

# From lab eco-conception to industrial scale production: CosmeGreen ES1822+, an example of R&D adaptation to green chemistry and actual socio-economic contexts



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Internal

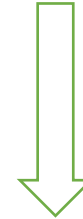
**ENSCR**


**&**

**SurfactGreen**



- ≈ 40 years of R&D on biobased surfactants
  - 5 employees in this research team to develop SurfactGreen technology
- Created in October 2016
  - 15 employees



**French innovation competition 2018 and 2019 (Laureate)** 

**Cleantech innovation competition at Shanghai in 2020 (1<sup>st</sup> place)**



**Beauty Creators Awards in 2021 (Finalist)**



**E-Cosmet'Agora 2021 and 2023 (3<sup>rd</sup> place)**



**Pierre Potier price in 2022 for CosmeGreen ES1822+**



**ENSCR**

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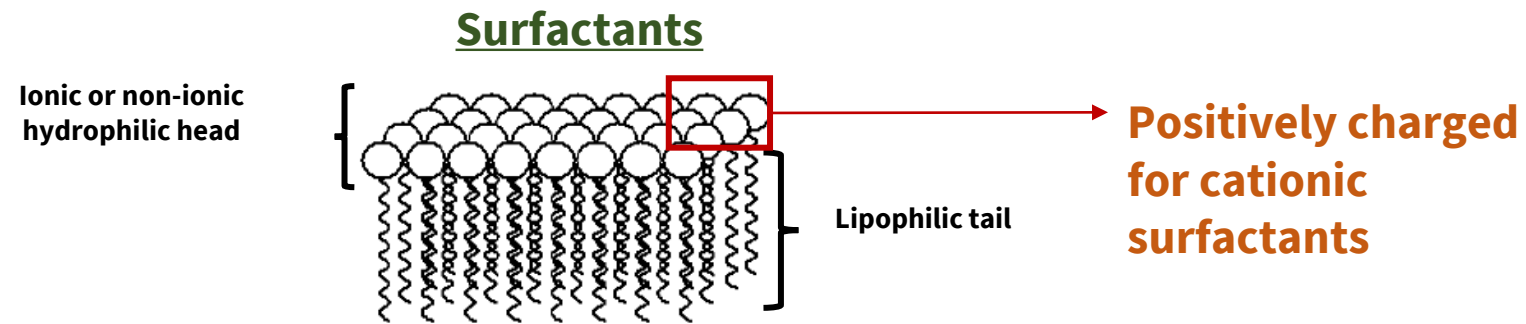


- **More than 11 international patents published, of which 7 published between 2018 and 2020**

## **Partnership between the ENSCR and SurfactGreen**

**Development of biobased Surfactants  
Physical and Chemical characterisation  
Formulation : Proof of concept / Personal counseling of customers**

# Context and challenges: cationic surfactants



## Applications of cationic surfactants



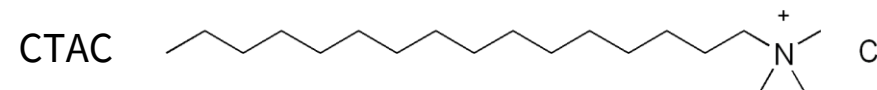
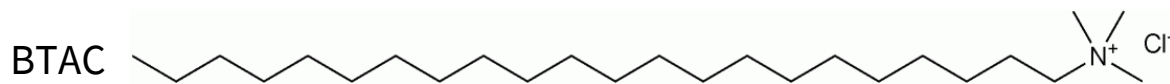
**Issues concerning the surfactant industry:**  
**Petroleum-based, toxicity, ecotoxicity and weakly biodegradable of surfactants**  
**This raises strong environmental and societal problematics**



# Context and challenges: cationic surfactants

## Petroleum-based conditioners on the market

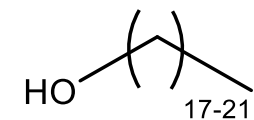
GHS Hazard Classifications	Acute Aquatic Toxicity	Chronic Aquatic Toxicity	Biodegradation	Skin Irritation	Eye Irritation	Other Hazards
<b>Behentrimonium Chloride (BTAC)</b>			80% degradation in 28 days			
<b>Cetrimonium Chloride (CTAC)</b>			94 % degradation in 28 days			



