SURFACE COATINGS

Paint, Ink, Adhesives, Elastomers, Performance Coatings,
UV Curing, Latex Emulsion

HARCROS

Harcros Chemicals-Introduction

Since our inception in 1917, we have been committed to safety, quality and responsible operations. Headquartered in Kansas City, Kansas we maintain twenty-nine distribution warehouses and three manufacturing facilities.

Our specialty chemicals manufacturing division (Harcros Organics) has rapidly expanded both domestically and globally. Our products have impacted industries in North and South America, Europe, Africa and the Asia-Pacific region.

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About Paint & Coatings

Harcros Chemicals has supplied the Paint and Coatings market segment with manufactured products for several decades. Our emphasis on quality and innovation has positioned us as a market leader, and our commitment to custom development has made us the ideal choice as surfactant manufacturing partner. We produce a full line of alkoxylated products that are especially useful for emulsion polymerization reactions, post-added latex stabilization, and preparation of particulate dispersions. Our phosphate esters are used widely as primary surfactants for emulsion polymerization, and provide benefits not experienced with other anionic surfactant groups. Our non-silicone defoamer products may be used in a variety of coating products, from raw acrylic latexes and pigment grinds, to finished food and beverage can coatings. We also provide a full line of specialized polymeric dispersants for inorganic and organic pigments, with an emphasis on organic particulates. At the truly specialized end of the product spectrum, we manufacture phosphated reactive monomers that may be used in a variety of polymerizable coating systems to enhance corrosion resistance and adhesion to metal and other difficult substrates. Many benefits may be realized from these exceptional products.

What is HLB?

The calculated HLB (hydrophilic/lipophilic balance) of surfactants is useful in determining applications in which a specific surfactant can be used. Below is a reference guide:

HLB Value : 5 - 9
- Emulsifiers (Water in Oil)
- Detergents/dispersing agents in petroleum oils
- Antifoaming agents in surfactant formulations

HLB Value : 9 - 12.5
- Oil-soluble detergents
- Dispersing agents
- Emulsifiers (Oil in Water)

HLB Value : 12.5 - 14
- Emulsifiers (Oil in Water)
- Wetting agents
- Detergents for household and industrial purposes

HLB Value : 14 - 16
- **Emulsifiers for emulsion polymerization**
- Detergents and wetting agents for use at high temperatures and in high electrolyte concentrations

HLB Value : 16 - 19
- **Emulsifiers for emulsion polymerization**
- **Post-added latex stabilizers**
- **Carbon black dispersants**
- Dispersing agents of lime soap
- Dyeing aids

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Nonionic Surfactants

Nonylphenol, Octylphenol Ethoxylates & Butyl-Capped Alkoxylates

Harcros nonionic surfactants are produced to meet the demanding requirements of the Paint and Coatings industry. While Harcros nonionic surfactants span a wide HLB range, the higher HLB value (high mole) surfactants are generally more useful for producing latex emulsion polymers. All our high mole surfactants are produced by proprietary processing and cycling, which results in a reproducibly lower glycol content in the finished product. High mole surfactants prepared by such methods allow for control of process coagulum in acrylic emulsion polymerization, allowing for easier post-filtration and production of higher quality latexes. Harcros high mole surfactants may be used either as primary surfactants or as co-surfactants in both acrylic and styrene-acrylic systems. Alternately, these products may be post-added to acrylic latex systems, to improve freeze thaw and shear stability, and to reduce viscosity creep in particulate dispersions. The high mole ethoxylates are available as either 100% solid concentrates, or as fluid, pumpable water dilutions, with active levels from 30-70%. Harcros high mole surfactants are also useful as organic and inorganic pigment dispersants, and are particularly useful for carbonaceous particulates. Harcros high mole products are especially useful for slow-set asphalt emulsions typically used in multi-layer road and highway slip coatings

Nonylphenol Ethoxylates

Product	Hydrophobe	Cloud Point 1% aq.	Moles EO	HLB	Appearance @ 25°C	Activity
T-Det® N 9.5	Nonylphenol	58.3°C	9.5	13.1	Clear Liquid	100%
T-Det® N 10.5	Nonylphenol	71.1°C	10.5	13.1	Clear Liquid	100%
T-Det® N 30	Nonylphenol	>100°C	30	17	White Solid	100%
T-Det® N 40	Nonylphenol	>100°C	40	17.7	White Solid	100%
T-Det® N 50	Nonylphenol	>100°C	50	18	White Solid	100%
T-Det® N 100 LG	Nonylphenol	>100°C	85	19	White Solid	100%
T-Det® N 307	Nonylphenol	>100°C	30	17	Clear Liquid	70%
T-Det® N 407	Nonylphenol	>100°C	40	17.7	Clear Liquid	70%
T-Det® N 507	Nonylphenol	>100°C	50	18	Clear Liquid	70%
T-Det® N 1003	Nonylphenol	>100°C	85	19	Clear Liquid	30%
T-Det® N 1007	Nonylphenol	>100°C	85	19	Clear Liquid	70%

