



PROPIONATE SURFACTANTS

HOME CARE and INSTITUTIONAL
& INDUSTRIAL Applications

INTRODUCTION

At Verdant Specialty Solutions, our mission is to support human well-being through the power of science and nature. Our surfactants experts can help you formulate for today's discerning customers.

The Verdant range of propionate based surfactants are true amphoteric surfactants based on carboxylate chemistry. As such they are compatible with cationic, anionic and nonionic surfactants, are stable at high temperature and also stable in acid and alkali solutions. They are salt-free and are multifunctional, having a range of typical surfactant properties and also more specialised properties, making them useful in a wide range of home care and institutional & industrial applications.

WHAT'S IN THIS GUIDE

On the following pages, you will find a range of specialty solutions for home, hygiene and industrial applications. Every product in this guide meets the regulatory requirements for its recommended uses and we strive to manufacture in a way that minimizes environmental impact. Many are from renewable, sustainable feedstocks from plant-based sources.

OUR PROMISE

At Verdant, we understand what's happening in the market now and stay ahead of emerging trends. We're here to help you create winning solutions. We deliver the personal attention you would expect from a small company with enterprise-level safety, environmental performance, and reliability.





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MACKAM® & DeTERIC™ PROPIONATES

BENEFITS

- Salt-free
- Compatible with anionic, cationic & nonionic surfactants
- Compatible with electrolytes, thickeners & solvents
- Low irritation to both skin & eyes
- Mitigate irritation potential of other surfactants especially anionics
- Biodegradable & low toxicity
- Wide pH solubility from acidic ($\leq 30\%$ HCl) to alkaline ($\leq 30\%$ NaOH)

FUNCTIONALITY

- Detergency
- Wetting
- Hydrotrope and coupling
- Low and high foaming depending on chain length
- Solubilization & Emulsification
- Rheology modification

SPECIALTY PROPERTIES

- Alkali/acid stability
- Corrosion inhibition
- Chelation
- Low film & streak
- Lubricity
- Good brine stability










APPLICATIONS

- Acid & alkali cleaners
- Vehicle cleaners
- Metal cleaning
- Low corrosion cleaners
- All purpose & bathroom cleaners
- Steam cleaners
- Degreasers
- Clean-In-Place (CIP) products
- Fire fighting foams
- High and low foam cleaners
- Textile auxiliaries
- Dishwash & warewash products
- Foaming agents in oil drilling
- Solubilizer for quaternary & halogenated germicides
- Emulsifier for vinyl acetate/ethyl acrylate & vinyl chloride systems
- Agrochemical formulations
- Industrial laundry



