>• Improve color development</li></ul>	70	Liquid	17.6	2442/52	93/22	>100	-6
TERGITOL™ 15-S-40 (70%)	Non-APEO	<ul style="list-style-type: none"><li>• Improve storage stability</li><li>• Readily biodegradable</li></ul>	70	Liquid	18	1314/45	103/28	>100	5
ECOSURF™ EH-40 (75%)	Non-APEO	<ul style="list-style-type: none"><li>• Improve storage stability</li><li>• Improve color development</li><li>• Readily biodegradable and low aquatic toxicity</li></ul>	75	Liquid	18	8454/46	70/40	>100	3
TERGITOL™ ECO-20	Non-APEO	<ul style="list-style-type: none"><li>• Improve storage stability</li><li>• Readily biodegradable</li></ul>	100	Liquid	10	56/40	50/25	disperse	-30
TERGITOL™ ECO-36			100	Liquid	13	44/40	60/50	80	12
TERGITOL™ ECO-40			100	Liquid	13	50/40	60/55	80	15

These properties are typical of the product, but should not be confused with, or regarded as, sales specifications.

- (1) Appearance at 25°C
- (2) Critical micelle concentration: ppm at 25°C
- (3) Surface tension: dynes/cm at 1% actives, 25°C
- (4) Ross-Miles foam height: mm at 0.1 wt% actives, 25°C, initial / 5 minutes
- (5) Cloud point: °C, 1 wt% actives aqueous solution
- (6) pour point: °C





## Neutralizers for Water Based Coatings

Dow offers specialty alkanolamines as neutralizers for water based coatings.

Neutralizer	Abbreviation	Appearance <sup>(1)</sup>	Odor	Boiling point <sup>(2)</sup>
Monoisopropanolamine	MIPA	Clear liquid	Slight ammonia odor	154
Diisopropanolamine	DIPA	White crystal	Slight ammonia odor	249
Triisopropanolamine	TIPA	White crystal	Slight ammonia odor	306

These properties are typical of the product, but should not be confused with, or regarded as, sales specifications.

(1) Appearance at 25°C

(2) °C, 760 mmHg

## Intermediates

Dow offers ethyleneamines as intermediates for epoxy hardeners.

Product	Abbreviation	Appearance <sup>(1)</sup>	Freeze point <sup>(2)</sup>	Boiling point <sup>(3)</sup>
Diethylenetriamine	DETA	Clear liquid	-39	207
Triethylenetetramine	TETA	Clear liquid	-35	277
Tetraethylenepentamine	TEPA	Clear liquid	-46	288
Aminoethylpiperazine	AEP	Clear liquid	-17	221

These properties are typical of the product, but should not be confused with, or regarded as, sales specifications.

(1) Appearance at 25°C

(2) °C

(3) °C, 760 mmHg

Polypropylene glycols are polymers of propylene oxide. They are clear, viscous liquids with low pour points. Viscosity increases and water solubility decreases with increasing molecular weight. Dow P-series polyglycols are linear polymers containing two terminal hydroxyl groups. They can be used to synthesize resin for coating.

Product	Average molecular weight	Specific gravity <sup>(1)</sup> , g/cm <sup>3</sup> , 25°C	Average viscosity <sup>(2)</sup> , cSt, 25°C	Pour point <sup>(3)</sup> , °C
Polyglycol P-400	400	1.007	70	-49
Polyglycol P-1000	1000	1.004	143	-43
Polyglycol P-1200	1200	1.003	160	-41
Polyglycol P-2000	2000	1.002	230	-31

These properties are typical of the product, but should not be confused with, or regarded as, sales specifications.