Tridecyl Alcohol Ethoxylates

Product	Hydrophobe	Cloud Point 1% aq.	Moles EO	HLB	Appearance @ 25°C	Activity
T-Det® A133	Tridecyl Alcohol	Insoluble	3	8	Opaque Liquid	99.5%
T-Det® A136	Tridecyl Alcohol	< 20°C	6	11.4	Opaque Liquid	99.5%
T-Det® A138	Tridecyl Alcohol	44°C	8	12.5	Opaque Liquid	99.5%
T-Det® A139	Tridecyl Alcohol	57°C	9	13.3	Opaque Liquid	99.5%
T-Det® 1330	Tridecyl Alcohol	>100°C	30	17.4	Clear Liquid	50%
T-Det® 1340	Tridecyl Alcohol	>100°C	40	18.0	Clear Liquid	50%
T-Det® 1350	Tridecyl Alcohol	>100°C	50	18.3	Clear Liquid	50%

Octylphenol Ethoxylates

Product	Hydrophobe	Cloud Point 1% aq.	Moles EO	HLB	Appearance @ 25°C	Activity
T-Det® O 9	Octylphenol	65°C	9	11.6	Clear Liquid	99.5%
T-Det® O 12	Octylphenol	82.2°C	12	14.1	Clear Liquid	99.5%
T-Det® O 307	Octylphenol	>100°C	30	17.8	Clear Liquid	70%
T-Det® O 407	Octylphenol	>100°C	40	17.9	Clear Liquid	70%

Butyl-Capped Alkoxylates

Product	Hydrophobe	Cloud Point 1% aq.	Moles EO	HLB	Appearance @ 25°C	Activity
T-Det® XD	Butyl	75°C	polyoxyalkylene	>17	Solid	100%
T-Det® XH	Butyl	98°C	polyoxyalkylene	>17	Solid	100%

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Anionic Surfactants

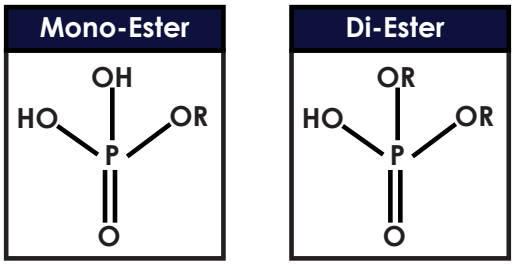
Phosphate Esters & Ether Sulfates

Of this ionogenic class, Harcros Organics produces both phosphate ester and ether sulfate surfactant products. Phosphate esters provide many benefits to the finished coating product, including increased corrosion protection on the metal surface, greater latex stability, and in certain cases, improved adhesion. Also notable is that post-adding a phosphate ester surfactant to a formulated paint product may improve gloss retention.

Phosphate ester surfactants are available as either mono-ester only products, or products that contain a mixture of mono-ester and di-ester. Phosphate ester products that contain predominantly mono-ester structures provide better film adhesion, while products containing a mixture of monoester and di-ester provide greater latex stability.

As part of our routine process control in phosphate ester production, we analyze for many parameters beyond typical, which provides the end user with considerably greater control over product consistency and particle size. All phosphate ester products listed in the table, below, are well suited to acrylic latex polymerization.

Harcros also produces a specialty ether sulfate product that is useful for polymerization of acrylic and styrene/acrylic monomer groups. Our unique sulfation method allows for ultra-low residual sulfate and oil levels, while still offering a high degree of conversion to active product. The low level of ring sulfonation makes for considerably greater surface activity than equivalent commercial products. Emulzymer N4SES-AQ is also well suited to preparation of acrylic latex, natural rubber and chlorinated rubber dispersions.



