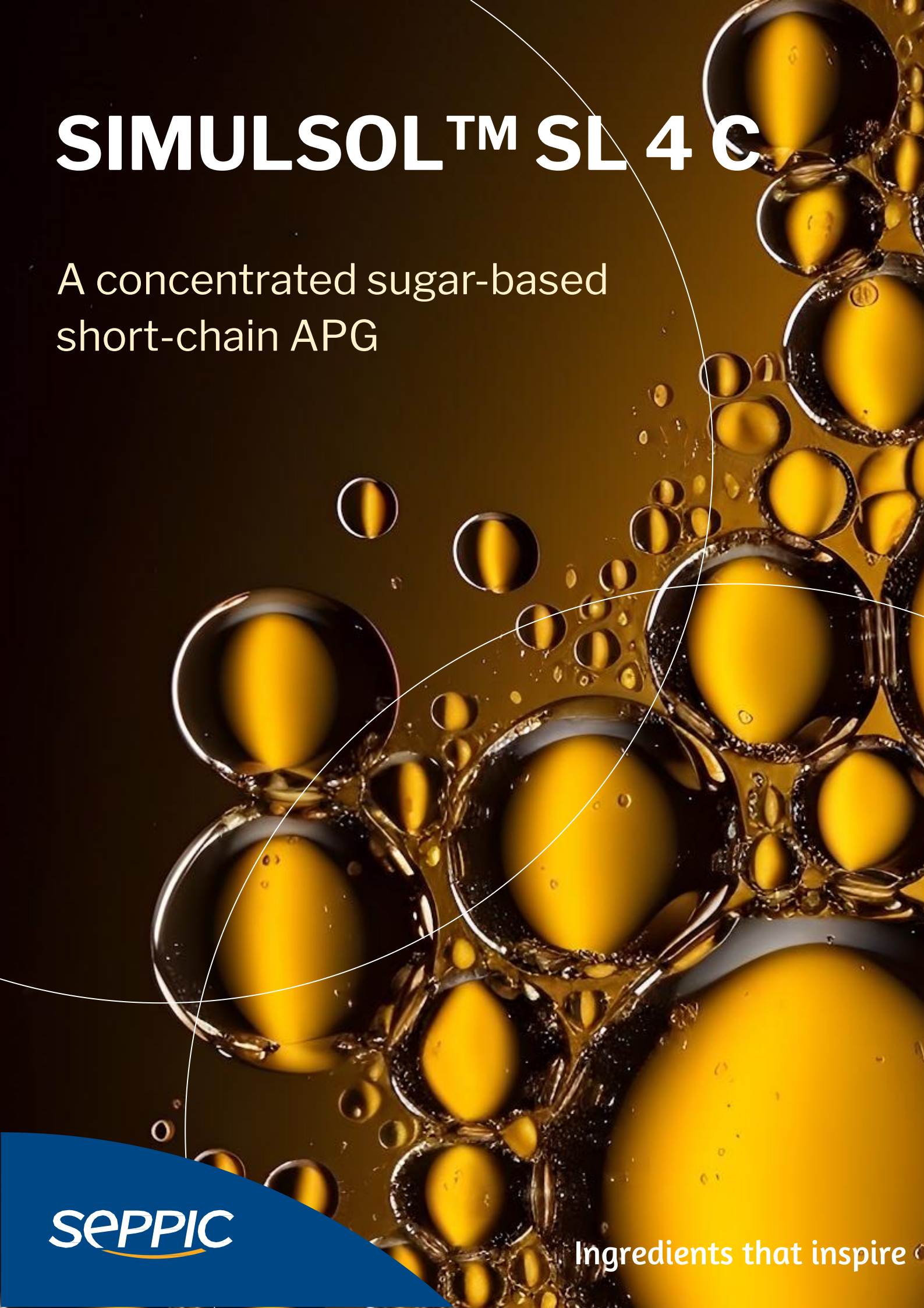
SIMULSOL™ SL 4 C

A concentrated sugar-based short-chain APG



SEPPIC

Ingredients that inspire

SIMULSOL™ SL 4 C

Identity card

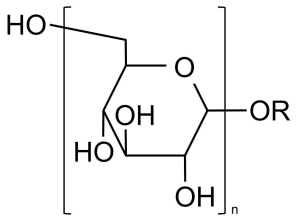
- *Non-ionic surfactant*
- *No safety labelling required*
- *No cloud point*
- *No flash point*
- *Stable upon heating*
- *Readily biodegradable*
- *Low bioaccumulative potential*
- *Easy to handle: liquid form*
- *Compatible with non-ionic, anionic and cationic surfactants*
- *Non foaming*
- *Suitable for highly alkaline or acidic or electrolytic media*
- *Reduces the viscosity of surfactant formulations without impacting performances*

What is it?

