

# Wetting additives

## for adhesive & sealant formulations

# Wetting agents for water-based adhesive formulations

Wetting agent	Chemical base	delivered as	Surface tension 0.1% in water		Cloud Point	Wetting of		
			Static (bubble life time 5000 ms)	Dynamic (bubble life time 30 ms)	0.1% in water (°C)	Glass	PE/PE film	Siliconized paper
SURFYNOL® AS 5000	Gemini surfactant, acetylenic	50 % active solution	35	40	< RT	●	●	
SURFYNOL®AS 5020	Ethoxylated gemini surfactant, acetylenic	100% active concentrate	34	39	< RT	○	○	●
SURFYNOL® AS 5040	Ethoxylated gemini surfactant, acetylenic	100% active concentrate	32	35	58	●	●	●
SURFYNOL® AS 5060	Alkoxylated gemini surfactant, acetylenic	100% active concentrate	33	37	46	●	●	●
SURFYNOL® AS 5080	Blend of gemini surfactants, acetylenic	100% active concentrate	25	30	< RT	●	●	●
SURFYNOL® AS 5100	Blend of acetylenic gemini and anionic surfactants	81% active concentrate	31	37	> 100	○	○	●
SURFYNOL®AS 5120	Anionic surfactant blend	75% active concentrate	33	37	28	●	●	●
SURFYNOL® AS 5140	Anionic surfactant blend	85% active concentrate	32	41	30	○	○	○
SURFYNOL® AS 5160	Anionic surfactant	75% active concentrate	30	38	> 100	○	○	●
SURFYNOL® AS 5180	Alcohol alcoxylate	100% active concentrate	29	34	44	●	●	●
TEGOPREN® 5840	Organomodified Siloxane	100% active concentrate	22	51	< RT	●	●	●
TEGOPREN® 5860	Organomodified Siloxane + acetylenic gemini	100% active concentrate	23	43	25	●	●	●
TEGOPREN® 5885	Siloxane based gemini surfactant	100% active concentrate	n.a. *	n.a. *	n.a. *	●	●	
TEGOPREN® 5890	Organomodified Siloxane	100% active concentrate	41	56	< RT	●	●	

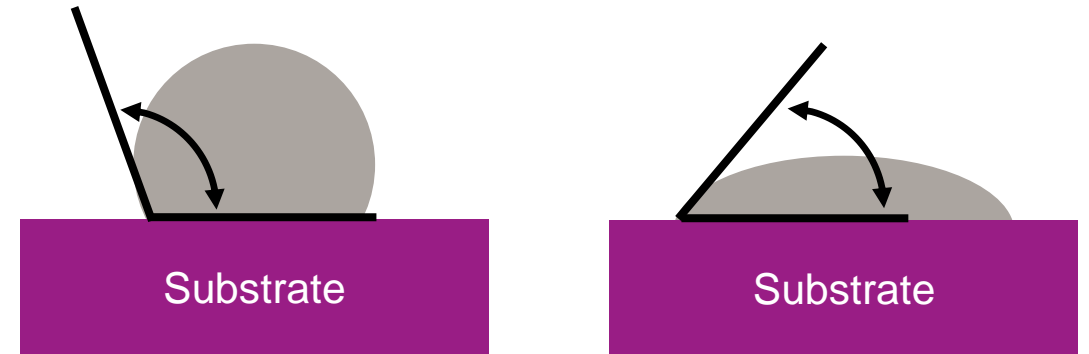
\* product is not soluble in water

● recommended ○ suitable

# Wetting agents reduce surface tension of liquids

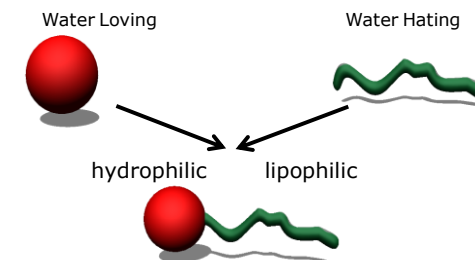
## Wetting agents

- are surface active molecules that reduce surface tension of liquids by migration to different surfaces/interfaces
- are surfactants that are optimized for substrate wetting
- have a partly hydrophilic and partly lipophilic character
- affect wetting performance, foaming behavior and dispersion/emulsion stability



poor surface wettability  
surface tension (droplet) >  
surface energy (substrate)  
contact angle >90°

good surface wettability  
surface tension (droplet) <  
surface energy (substrate)  
contact angle < 90°



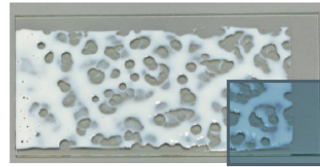
# What benefits can we achieve with our wetting agents?