Phosphate Esters

Product	Type	Mono/Diester	Pour Point	Appearance @ 25C	Activity
T-Mulz® 565-2	Nonylphenol	Mono/Diester	36	Pale Straw Colored Liquid	100%
T-Mulz® 786-1	Nonylphenol	Mono/Diester	22	Pale Straw Colored Liquid	25%
T-Mulz® 1183	Aromatic	Mono/Diester	60	Clear Yellow Liquid	100%
T-Mulz® 1396	Aliphatic	Monoester	< 40	Pale Yellow Liquid	45%
T-Mulz® A 136 PE	Aliphatic	Mono/Diester	< 40	Pale Yellow Liquid	100%
T-Mulz® A 139 PE	Aliphatic	Mono/Diester	< 40	Pale Yellow Liquid	100%
T-Mulz® T9 PE	Aliphatic	Monoester	< 40	Pale Yellow Liquid	100%

Ether Sulfates

Product	Type	Mono/Diester	Base HLB	Appearance @ 25°C	Activity
Emulzymer® N4SES-AQ	Aromatic	N/A	8.9	Clear Pale Yellow Liquid	22%

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Dispersants

Harcros H-Sperse® N series dispersants comprise a series of alkoxylated polymeric materials that are useful for the dispersion of organic pigments in water. The 100% active products are also useful for non-aqueous systems, such as oil-based inks. The 2000, 3000 and 4000 series dispersants are free of APE's. Typical suggested use rates of H-Sperse® products are 2-5 mg of dispersant per square meter of particulate surface area.

Each H-Sperse product has its specific performance advantages. H-Sperse® 3000N has a low foam profile during the high shear milling stage, and allows for high carbon black loadings, while retaining excellent color strength in the final coating. H-Sperse® 4000N imparts excellent gloss retention to the coating, and also eliminates viscosity creep. H-Sperse® 3000N has a low pour point, and handles very well at low temperatures. H-Sperse® 4000N, supplied as a solid, requires little energy for melting, and disperses readily in water. For additional guidance on selection, please contact your Advanced-Harcros representative.

Product	Activity	Flash Point °C	Pour Point °C	APE Free
H-Sperse® 247	38%	>148°C		Yes
H-Sperse® 10190C	35%	>148°C		Yes
H-Sperse® 2000A	99.5%	>148°C	9°C	Yes
H-Sperse® 2000N	99.5%	>148°C	7°C	Yes
H-Sperse® 3000N	100%	>148°C	< -6°C	Yes
H-Sperse® 3100N	80%	>148°C	< 15°C	Yes
H-Sperse® 4000N	100%	>148°C	Solid	Yes

All of our N-Series dispersants are non-ionic polymers. Ask us about our H-Sperse® 2000A anionic dispersant, which is suitable for inorganic pigments. H-Sperse® 2000A is also sutiable for preparing solvent based dispersions of organic pigments and inorganic pigments such as titanium dioxide.

Applications Information, H-Sperse N-Series:

- Flexo and Gravure Inks
- Inkjet Inks
- Industrial Coatings
- Leather Coatings
- Pigment Concentrates

HSperse®

Defoamers

Many paint and coating systems contain surfactants and dispersants, which can lead to processing difficulties if the foam isn't controlled. This is especially true with coatings products, where high energy mixing and agitation are used in many stages of processing and formulation.

All Harcros antifoam products listed below are non-silicone 100% active, mineral oil based defoamers. They consist of highly efficient and effective blends of organic defoaming ingredients that give excellent performance across a broad range of applications, including water based latex paints, inks and coatings, chemical processing – both batch and continuous, textiles, textile finishes, and latex adhesives. Both Antifoam HL-52 and Antifoam HL-66M are especially useful as defoaming agent in the production of flat and semi-gloss latexes. Specific suggested applications for each of the four defoamer products are shown in the guide, below.

The recommended starting level of Antifoams HL-52, HL-40 and HL-66M is 0.25% of the total weight of the system. In paint manufacture, best results are usually obtained when half of the antifoam is added to the pigment before grinding to suppress the formation of foam, and the remainder added to the "let down" portion. In adhesives and caulks, a starting addition of 0.5-2.0% of the weight of the latex solids is generally recommended. In can coating formulations, a recommended starting use level of Antifoam 645:35 is 100-1000 ppm.