(1) ASTM D 892

(2) ASTM D 445/446

(3) ASTM D 97

## Dow Industrial Solutions Product Offerings:

Product	Chemical name	Type	Application				
			Industrial coating		Wood coating		Architectural coating
			Solvent based	Water based	Solvent based	Water based	
DOWANOL™ PM Glycol Ether	Propylene Glycol Methyl Ether	Glycol Ether	●	●	●		
DOWANOL™ PMA Glycol Ether	Propylene Glycol Methyl Ether Acetate	Glycol Ether	●	●	●	●	
DOWANOL™ DPM Glycol Ether	Dipropylene Glycol Methyl Ether	Glycol Ether	●		●	●	
DOWANOL™ DPMA Glycol Ether	Dipropylene Glycol Methyl Ether Acetate	Glycol Ether			●		
DOWANOL™ PnP Glycol Ether	Propylene Glycol n-Propyl Ether	Glycol Ether	●	●		●	
DOWANOL™ PnB Glycol Ether	Propylene Glycol n-Butyl Ether	Glycol Ether	●	●	●	●	
DOWANOL™ DPnB Glycol Ether	Dipropylene Glycol n-Butyl Ether	Glycol Ether		●		●	
DOWANOL™ DPnP Glycol Ether	Dipropylene Glycol n-Propyl Ether	Glycol Ether				●	
DOWANOL™ PPh Glycol Ether	Propylene Glycol Phenyl Ether	Glycol Ether		●			
Butyl CELLOSOLVE™	Ethylene Glycol n-Butyl Ether	Glycol Ether	●	●	●	●	
Butyl CARBITOL™ Solvent	Diethylene Glycol n-Butyl Ether	Glycol Ether	●		●		
Hexyl CELLOSOLVE™ Solvent	Ethylene Glycol Hexyl Ether	Glycol Ether		●			
Hexyl CARBITOL™ Solvent	Diethylene Glycol Hexyl Ether	Glycol Ether		●			
Butyl CELLOSOLVE™ Acetate	Ethylene Glycol n-Butyl Ether Acetate	Glycol Ether	●		●		
Butyl CARBITOL™ Acetate	Diethylene Glycol n-Butyl Ether Acetate	Glycol Ether	●		●		
DOWANOL™ PGDA Glycol Ether	Propylene Glycol Diacetate	Glycol Ether	●	●		●	
PROGLYDE™ DMM Glycol Ether	Dipropylene Glycol Dimethyl Ether	Glycol Ether		●		●	
UCAR™ n-Propyl Propionate	n-Propyl Propionate	Ester	●				
UCAR™ n-Butyl Propionate	n-Butyl Propionate	Ester	●				
UCAR™ n-Pentyl Propionate	n-Pentyl Propionate	Ester	●				
UCAR™ Ester EEP	3-ethoxypropionic acid ethyl ester	Ester	●				
UCAR™ Filmer IBT	2,2,4-trimethyl-1,3-pentanediol monoisobutyrate	Ester		●			●
Diisobutyl Ketone (DIBK)	Diisobutyl Ketone	Ketone	●				
DALPAD™ series	Glycol ether coalescent	Glycol Ether					●
TRITON™ CF- 10	Alkylphenol polyether	Surfactant		●			●
TRITON™ X series	Alkylphenol polyether	Surfactant		●			●
TRITON™ DF- 16	Fatty alcohol polyether	Surfactant		●			●
TERGITOL™ 15-S series	Fatty alcohol polyether	Surfactant		●			●
TERGITOL™ CA series	Fatty alcohol polyether	Surfactant		●			●
ECOSURF™ EH series	Fatty alcohol polyether	Surfactant		●			●
ECOSURF™ LF series	Patent protected	Surfactant		●			●
TERGITOL™ ECO series	Natural plant oil polyether	Surfactant		●			●
TERGITOL™ XD, XH, XJ	EO/PO block polyether	Surfactant		●			
TERGITOL™ TMN series	Branched Secondary Alcohol polyether	Surfactant		●			
TRITON™ HW-1000	Specialty alcohol polyether	Surfactant		●			
TRITON™ GR-5M	Diocetyl Sulfosuccinate	Surfactant		●			





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