

The background of the entire image is a blue-tinted photograph of an industrial facility, likely a refinery or chemical plant, featuring complex piping, metal walkways, and large storage tanks. In the foreground, two workers are visible within a white circular frame. One worker, on the left, wears a white hard hat and a light blue long-sleeved shirt. The other worker, on the right, wears a yellow hard hat and a high-visibility yellow safety vest over a dark shirt. They are both wearing dark trousers and high-visibility yellow safety boots, and appear to be engaged in a conversation on a metal walkway.

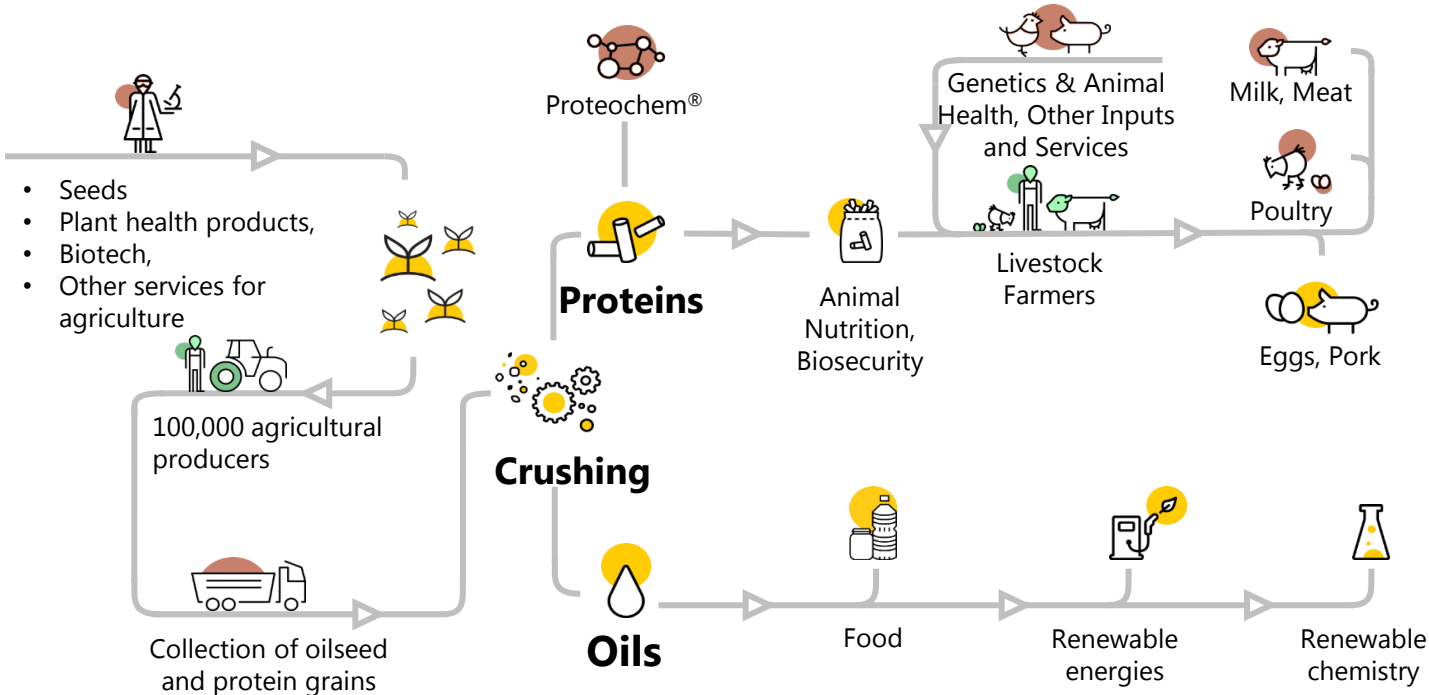
# RADIUSURF ML

THE NATURAL BIOSURFACTANT BY OLEON

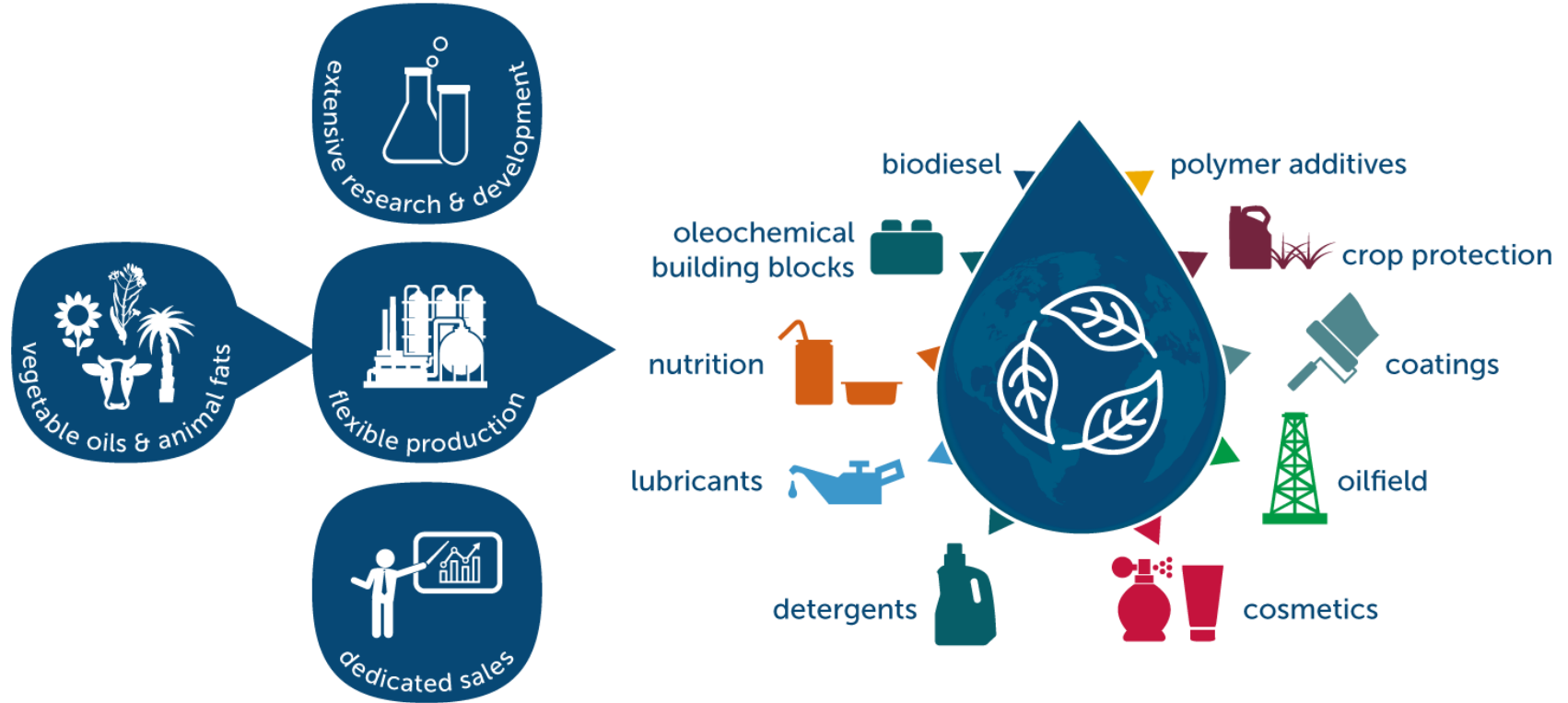