MACKAM® & DeTERIC™ PROPIONATES

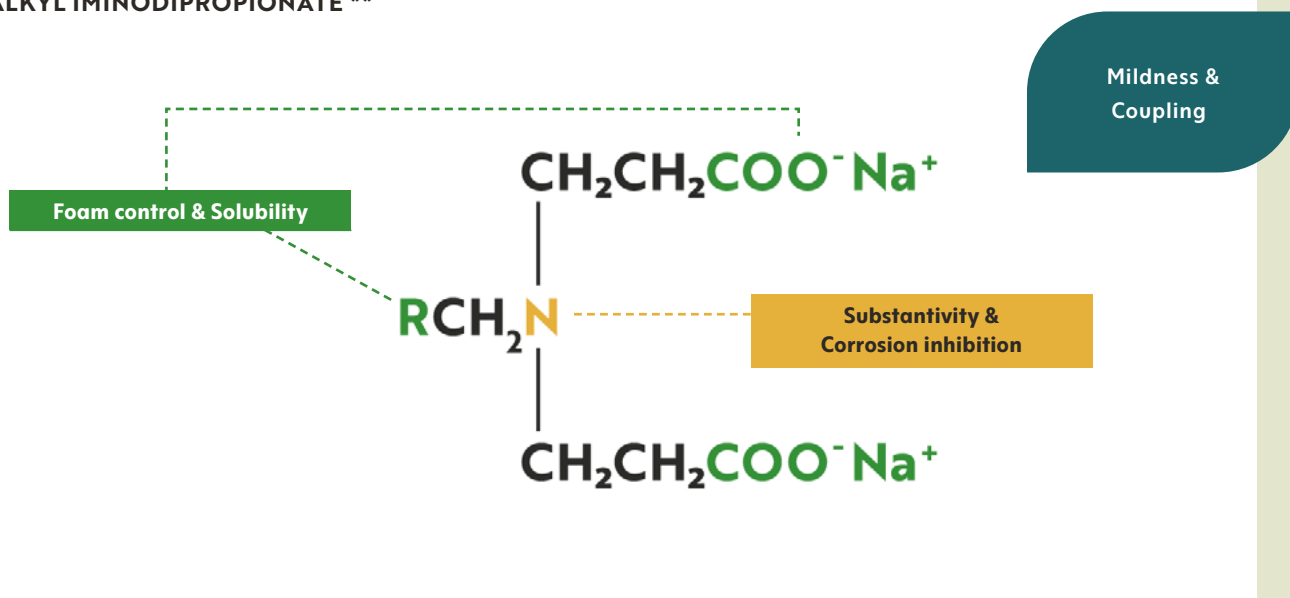
 SALT-FREE

Trade Name		Chemical Name	Form	% Active	% Solids	Properties & Applications
MACKAM® 2CSF		Disodium Cocoamphodipropionate	Clear liquid	39	39	High foaming, salt free surfactant with good electrolyte tolerance and coupling properties.
MACKAM® 2CSF-40CG		Disodium Cocoamphodipropionate	Clear liquid	39	39	Methanol free version of MACKAM® 2CSF . Used in Aluminium cleaners.
MACKAM® H2C-HA		Sodium Lauriminodipropionate	Clear liquid	30	30	High foaming, salt free amphoteric surfactants with good detergency and corrosion inhibition. Gives very stable, dense foam especially suited to demanding applications such as fire-fighting foam.
MACKAM® 168L		Sodium Lauriminodipropionate	Clear liquid	30	30	
DeTERIC™ LP		Sodium Lauriminodipropionate	Clear liquid	30	30	
MACKAM® DP 122		Sodium Cociminodipropionate	Clear liquid	30	30	
MACKAM® OIP 40		Sodium Ethylhexyl-iminodipropionate	Clear liquid	40	40	Low foaming salt-free surfactant and hydrotrope. Good caustic stability and coupling.
DeTERIC™ ODP-LF		Sodium Ethylhexyl-iminodipropionate	Clear liquid	50	50	Higher active version of MACKAM® OIP 40 . Excellent hydrotrope and exhibits corrosion inhibition. Used in high electrolyte cleaners and as a demulsifier for oils in synthetic cutting fluids.
DeTERIC™ CP-NA-38		Sodium Salt of Carboxylated Propionate	Clear liquid	40	40	High foaming surfactant with good detergency and wetting and stable in acid & alkali systems. Finds use in high electrolyte cleaners, foam cleaners and fire fighting foams.
MACKAM® EWC		Amphoteric Surfactant	Clear liquid	35	38	Multi-purpose foaming agent and hydrotrope. Excellent in coupling nonionics into highly built, high electrolyte systems. Finds use in degreasers, hard surface cleaner and industrial laundry.
MACKAM® MEJ		Sodium Mixed C8 Carboxylates	Clear liquid	29	34	Low foaming wetting agents ideally suited to applications such as bottle washing, wax stripping, etc. They exhibit excellent stability in high concentrations of electrolyte.
MACKAM® JEM		Sodium Mixed C8 Carboxylates	Clear liquid	29	34	



PROPIONATES: STRUCTURE FUNCTION RELATIONSHIP

** ALKYL IMINODIPROPIONATE **



FORMULATION ADVANTAGES OF PROPIONATES

Industrial cleaning processes often use high concentrations of acids, alkalis or electrolyte to give effective performance in demanding applications. Surfactants can greatly improve the efficiency of cleaning but must be stable and effective under these harsh conditions. Different applications may also require the surfactant to be high or very low foam and also be able to hydrotrope nonionic surfactants into the formulation.