## Substrate Wetting



- Wetting of low surface energy surfaces
- Improvement of Adhesion
- Improved levelling of thick layers
- Improved gloss

Without wetting agent!



Craters, e.g. due to not sufficient surface tension or silicone oil containing antifoam



Defects, e.g. due to hydrophobic particles used as raw material in antifoam formulations

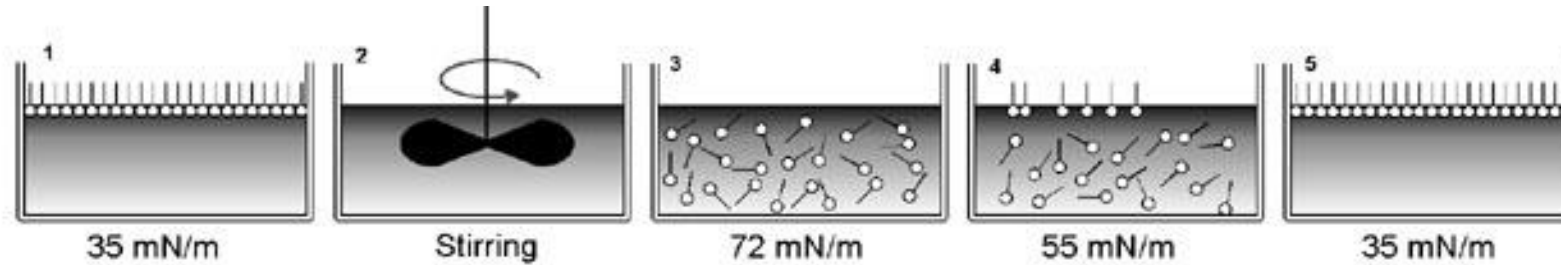
Such adhesive films need to be wasted, since delamination of labels, tapes or films could appear

Dewetting, delamination or even splitting of adhesive curtain during curtain coating

With wetting agent!



# Dynamic processes require low “Dynamic Surface Tension” (DST)



Source: <https://www.kruss-scientific.com/services/education-theory/glossary/dynamic-surface-tension/>

Surface tension is lowered when wetting agent molecules assemble at the air/liquid interface.

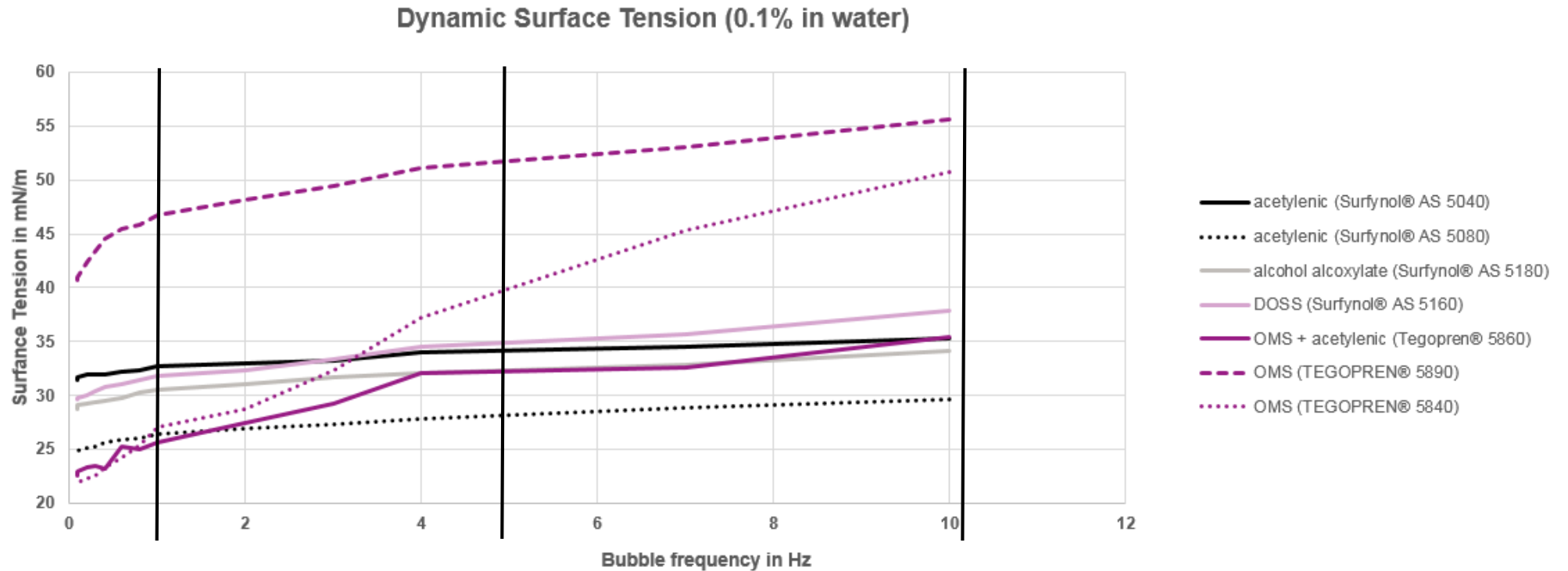
When the surface changes, wetting agents are moved from the surface and must move back to new surface. Different wetting agents move at different speeds. Speed is also depending on interactions of the wetting agent with liquid phase.