**oleon**  
a natural chemistry

# OUR SHAREHOLDER

FROM GRAIN TO FINISHED PRODUCTS



# WHAT WE DO



# OUR KEY FIGURES

1000  
employees



market share of **25%** in  
Europe

2016 turnover  
+ **€ 630** mio



**oleon**  
a natural chemistry



+ **530.000**

tons/year  
87 % Renewable Raw Materials

**6** production  
plants



**12** offices  
in Europe, USA and Asia



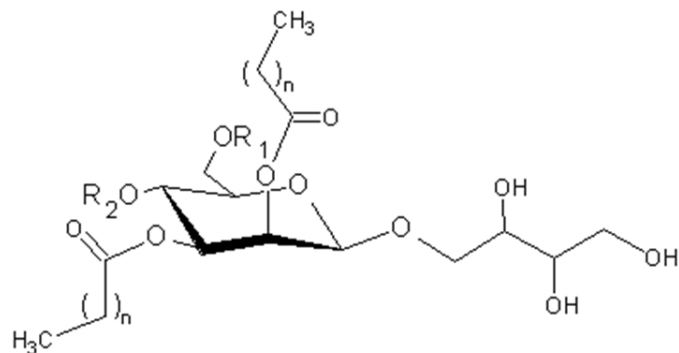
# OLEON RADIA RANGE OF ESTERS

A LARGE NUMBER OF BIOBASED EMULSIFIERS FOR PESTICIDES, SKIN CARE, FOOD AND MANY OTHER APPLICATIONS

- Mono & Diglycerides
- Cytrilated Mono & Diglycerides
- Lactylated Mono & Diglycerides
- PEG Esters
- Glycerol & Polyglycerol Esters
- Propyleneglycol Esters
- Sorbitan Esters