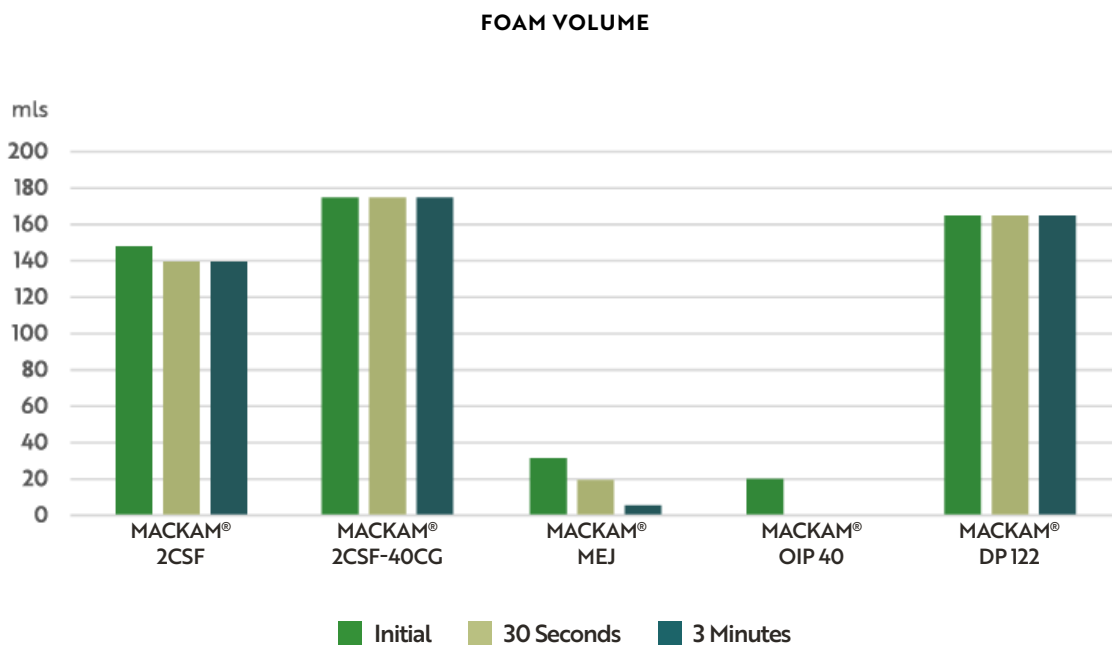
Trade Name	Chemical description	Low Foam	High Foam	Hydrotrope / Coupling	Acid stability	Alkaline stability
MACKAM® 2CSF	Disodium Cocoamphodipropionate	-	+++	++	++ (20%HCl)	+++ (20%NaOH)
MACKAM® H2C-HA	Sodium Lauriminodipropionate	-	++	+++	+++ (30%HCl)	++ (30%NaOH)
MACKAM® 168L	Sodium Lauriminodipropionate	-	++	+++	+++ (30%HCl)	++ (30%NaOH)
DeTERIC™ LP	Sodium Lauriminodipropionate	-	++	+++	+++ (30%HCl)	++ (30%NaOH)
MACKAM® DP 122	Sodium Cociminodipropionate	-	++	+++	+++ (30%HCl)	++ (25%NaOH)
MACKAM® OIP 40	Sodium Ethylhexyl- iminodipropionate	+++	-	+++	+++ (30%HCl)	++ (25%NaOH)
DeTERIC™ ODP-LF	Sodium Ethylhexyl- iminodipropionate	+++	-	+++	+++ (30%HCl)	++ (25%NaOH)

FOAMING

Foam can be either a key function of a formulation, or an undesirable property to be controlled or eliminated. In foam cleaners for vertical surfaces stable foam is essential. In many industrial processes the presence of foam can reduce both the speed and efficiency of cleaning. The Verdant propionate range includes surfactants which will produce copious volumes of stable foam and products which produce virtually no foam, even under severe agitation or aeration.

Foam Properties of MACKAM® Propionate Range

MACKAM® propionates were tested in a cylinder shake foam test. 100 ml of a 0.1% active solution of the surfactant in 140 ppm hardness water was inverted 10 times in a 500 ml graduated cylinder. The amount of foam was measured at 3 intervals, initially, 30 seconds and 3 minutes.



HYDROTROPES/COUPLING PROPERTIES

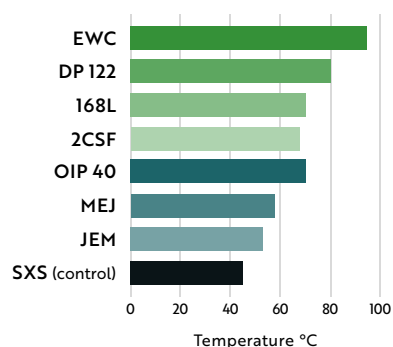
There are several ways to test for hydrotroping properties. A classic method is to test a 3-component system of a nonionic surfactant, a source of electrolyte and a set amount of a test hydrotrope. Initially the test solutions are clear at room temperature. As the temperature is raised, the nonionic will eventually cloud-out. The higher the temperature reached, the more effective the hydrotrope.