SIMULSOL™ SL 4 C is an **alkylpolyglucoside** prepared from glucose and butanol.

Its numerous properties like **low foaming power**, **wide range of pH compatibility, electrolyte resistance, viscosity reduction** and its safety profile with **readily biodegradability**, **low bioaccumulation potential**, **no flash nor cloud points** make it ideal for a large range of applications: **detergence**, **agro**, **drilling fluids, chemical synthesis** etc.

Chemical/Physical Properties	
Appearance at 20°C	Limpid liquid
Colour (Gardner)	1 - 5
HLB	16.3
Solid content (%)	65 - 75
pH	5 - 7
Freezing point	less than - 20°C
Shelf-life	2 years (test for 3 years on going)



$R = nC_4H_9$

Chemical formula

SIMULSOL™ SL 4 C is supplied in liquid form and is easy to handle.

Regulatory & safety profile

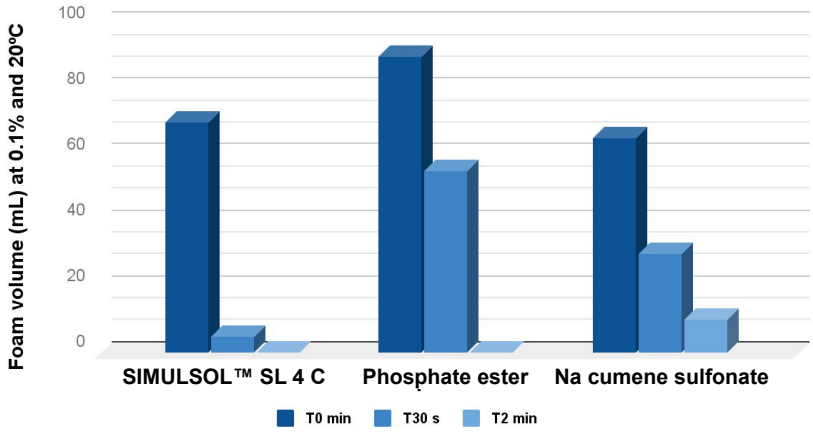
- **TSCA** (USA)
- Suitable for **Ecolabels** (DID listed - Part A, 2134)
- **CEFAS** *on going*
- **DFE - US CleanGredients** *on going*
- **No safety labelling required**
- **Readily biodegradable** (anaerobic: ISO 11734 / aerobic - read-across: OECD 301F)
- **Low bioaccumulative potential**

Properties & applications: HI&I

Low foaming power

SIMULSOL™ SL 4 C has a low foaming power, making it **ideal for mechanical cleaning processes** like **automatic dishwashers**, **surface washing**, **cleaning in place** ...

Foam volume of SIMULSOL™ SL 4 C vs benchmarks



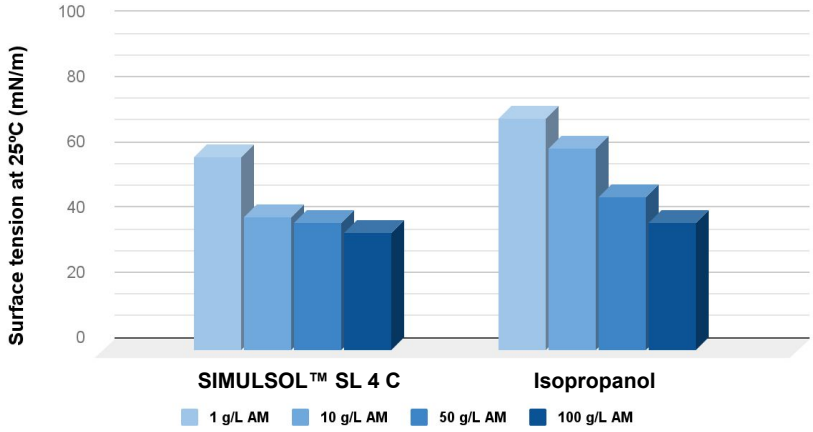
Foaming properties have been measured using a bubbling method and expressed as the volume (in mL) of initial foam after 30 seconds and 2 minutes.

SIMULSOL™ SL 4 C has **less foaming power** than phosphate ester and sodium cumene sulfonate while having a **good compatibility with various types of surfactants.**

Reduction of surface tension

SIMULSOL™ SL 4 C lowers the surface tension, thus being able to **enhance wettability** and partially **replace solvents.**

Surface tension of SIMULSOL™ SL 4 C vs isopropanol



Surface tension has been measured and expressed as the force (in mN) by the surface (in m) according to the active matter concentration.