# RADIUSURF ML: THE NATURAL BIOSURFACTANT BY OLEON



MANNOSYLERYTHRITOL LIPIDS



ECO-FRIENDLY MOLECULE



VERY HIGH SURFACE ACTIVITY



VERSATILE CHARACTERISTICS

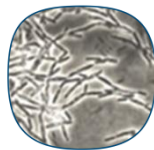
# THE 'NATURAL' CONCEPT BY OLEON BIOTECH



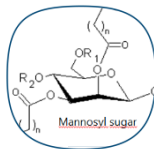
*A process inspired by nature !*



Raw Material : A natural Vegetable Oil

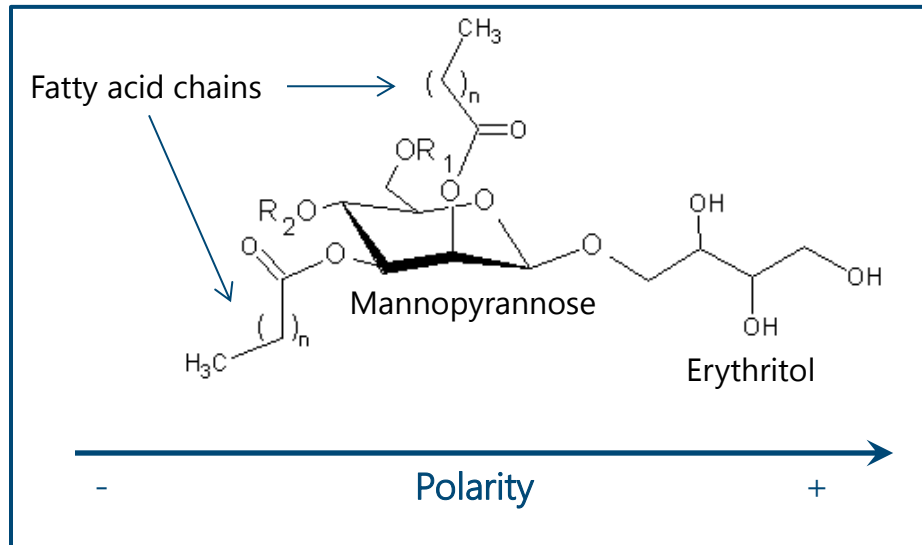


Catalyst : A natural non GMO microorganism (Yeast)