MACKAM® PROPIONATE RANGE

The MACKAM® range of propionates are all excellent hydrotropes and more effective than Sodium Xylene Sulfonate, a more traditional anionic hydrotrope. In addition, the MACKAM® propionate products are multi-functional, bringing surface tension reduction and wetting properties to a formulation.

The higher the cloud point temperature, the more efficient the hydrotrope.

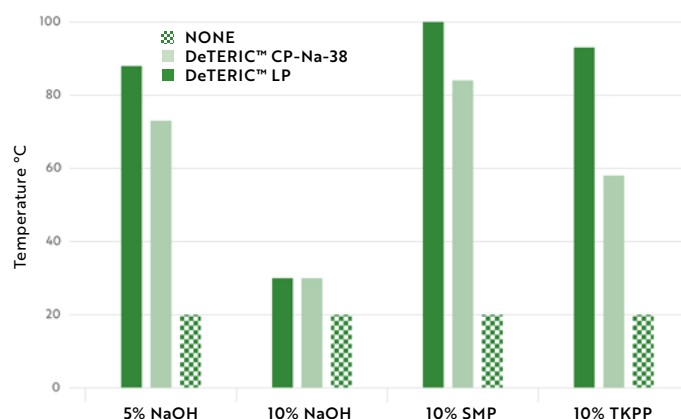
HYDROTROPE CLOUD POINTS, °C
2% NPE-9 + 2% HYDROTROPE IN 5% NaOH SOLUTIONS



DeTERIC™ PROPIONATE RANGE

DeTERIC™ propionates high versatility in alkali and built systems makes them excellent choices for heavy duty vehicle care, industrial and oil field rig cleaning. For low foam applications such as bottle washing, *DeTERIC™ ODP-LF* is recommended. For applications where high foam provides cling and increased contact time, *DeTERIC™ LP & DeTERIC™ CP-Na-38* are the products of choice.

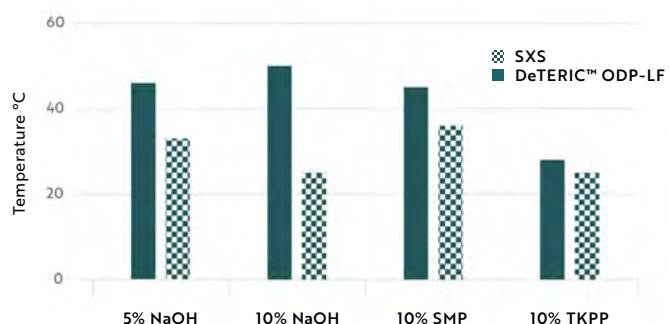
HIGH FOAM DeTERIC™ - 3% NPE-9 + 2.5% HYDROTROPE



PROPIONATE PRODUCT RANGE

High Foam	Low Foam
• MACKAM® EWC	• MACKAM® OIP 40
• MACKAM® DP 122	• MACKAM® MEJ
• MACKAM® 168L	• MACKAM® JEM
• MACKAM® 2CSF	• DeTERIC™ ODP-LF
• DeTERIC™ LP	
• DeTERIC™ CP-Na-38	

LOW FOAM DeTERIC™ - 1% NPE-9 + 1.5% HYDROTROPE



* SMP - Sodium metasilicate pentahydrate
TKPP - Tetrapotassium Pyrophosphate
SXS - Sodium Xylene Sulfonate

CORROSION INHIBITION

The protection of metal surfaces from damage due to oxidation or chemical attack is important in a wide range of industrial and domestic cleaning processes, such as lubricant formulations, metalworking, metal cleaning, and bathroom cleaners. Verdant amine based propionate surfactants can offer this important attribute.