The surface tension during this time is called “Dynamic surface tension” (DST).

For uniform substrate wetting, surfactants have to migrate rapidly to the new interfaces.

Adhesives are often applied in coating processes at high speeds, creating large surface areas very quickly.

# Different processes require different wetting agents



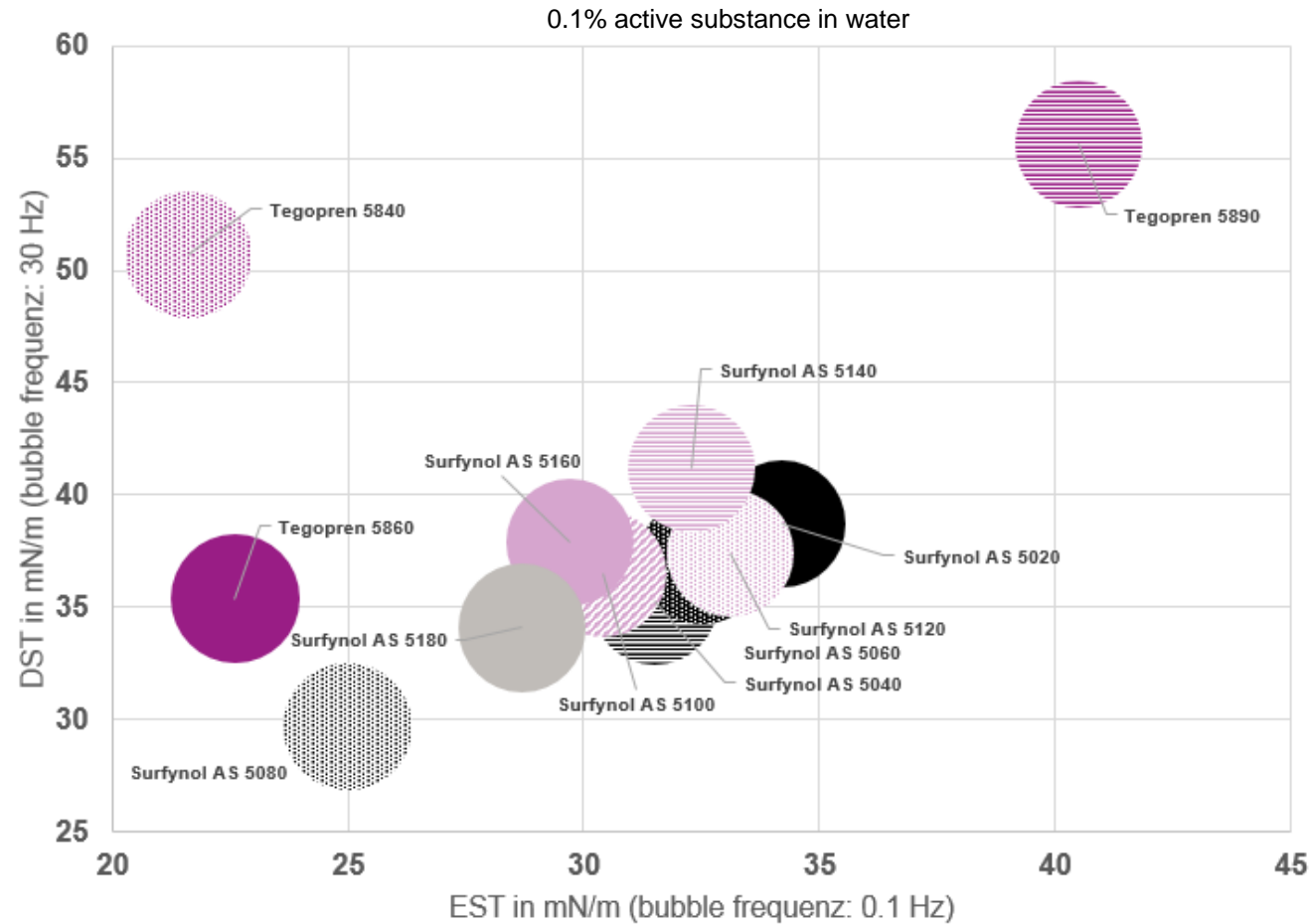
Static: long bubble life time/low bubble frequency is corresponding to spreading of adhesive onto low energy substrates