SIMULSOL™ SL 4 C has **better surface tension reduction properties** than isopropanol while **no flash point**.

Properties & applications: HI&I

Multiple compatibilities

Thanks to its **non-ionic structure**, SIMULSOL™ SL 4 C is **compatible with all types of surfactants** (anionic, cationic, non-ionic) as well as **electrolyte-rich formulations.** They are also suitable to clean specific surfaces like plastics as they do not cause any stress cracking.

Very good stability

Thanks to its structure, SIMULSOL™ SL 4 C is **extremely stable:**

- upon **heating**
- in **highly alkaline solutions**
- in **acidic solutions.**

Hydrotropic properties

Hydrotropic compounds are common in detergence applications. They allow **adjusting the cloud point and clarity of formulas** and **indirectly influence the cleaning efficacy**. They work by **destabilizing liquid crystalline phases** that may appear[(1)]. In a study evaluating different APGs, **butyl glycoside was assessed the most efficient in destabilizing liquid crystalline phases** in a system of water, sodium dodecyl sulfate and pentanol[(2)], thus making it **promising for stability adjustments** in HI&I applications, in liquids as well as in compact formats [(3)].

Viscosity reduction

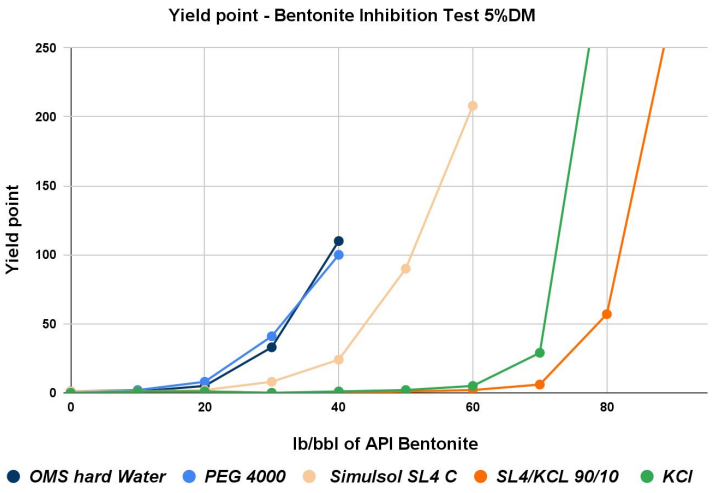
SIMULSOL™ SL 4 C allows a **significant reduction of the viscosity of surfactant formulations** and is advantageous versus conventional viscosity modifiers thanks to its safety and good biodegradability profile.

(1) A. Matero, Å Mattsson & M. Svensson, *Alkyl polyglucosides as hydrotropes,* J Surfact Deterg 1, (1998), 485–489.
(2) A. Ferhat & H. Boulouh, *Formulation of a liquid dishwashing detergent from alkyl polyglycosides*, Graduation dissertation, 2011.
(3) B. Renault, *New surfactants derived from alkyl polyglycosides. Synthesis and physico-chemical evaluation*, Doctoral thesis, Université de reims champagne-ardenne, 2009.

Properties & applications: Drilling fluids

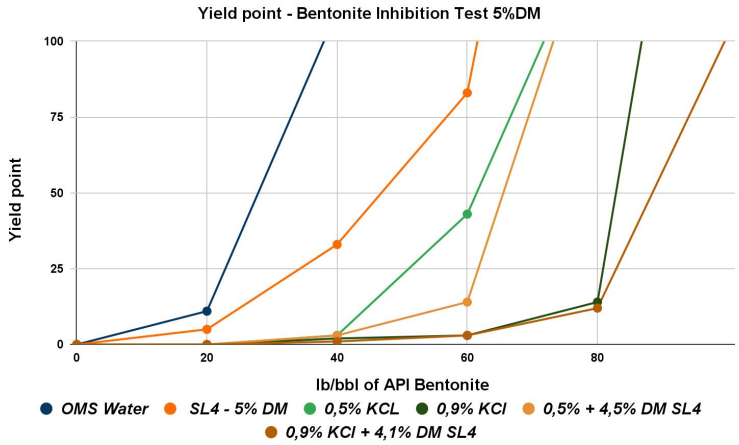
Booster of shale inhibition in drilling fluids

SIMULSOL™ SL4 C demonstrated **interesting properties for drilling fluid applications**, especially water-based muds, commonly used in drillings on unconsolidated or depleted geology. The results obtained (see below) indicate **good performance** and **show potential**, especially in the field of **low-depths drillings** at moderate temperatures.