Corrosion Inhibition Properties of DeTERIC™ LP

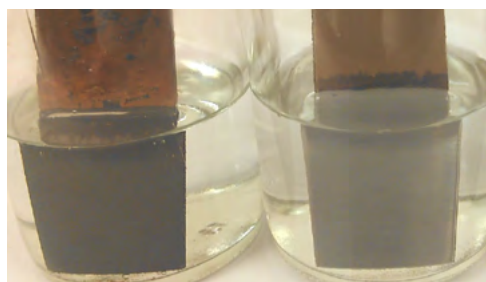
ACID CORROSION PROTECTION

Cold-rolled steel panels were submerged in the acid solutions and placed in sealed jars at room temperature and observed for signs of corrosion.

HARD WATER CORROSION PROTECTION

Metal panels were submerged in hard water (100 ppm as CaCO₃ and 71 ppm as chloride) in sealed jars at room temperature and observed for signs of corrosion over time.

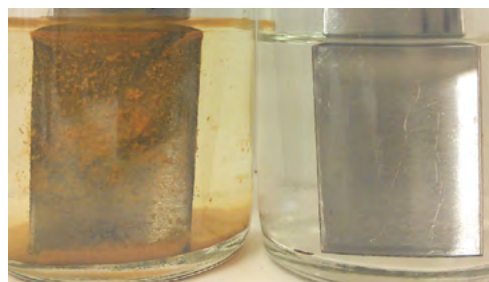
5% active Hydrochloric Acid, 72 hours



Control, no inhibitor

DeTERIC™ LP,
(1% by wt)

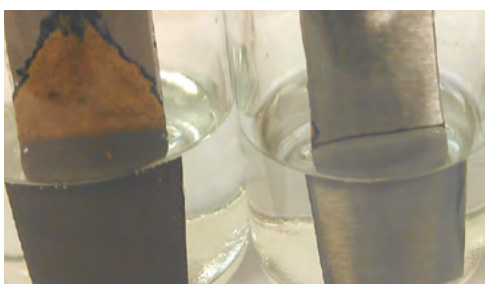
Cold-Rolled Steel, 72 hours



Control, no inhibitor

DeTERIC™ LP,
(0.5% by wt)

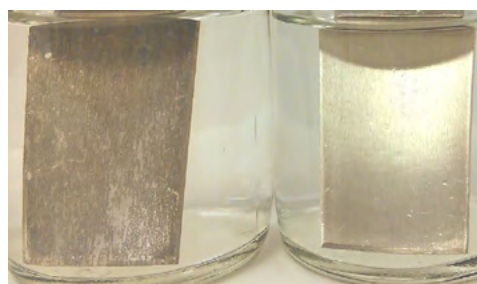
5% active Sulfuric Acid, 72 hours



Control, no inhibitor

DeTERIC™ LP,
(1% by wt)

Aluminium, 72 hours



Control, no inhibitor

DeTERIC™ LP,
(0.5% by wt)

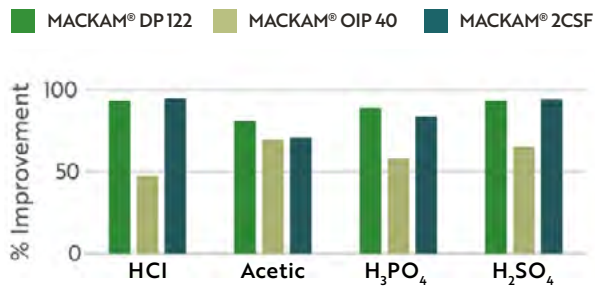
CORROSION INHIBITION | *PROPERTIES OF MACKAM® PROPIONATES*

Acid Corrosion Protection

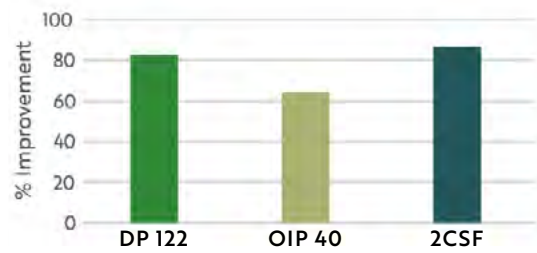
Mild steel washers were submerged in 10% solutions of the acids and placed in sealed jars at room temperature. Weight loss was measured after 48 hours and compared to a control.

Stainless steel washers were submerged in 10% HCl solution and placed in sealed jars at room temperature. Weight loss was measured after 7 days and compared to a control.