Moderately dynamic: e.g. brush or roller application

Highly dynamic: short bubble life time/ high bubble frequency correlates with high speed applications (e.g. curtain coating or spray applications)

(SURFYNOL® AS 5000 & TEGOPREN® 5885 are not soluble in water: measurement is not possible)

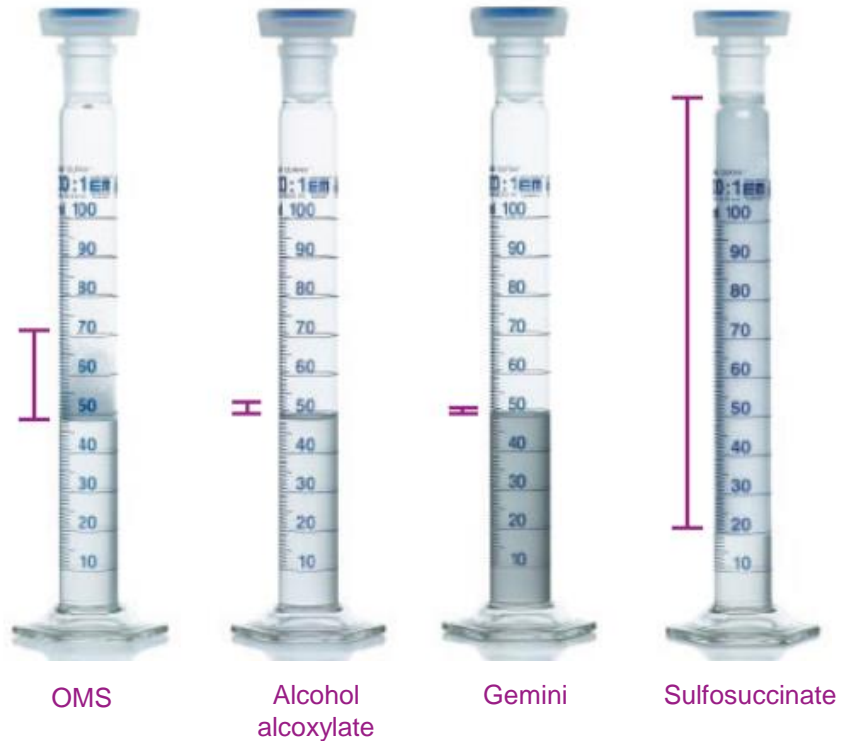
# Wetting agents – correlation of dynamic (DST) & static (EST) surface tension



- acetylenic (Surfynol® AS 5020)
- ≡ acetylenic (Surfynol® AS 5040)
- ⊠ acetylenic (Surfynol® AS 5060)
- ⊞ acetylenic (Surfynol® AS 5080)
- ⋈ DOSS + acetylenic (Surfynol® AS 5100)
- ⊞ DOSS (Surfynol® AS 5120)
- ≡ DOSS (Surfynol® AS 5140)
- DOSS (Surfynol® AS 5160)
- alcohol alcoxylate (Surfynol® AS 5180)
- ⊞ OMS (TEGOPREN® 5840)
- OMS + acetylenic (Tegopren® 5860)
- ≡ OMS (TEGOPREN® 5890)