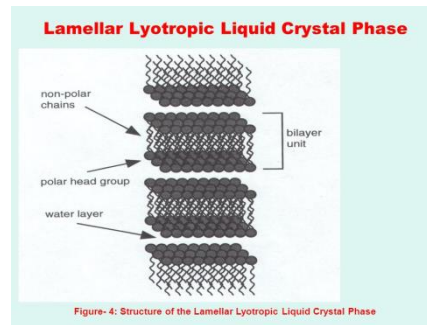


Biosurfactant : a product which already exists in the nature

# STRUCTURE : MANNOSYLERYTHRITOL LIPID



*A BICATENARY NON-IONIC SURFACTANT WITH  
GRADIENT OF POLARITY  
(PSEUDO-GEMINI SURFACTANT)*



## Structure

- Short fatty acid chain
  - $n = 8 - 12$
- Partially acetylated

## Composition : a mixture of 4 molecules

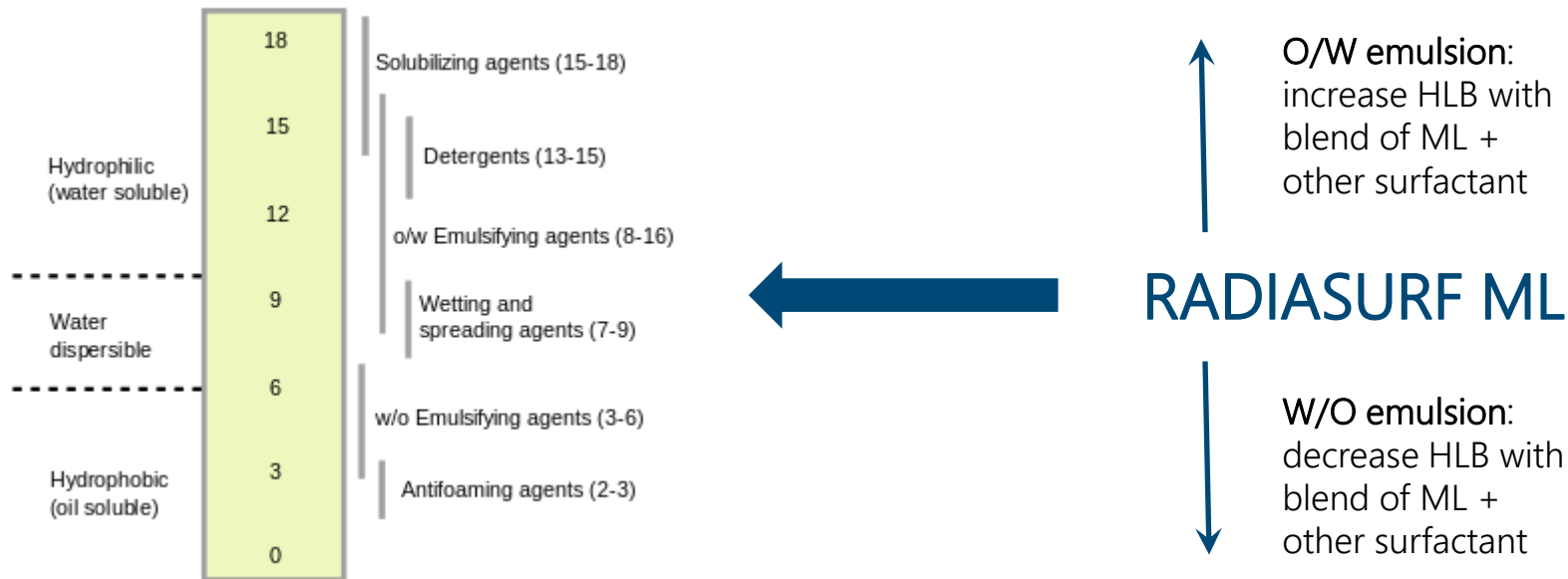
- MEL-A:  $R_1 = R_2 = \text{acetyl}$
- MEL-B:  $R_1 = \text{acetyl}$  and  $R_2 = \text{H}$
- MEL-C:  $R_1 = \text{H}$ ,  $R_2 = \text{acetyl}$
- MEL-D:  $R_1 = R_2 = \text{H}$

↑ -  
Polarity  
+



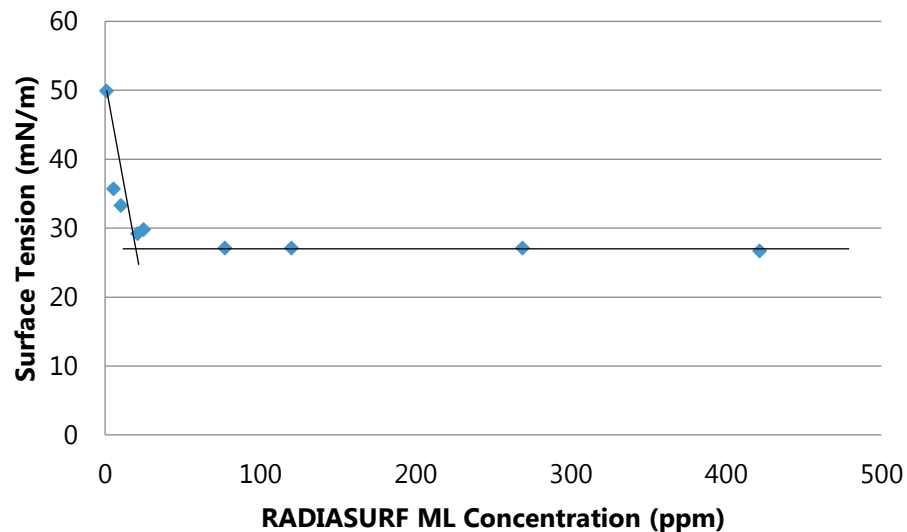
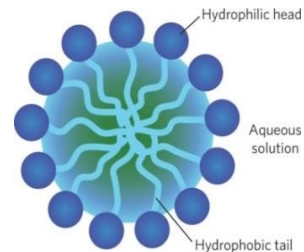
# HYDROPHILIC LIPOPHILIC BALANCE (PIT METHOD)