% IMPROVEMENT OVER MILD STEEL BLANK
for MACKAM® PROPIONATES



% IMPROVEMENT OVER STAINLESS STEEL BLANK
After 7 Days at Room Temperature





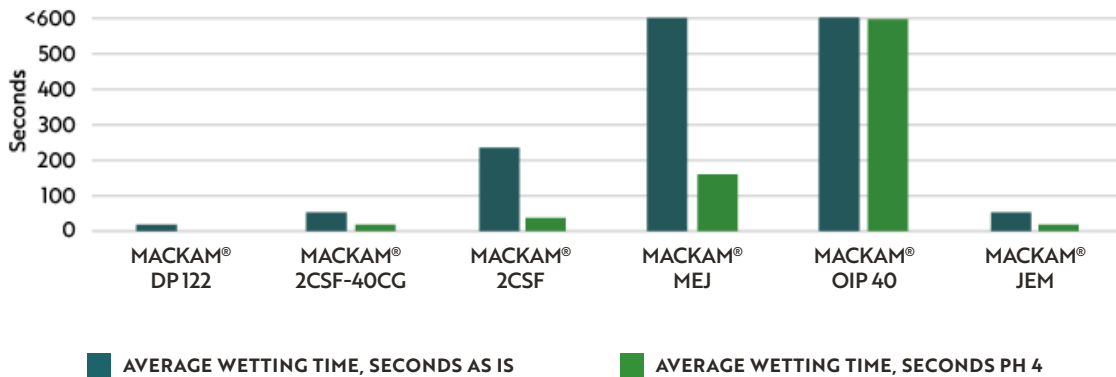
WETTING

Wetting is the property that describes the contact between cleaning solutions and the surfaces to be cleaned. No matter how effective a cleaner or corrosion inhibitor is, if it is not in contact with the target surface, then it cannot do its job efficiently.

Wetting Properties of MACKAM® Propionates

Verdant propionates were tested using the Draves wetting test which measures the ability of a surfactant solution to displace air from a weighted skein of cotton. A 0.5% active solution in deionised water was tested using a 3gm hook. Shorter times indicate more efficient wetting.

DRAVES WETTING



FILM & STREAK

When used in hard surface cleaners many surfactants may clean efficiently but can leave streaks or a thin film on the surface. Using Verdant's propionates can help to reduce the level of filming and streaking of cleaned surfaces.

MACKAM® Propionates Film & Streak Properties

FILM & STREAK TEST METHOD

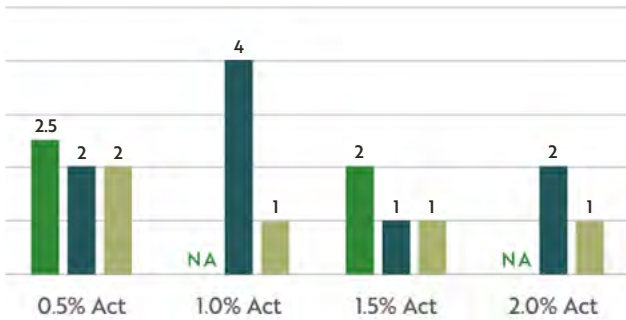
10 drops of test material placed onto a 4"x4" high gloss black ceramic tile. A Kimwipe is folded into fourths and used to wipe the tile lightly twenty times. Tiles allowed to air dry. Tiles evaluated and graded: 1 = lowest & 5 = highest (lower number is better).

Test Solution - Actives by weight %	
C1215-7 alcohol ethoxylate:	2.0%
EB Solvent:	2.0%
Na4EDTA:	1.2%
Test Propionate:	<i>as indicated below</i>
Water, DI:	qs to 100

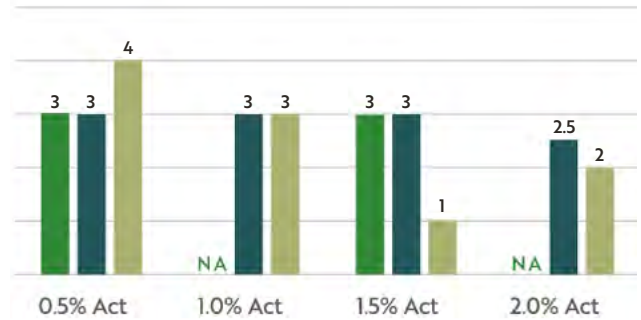
The Test Solution with no propionate was used as a control. It gave a score of 5 for both film & streak.