Method : Bentonite : 10lb/bbl ~ 28.53g/L initial concentration + 28.53g/L after each ageing – Shale inhibitor : 5%AM or DM - Fann viscosimeter – ageing 16h-150° F (=66°C) - The best product is determined by the maximum quantity of added clay before the thickness.

SIMULSOL™ SL4 C increases the shale inhibition of KCl brines. It is intrinsically **more efficient** than PEG 4000, a **market benchmark**.



Method: Bentonite : 20lb/bbl ~ 57.1g/L initial concentration + 57.1g/L after each ageing – Shale inhibitor : 5%AM or DM - Fann viscosimeter – ageing 16h-150° F (=66°C) . The best product is determined by the maximum quantity of added clay before the thickness.

Optimum ratio measured for **shale inhibition** was: **4.5% dry matter eq. SIMULSOL™ SL 4 C** with a **0.9% KCl solution.**

Properties & applications
Chemical synthesis

A stable compound to use in synthesis processes

Butyl glycoside is a **stable compound to use in synthesis processes**. A few processes were documented and unveil its potential :
- A **transglycosylation process** with fatty alcohols **to synthesize long-chain alkyl polyglycosides** [1], [2]
- An **esterification process to synthesize sugar fatty acid esters**. [3]

Properties & applications
Agriculture

A product with ideal properties

SIMULSOL™ SL 4 C demonstrates **many benefits seeked by agricultural applications**[4]:
- **Low surface tension & wetting properties**, thus increasing spreading & penetration of active substances and performance,
- **Electrolyte resistance**, important and key in active-ionic-substance-rich formulations
- **No cloud** point phenomenon,
- **Environmental-friendly** ecotoxicity profile.

(1) R. Donat, V. Demirel, *Synthesis of Some Alkyl Polyglycosides,* Int. J. Sec. Metabolite, Vol. 9, No. 1, (2022) pp. 52-65
(2) B. Renault, *New surfactants derived from alkyl polyglycosides. Synthesis and physico-chemical evaluation*, Doctoral thesis, Université de reims champagne-ardenne, 2009.
(3) S. Sangiorgio, E. Pargoletti, M. Rabuffetti et al., *Emulsifying properties of sugar-based surfactants prepared by chemoenzymatic synthesis*, Colloid and Interface Science Communications 48 (2022) 100630.
(4) K. Hill, W. von Rybinski, G. Stoll, *Alkyl polyglycosides, Technology, properties & applications*, Weinheim ; New York ; Basel ; Cambridge ; Tokyo : VCH, 1996.

Positioning within the SIMULSOL™ range

SIMULSOL™ Grade	SL 4 C	SL 7 G	SL 8 B 870	SL 10	SL 11 W	SL 26 C	SL 826 E	AS 48
Viscosity reducer	☆☆☆							
Solubilizer/hydrotrope	☆	☆☆☆	☆☆					☆☆
Emulsifier			☆	☆☆	☆	☆☆☆	☆☆	
Detergent			☆	☆☆☆	☆☆	☆☆	☆☆	☆
Degreaser			☆	☆☆	☆☆	☆☆☆	☆☆	☆
Foamer - OMS water			☆☆☆	☆☆☆		☆☆	☆☆	
Foamer - sea water			☆☆☆	☆☆	☆		☆☆	
Foamer - brines			☆☆☆	☆			☆☆	
No-foamer	☆☆☆	☆☆☆			☆☆			☆☆☆
Wetting agent - cotton				☆☆	☆☆☆	☆☆	☆	
Wetting agent - talc			☆☆	☆☆	☆☆☆	☆	☆	
Wetting agent - stainless steel			☆	☆☆	☆☆☆	☆☆	☆☆	
Solubility in sea water / brines	☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆	☆☆	☆☆☆	☆☆☆

***Green** : main properties / **blue** : secondary properties / **orange** : less performant*

SIMULSOL™ SL 4 C, the shortest chain APG of the range

Within the SIMULSOL™ range, **SIMULSOL™ SL 4 C** is **particularly interesting** for its **non-foaming property and viscosity reduction**, thus making it particularly of interest for HI&I, drilling fluids, chemical synthesis and agriculture applications. **Where low foam and/or thinning (incl. sprayability) and/or good spreading is needed, SIMULSOL™ SL 4 C is the ideal product to test!**

SIMULSOL™ SL 4 C

Application fields

HI&I

Drilling fluids

Chemical synthesis

Agriculture

Nota :

The analytical specifications warranted are only those mentioned on the certificate of analysis supplied with each delivery of the product.
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