→ HLB between 8 and 10 : O/W emulsifier - Wetting agent



# HIGH SURFACE ACTIVITY – CRITICAL MICELLE CONCENTRATION

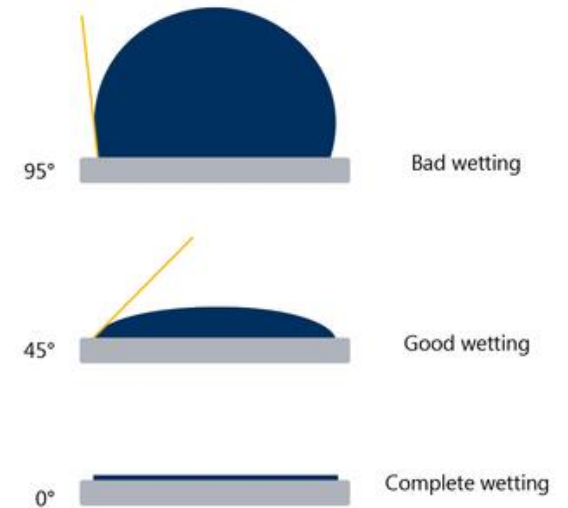
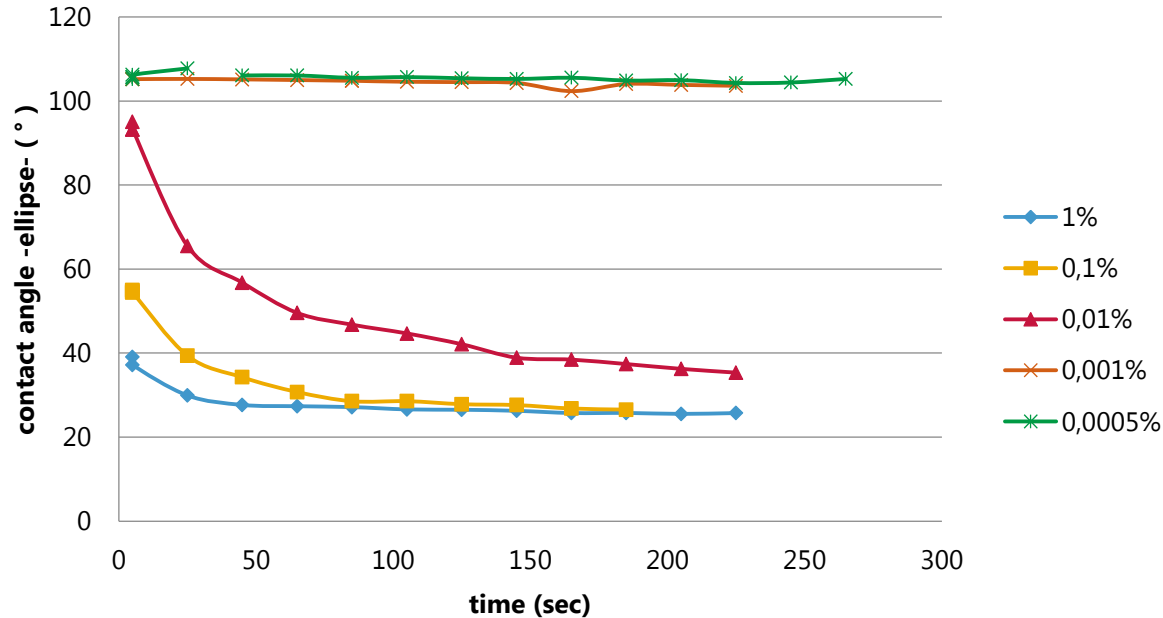
SURFACTANT	CMC (PPM)	SURFACE TENSION (mN/m)
<b>RADIUSURF ML</b>	<b>1-10</b>	<b>26.1</b>
POLYSORBATE 80	13-15	30.0
APG C10 & C16	48	28.4
POLYSORBATE 20	60	32.0
PEG8-LAURATE	114	28.0
SLES-2EO (23% ACTIVE)	171	25.0
SDS (29% ACTIVE)	185	26
SOPHOROLIPIDS	553	35,6
LECITHIN	1000	25.2