(SURFYNOL® AS 5000 & TEGOPREN® 5885 are not soluble in water: measurement is not possible)

# Wetting agents - Influence on foaming properties

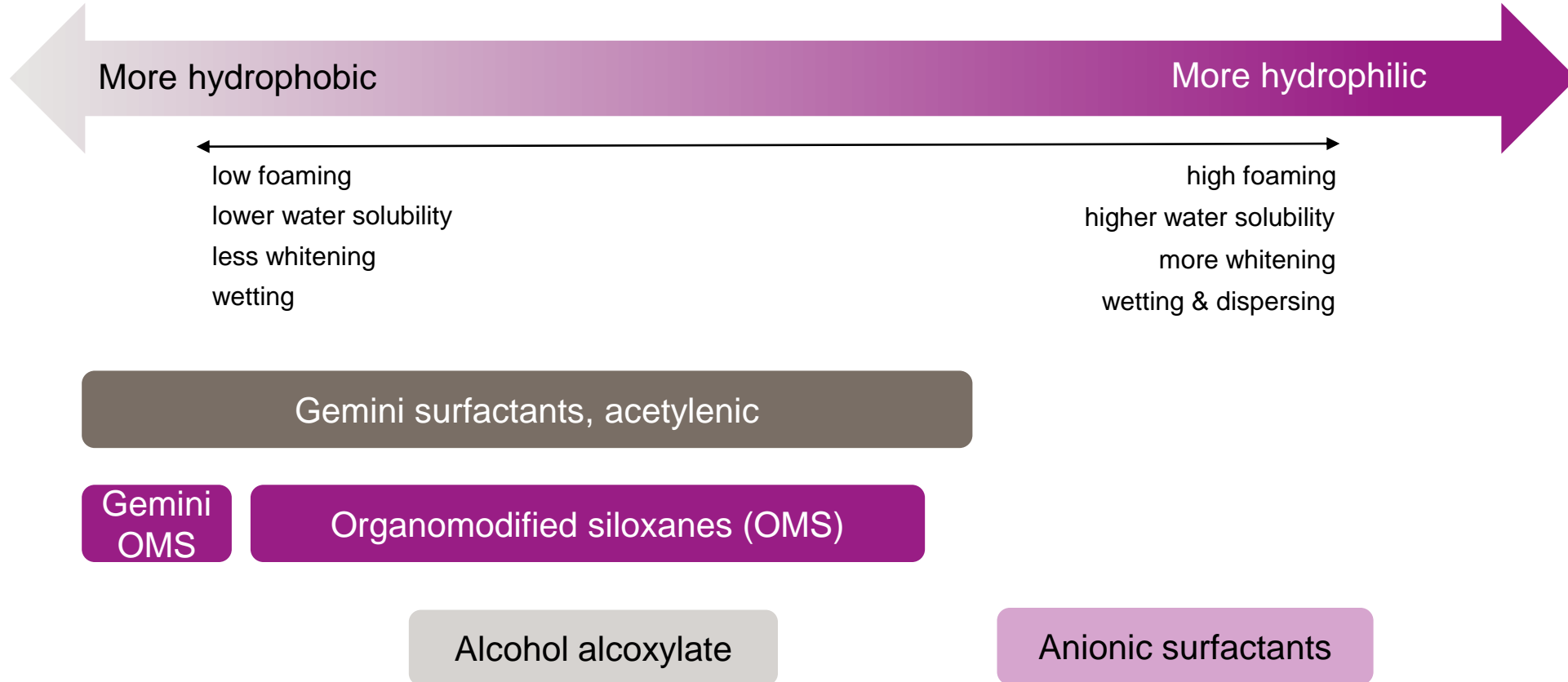


Sulfosuccinates often show good compatibility in a system, but high foam formation. Usage of an additional defoamer is necessary.

The Evonik additive portfolio contains also low foaming high performance wetting agents in addition to sulfosuccinate based products.