■ MACKAM® 168L
 ■ MACKAM® 2CSF
 ■ MACKAM® MEJ

STREAK RESULTS AT VARIOUS % OF PROPIONATES



FILM RESULTS AT VARIOUS % OF PROPIONATES



↑ POOR
↓ BETTER



SUGGESTED FORMULATIONS

Shampoo for Automatic Car Wash

DI Water	to 100
SLES-3 (27%)	15.0
MACKAM® CAB 818	5.0
MACKAM® H2C-HA	3.0
Mirapol Surf-S 310 (Solvay)	5.0
MGDA (38%)	5.0
Citric Acid (50%)	to pH 6-6.5
Preservative	as required
Dye, Fragrance	as required

In use: 10-20 ml/car diluted 1:500 to 1:1000

Streak Free Wash & Wax

DI Water	to 100
MACKAMINE® CS	10.0
Mirapol Surf-S 310 (Solvay)	4.0
MGDA (38%)	2.0
MACKAM® OIP 40	7.0
Preservative	as required
Dye, Fragrance	as required

In use: Dilute 1:50 to 1:100 with water

Low Foaming Degreaser

Water	to 100
MACKAM® OIP 40	3.0
DeIONIC™ LF-EP-25	2.5
Sodium Metasilicate	3.0
DePHOS™ H-66-872	1.5
Preservative	as required
Fragrance, Dye	as required

In use: Dilute as needed & use through trigger spray

Low Film & Streak Glass Cleaner

Water	to 100
MACKAM® 2CSF	8.5
MACKAM® 654	6.5
Solvent PnB	3.0
Solvent PM	1.5
MGDA (38%)	2.5
Preservative	as required
Fragrance, Dye	as required

In use: Dilute 1:20 with water & use through trigger spray

SUGGESTED FORMULATIONS

Shower, Bath & Tile Cleaner

Water	to 100
MACKAM® H2C-HA	6.0
Mirapol Surf-S 110 (Solvay)	0.75
EDTA, 40%	0.5
Sodium Citrate	1.0
Preservative	as required
Citric Acid	as required
Fragrance, Dye	as required
Use through trigger spray	

Kitchen Degreaser

Water	to 100
MACKAM® 2CSF	2.5
MACKAM® LSB 50	5.0
MACKAMINE® 654	1.5
Solvent PM	2.0
MGDA (38%)	2.5
Preservative	as required
Fragrance, Dye	as required
Use through trigger spray	



SUGGESTED FORMULATIONS

Truck/Bus Cleaner

DI Water	to 100
DeTERGE™ LF-7315	5.0
MACKAMINE® LA	4.0
MACKAM® 168L	5.0
Mirapol Surf-S 310 (Solvay)	2.0
DPG methyl ether	4.0
GLDA (40%)	10.0
Sodium Metasilicate	2.0
Preservative	as required
Dye, Fragrance	as required

In use: apply with spray lance or spray arch diluted 1:500 with water

Low VOC Motorcycle Wash

DI Water	to 100
Sodium Gluconate	6.0
NaOH (50%)	1.0
DDBSA	5.0
DeTERGE™ NAS	7.0
MACKAM® DP 122	6.0
NaOH (50%)	to pH 9.5
Preservative, dye	as required

In use: apply dilution with a spray lance.

Low Foam Alkaline Cleaner

DI Water	to 100
EDTA, 40%	2.0
Sodium Carbonate	8.0
DeTERGE™ LF-28	6.0
DeTERIC™ ODP-LF	7.0
Solvent DPM	4.0
DeIONIC™ LF-EP-40	2.0
Preservative	as required

In use: dilute up to 40:1 with water & use through trigger spray

Glass Cleaner Concentrate

Water	to 100
MACKAM® 168L	3.0
Isopropanol	15.0
Mirapol Surf-S 110 (Solvay)	5.0
Solvent PnB	2.0
Ammonia	2.5
Preservative	as required
Fragrance, Dye	as required

In use: Dilute as needed, maximum 1:5 concentrate: water, & use through trigger spray

With a network of industrial, technological and market experts all over the world, we support our customers by focusing on value and global supply chain optimization as well as providing cost-competitive innovations and customized solutions.



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