# HIGH SURFACE ACTIVITY – WETTING PROPERTIES ON APOLAR SURFACE

## Wetting on parafilm (apolar surface)

RADIUSURF ML in demin water



# THICKENING, CLEANSING AND FOAMING AGENT



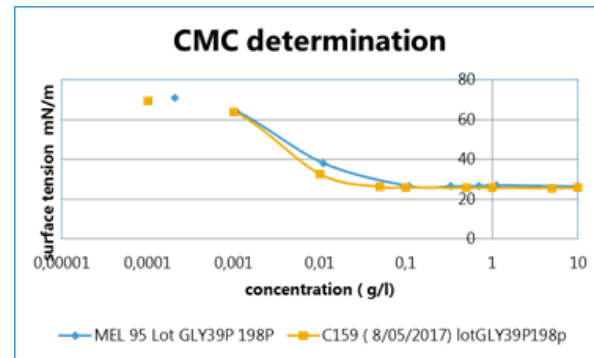
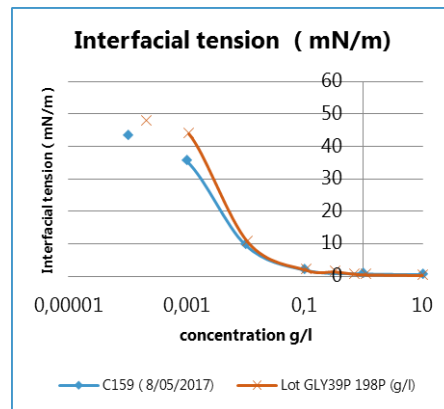
C159 = RADIASURF ML10 + POLYGLYCEROL FATTY ACID ESTER (PG4 CAPRATE – JOLEE 7931)



- To overcome high viscosity and water insolubility of ML10
- To replace Cocamide DEA or SLS or SLES in formulation

PROPERTIES	UNIT	RESULT
pH 1% in water		4,75
Dynamic viscosity @ 20°C	Pa.s	142,4
Dynamic viscosity @ 25°C	Pa.s	83,16
Dynamic viscosity @ 40°C	Pa.s	13,72
Density @ 60°C	g/cm3	1,11998
1% in water Surface tension @ 25°C K100/K10	mN.m	25,8
1% in water Inter facial tension against Min. oil @ 25°C	mN.m	0,7
HLB (slope PIT)		9,8

$CMC_{ML10} = 15 \text{ ppm}$   
 $CMC_{C159} = 12 \text{ ppm}$



# BOOSTER OF YOUR FOAMING FORMULATIONS



## ○ Cleansing:

- Caps with foundation (0,1 g)
- Contact with different test solutions in water for 15 min while shaking
- Quantification of make-up removal

Test	Set-up	Removal (%)
1	0,1% C159	96
2	0,5% C159	99
3	0,1% SLES	91
4	0,5% SLES	98
5	-	82

## ○ Thickening + foaming + cleansing



Shampoo formulation



# BOOSTER OF YOUR FOAMING FORMULATIONS

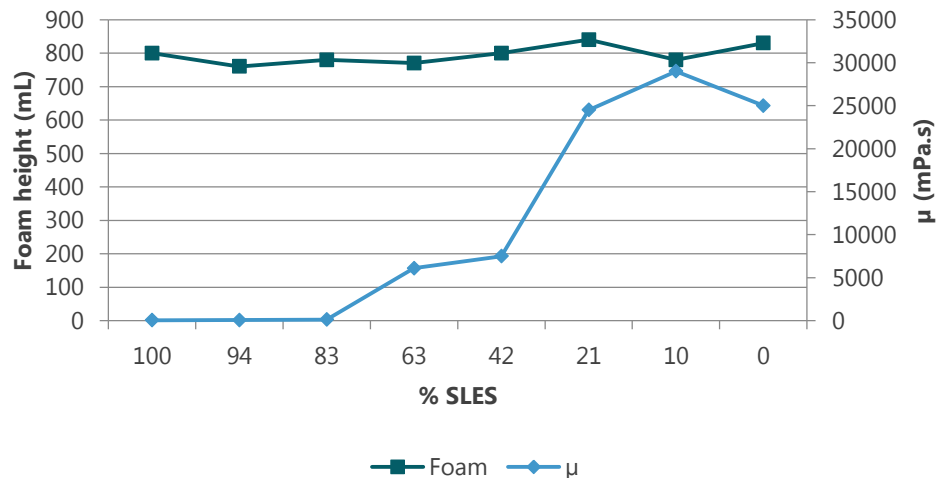
## SHAMPOO



Raw material	wt%
Water	up to 100,0
C159	0,0-48,0
SLES	0,0-48,0
Cocoamidopropyl betaine	3,0
Sodium benzoate	0,5
Perfume	0,2
pH regulator	Till pH 5,8
<b>Total</b>	<b>100,0</b>

### ○ Process:

- Disperse SLES and/or C159 in water
- Adjust pH to 5,8 with citric acid → mix
- Add cocoamidopropyl betaine → mix
- Add preservative and fragrance → mix



# BOOSTER OF YOUR EMULSIFICATION POWER (O/W EMULSIONS)

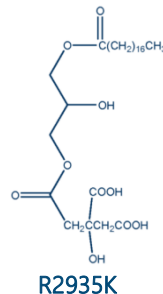
C161 = RADIASURF ML10 + GLYCEROL OLEATE CITRATE