Product	Type	Appearance	Viscosity	Activity
Antifoam HL-40	Non-silicone	Cloudy Viscous Liquid	500 - 1500cps	100%
Antifoam HL-52	Non-silicone	Opaque Yellow Liquid	140 - 1040cps	100%
Antifoam HL-66M	Non-silicone	Opaque Liquid	500 - 2000cps	100%
Antifoam 645:35	Non-silicone	White Viscous Liquid	300 - 1500cps	100%

Applications Guide

Product	Polyvinyl Alcohol	Acrylic Latex	Styrene/Acrylic Latex	Clear Stain	Pigment Grind	Can Coatings
Antifoam HL-40		■	■		■	
Antifoam HL-52		■	■	■	■	
Antifoam HL-66M	■		■	■		
Antifoam 645:35		■	■			■

Antifoam HL

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Reactive Monomers

Harcros produces four free acid, reactive phosphate monomers that can be readily incorporated into emulsion, solvent, and solids based polymer systems. Both products may be incorporated into all-acrylic, styrene/acrylic, VEOVA/acrylic and urethane polymers. Typical uses include metal coatings, UV-Curable coatings, super-adhesives, adheives for concrete, and thread-lock adhesive systems. An indicative Tg for both products is 200°C.

All Harcryl products are:

- Based on 2-hydroxyethylmethacrylate (2-HEMA)
- Supplied as > 99.5% solids products

The major benefits offered by Harcryl brand products are:
- Increased corrosion protection on metal substrates (reducing the need for corrosion inhibitors)
- A reduced need for time consuming and expensive surface pre-treatment
- Increased adhesion to metal, glass and concrete surfaces

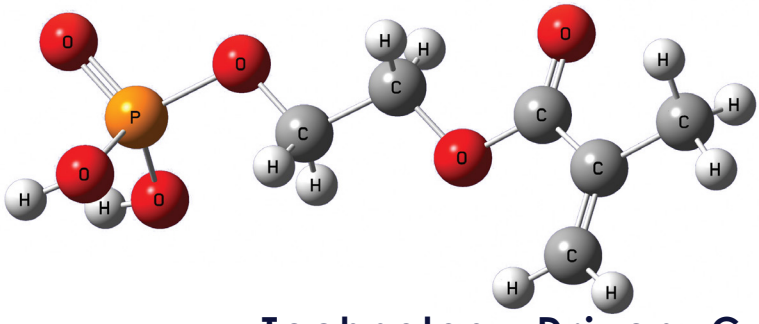
With all products, improved surface adhesion is noted on galvanized and phosphated steels, cold rolled steel, stainless steel, aluminum, brass, copper, glass and concrete.

UV grades of Harcryl®, which contain low inhibitor levels, are suitable for use in radiation curable films.

Product	pH (1% ap.)	Inhibitor	Appearance @ 25°C	Activity
Harcryl® 1228	1.5 - 2.5	400 ppm HQ	Clear Yellow Liquid	99.5%
Harcryl® 1228 UV	1.5 - 2.5	100 ppm MeHQ	Clear Yellow Liquid	99.5%
Harcryl® 1228 M	1.5 - 2.5	400 ppm HQ	Yellow Viscous Liquid	99.5%
Harcryl® 1228 M UV	1.5 - 2.5	100 ppm MeHQ	Yellow Viscous Liquid	99.5%

For specific guidelines on how to handle, store and use these products, please contact your Harcros representative. Guidance documents are available.

Harcros also has other developmental reactive monomers avaliable that are esters of boric acid. Please contact your Advanced-Harcros represetative for more details.



HARCRYL®

Technology Driven. Customer Focused.

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Applications Guide

Nonionic Surfactants

Product	All Polymer Systems	Post-add Latex Systems	All Acrylic
T-Det® N 10.5	■		■
T-Det® N 30	■		■
T-Det® N 40	■	■	■
T-Det® N 50	■	■	■
T-Det® N 100 LG	■	■	■
T-Det® N 307	■	■	■
T-Det® N 407	■	■	■
T-Det® N 507	■	■	■
T-Det® N 1003	■	■	■
T-Det® N 1007	■	■	■
T-Det® O 307	■		■
T-Det® O 407	■	■	■
T-Det® XD	■		
T-Det® XH	■		

Reactive Monomers

Product	All Acrylic	Acrylic Resin Coatings	Styrene/Acrylic	Rubber	UV Coatings
Harcryl® 1228	■	■	■	■	
Harcryl® 1228M	■	■	■	■	
Harcryl® 1228 UV	■	■	■	■	■
Harcryl® 1228 M UV	■	■	■	■	■

HSperse® Antifoam HL HARCRYL® T-Det® T-Mulz®

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