# Wetting agents in our portfolio

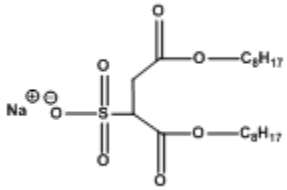


# Wetting agents - Available technologies in our portfolio

Technology	Product	Properties
Sulfosuccinate	SURFYNOL® AS 5160 SURFYNOL® AS 5140 SURFYNOL® AS 5120	<ul style="list-style-type: none"> <li>▪ common wetting agent for different applications;</li> <li>▪ high foaming properties</li> <li>▪ low water resistance → whitening effects are possible</li> <li>▪ broad food contact compliance</li> <li>▪ hydrophilic character: AS 5160 &gt; AS 5140 = AS 5120</li> </ul>
Alcohol alcoxylate	SURFYNOL® AS 5180	<ul style="list-style-type: none"> <li>▪ for curtain coating processes &amp; applications on fast running machines</li> <li>▪ low foaming properties</li> <li>▪ hydrophobic character</li> </ul>
Organomodified siloxane (OMS)	TEGOPREN® 5840 TEGOPREN® 5860 (blend with Gemini, acetylenic) TEGOPREN® 5890	<ul style="list-style-type: none"> <li>▪ for wetting of substrates with low surface energy</li> <li>▪ medium foaming properties</li> <li>▪ 5840 &amp; 5860: for low surface energy substrates</li> <li>▪ 5890: for applications requiring food contact compliance; hydrophilic character; helps to keep a coated adhesive layer “in form” on low energy substrates (low shrinkage of wet film, stabilizes wetting effects)</li> </ul>
Gemini (OMS)	TEGOPREN® 5885	<ul style="list-style-type: none"> <li>▪ product for niche applications; works well in dispersions which contain relative high quantities of emulsifiers</li> <li>▪ good balance between defoaming and wetting properties</li> <li>▪ very hydrophobic character</li> </ul>
Gemini (acetylenic)	SURFYNOL® AS 5000 SURFYNOL® AS 5020 SURFYNOL® AS 5040 SURFYNOL® AS 5060 SURFYNOL® AS 5080 SURFYNOL® AS 5100 (blend with sulfosuccinate)	<ul style="list-style-type: none"> <li>▪ dynamic wetting agents for curtain coating processes &amp; applications on fast running machines</li> <li>▪ for wetting of substrates with low surface energy</li> <li>▪ low foaming properties</li> </ul>

# Wetting agents - Available technologies in our portfolio

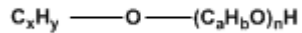
## Sulfosuccinate



SURFYNOL® AS 5160  
SURFYNOL® AS 5140  
SURFYNOL® AS 5120

Common wetting agent  
for different applications

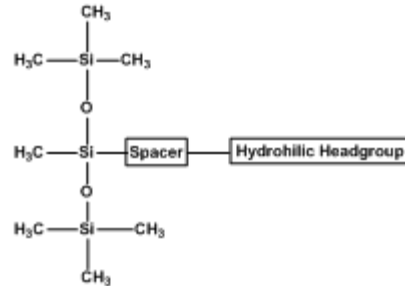
## Alcoxylate



SURFYNOL® AS 5180

curtain coating &  
fast running machines

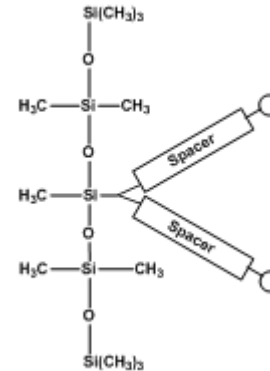
## Organomodified siloxane (OMS)



TEGOPREN® 5840  
TEGOPREN® 5890  
TEGOPREN® 5860 (blend with  
Gemini, acetylenic)

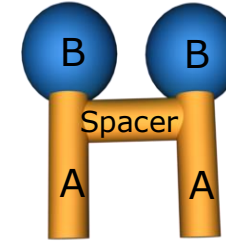
Wetting of substrates with low  
surface energy e.g laminate

## Gemini (OMS)



TEGOPREN® 5885

## Gemini (acetylenic)



SURFYNOL® AS 5000  
SURFYNOL® AS 5020  
SURFYNOL® AS 5040  
SURFYNOL® AS 5060  
SURFYNOL® AS 5080

SURFYNOL® AS 5100 (blend with  
sulfosuccinate)

dynamic wetting agents with  
low foaming properties

curtain coating &  
fast running machines



**EVONIK**

**Leading Beyond Chemistry**