- Glycerol oleate citrate (R2935K) is known O/W emulsifier (HLB = 13)

- Combination with Radiesurf ML10 = C161



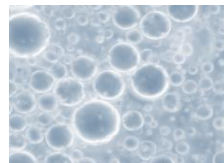
- 100% renewable carbon
- Like C159, no influence on physico-chemical properties
- Liquid @ ambient temperature → cold processing
- Fully dispersible in water
- Macro-emulsion → nano-emulsion
  - Water thin emulsions → water thin and sprayable (< 4000 mPa.s)
  - Stable > 2 months @ room temperature → wet wipes



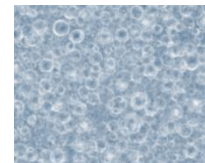
Ingredient	wt%
Water	70
MCT	27
Emulsifier	3

Mix water and emulsifier  
Gradually add oil  
Mix intensively for 1 min (Ultra-Turrax)  
Mastersizer analysis

Emulsifier	Dv(10) (µm)	Dv(50) (µm)	Dv(90) (µm)
R2935K	9,2	22,3	40,1
C159	0,1	0,4	3,3



R2935K



C161

RADIASURF ML – THE NATURAL BIOSURFACTANT BY OLEON



# BOOSTER OF YOUR EMULSIFICATION POWER

## O/W EMULSIONS – WET WIPE FORMULATION

Phase	Raw material	wt%
A	Emollients (R7202, R7750 & R7104)	33,0
B	Glycerine	2,5
	Water	Up to 100,0
	R2935K or C161	3,0
C	Perfume	0,2
	Preservative	0,2
Total		100,0

### ○ Process:

- Blend phases A and B separately at ambient T
- Add A to B under high stirring (1300 rpm)
- Homogenize with Ultra-Turrex (10 000 rpm) for 1 min
- Add phase C during stirring

	R2935K	C161
$\mu$ (mPa.s)	26,0	12,0
Microscopy		

Dv(50) 3,5  $\mu\text{m}$   $\rightarrow$  0,03  $\mu\text{m}$   
Nano-emulsion

# BOOSTER OF YOUR EMULSIFICATION POWER (W/O EMULSIONS)

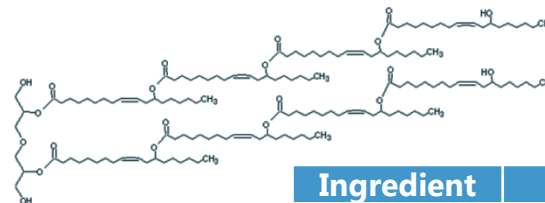
## W/O EMULSIONS

- Polyglycerol polyricinoleate (R2251K) is known W/O emulsifier (HLB = 3)

- Combination with Radiesurf ML10 = C162



- 100% renewable carbon
- Like C159 & C161, no influence on physico-chemical properties
- Liquid @ ambient temperature → cold processing
- Compatible with standard oils e.g. sunflower, MCT, ...
- Decrease in particle size & viscosity
- Improved stability even under challenging processing conditions (high pressure homogenizer or anti-spattering test)

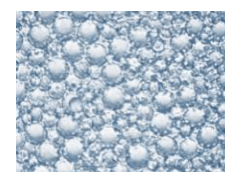
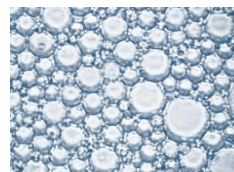


Ingredient	wt%
Water	69
MCT	30
Emulsifier	1



Mix oil and emulsifier  
Gradually add water under stirring  
Mix intensively for 1 min (Ultra-Turrax)  
Homogenize 1 min  
Mastersizer analysis

Emulsifier	Dv(10) (µm)	Dv(50) (µm)	Dv(90) (µm)
R2251K	9,8	17,8	31,0
C162	1,8	3,6	22,5



# BOOSTER OF YOUR EMULSIFICATION POWER

## W/O EMULSIONS – SUNSCREEN FORMULATION

Phase	Raw material	wt%
A	Emollients (R7202, R7750 & R7104)	20,5
	R2251K or C162	4,0
B	Glycerine	4,0
	Water	Up to 100,0
	MgSO <sub>4</sub> .7H <sub>2</sub> O	0,8
C	UV filters (Avobenzone & Oxybenzone)	9,0
D	Perfume	0,2
	Preservative	0,2
Total		100,0

### ○ Process:

- Heat phase A and B separately till 75°C
- Add B to A under high stirring (1300 rpm)
- Homogenize with Ultra-Turrex for 1 min
- Below 40°C add components of phases C and D

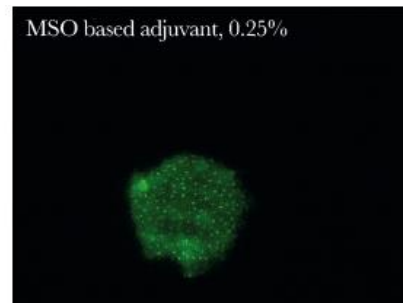
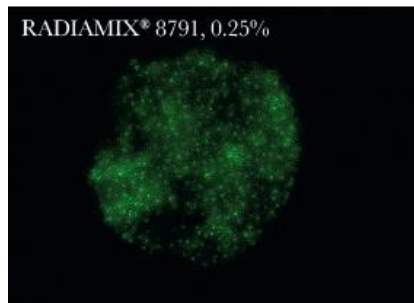
	R2251K	C162
μ (mPa.s)	1780	3100
Microscopy		

# CROP PROTECTION



## ○ Adjuvant

- Biosurfactant
- Wetting adjuvant



## ○ Biocontrol : a natural booster for your formulation

- Facilitation of biocontrol mechanisms of microbes
- Plant pathogen elimination and increased bioavailability of nutrients for beneficial plant-associated microbes





**PATENTED**

„New Powerful 100% renewable biosurfactant.“ presented by Oleon

17/06/2016 from 11:20-11:40 in Regency Grand Ballroom Main

built-in

in-can RTU adjuvant

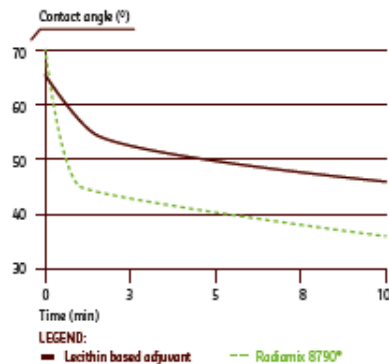
## **RADIUSURF® 8780** BIOSURFACTANT FOR HYDROPHILIC FORMULATIONS

Oleon biotechnology developed a safe, non-toxic and ecofriendly wetting agent for hydrophilic formulations based on a 100% renewable biosurfactant: Mannosyl Erythritol Lipid (MEL).

NAME	RADIUSURF® 8780
Aspect	Cloudy
Density at 20°C (g/mL)	1,024
Flash point (°C)	94
Viscosity at 20°C (mm²/s)	197
pH, 1% in demi water	7,4

## **RADIAMIX® 8790** WETTING ADJUVANT

Based on RADIUSURF® 8780, Oleon developed a new non-phytotoxic wetting adjuvant demonstrating good penetration efficiency, low foaming potential and good storage stability.





**PATENTED**

„New Powerful 100% renewable biosurfactant.“ presented by Oleon

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## RADIUSURF® 8781

### BIOSURFACTANT FOR HYDROPHOBIC FORMULATIONS

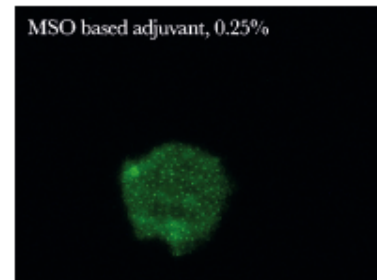
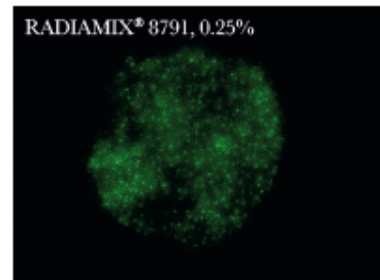
Oleon biotechnology developed a safe, non-toxic and ecofriendly wetting agent for hydrophobic formulations based on a 100% renewable biosurfactant: Mannosyl Erythritol Lipid (MEL).

NAME	RADIUSURF® 8781
Aspect	Cloudy
Density at 20°C (g/mL)	0.956
Flash point (°C)	94
Viscosity at 20°C (mm²/s)	83
pH, 1% in demi water	7,7

## RADIAMIX® 8791

### CROP OIL CONCENTRATE

Based on RADIUSURF® 8781, Oleon developed a new non-phytotoxic penetrating adjuvant with good wetting properties, low foaming potential and good storage stability.



Source: *Biotransfer*

RADIAMIX® 8791 shows better penetration and wetting properties than an MSO based adjuvant when testing on CHEAL leaves.



## THANK YOU

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Business Developer Biotechnology

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