➔ **Goal: Development of novel biobased, biodegradable, non-toxic and non-ecotoxic surfactants , in accordance with green chemistry principles**



# CosmeGreen ES1822+: Choice of raw materials



**Fatty alcohol**  
(Lipophilic Tail)

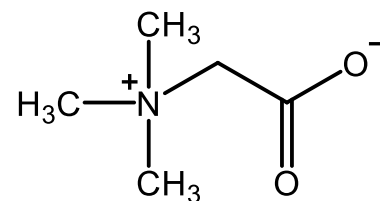
Choice of fatty alcohols from erucic rapeseed



**Rapeseed rich in C18 to C22**

## Advantages

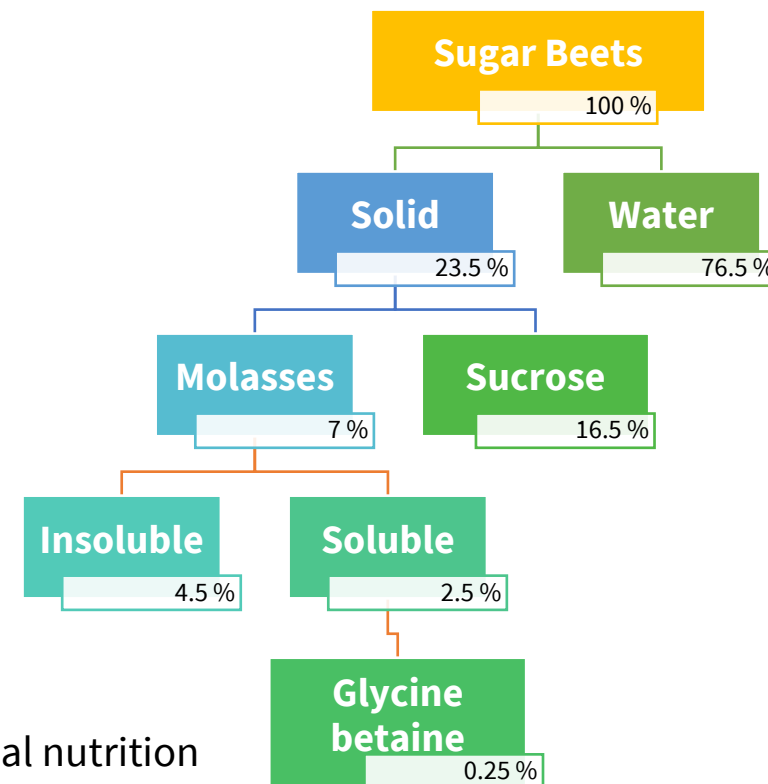
- No competition with human food production
- No derived from palm
- Mixture of long fatty alcohols for cosmetic applications like emulsifying and hair care



**Glycine betaine**  
(Hydrophilic Head)

## Advantages

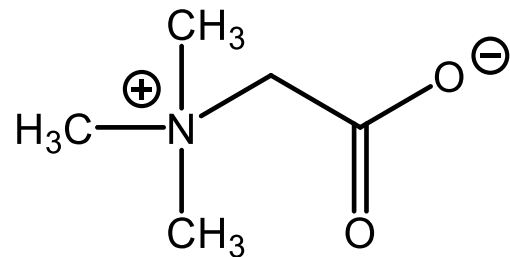
- By-product of sugar industry
- Available in large quantity
- Limited added value for animal nutrition
- Natural quaternary ammonium



# Synthesis

Green Chemistry

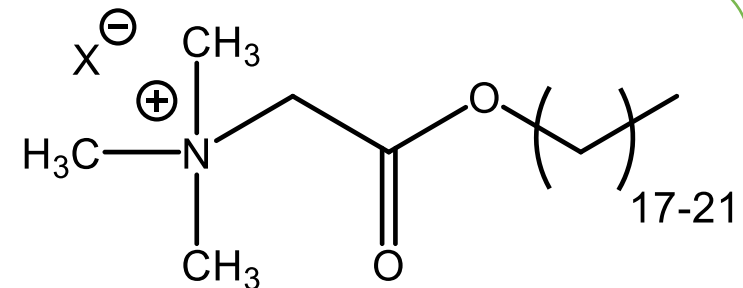
## CosmeGreen ES1822+



Glycine Betaine

Esterification

Fatty alcohols C18-C22  
Biobased acid (HX)

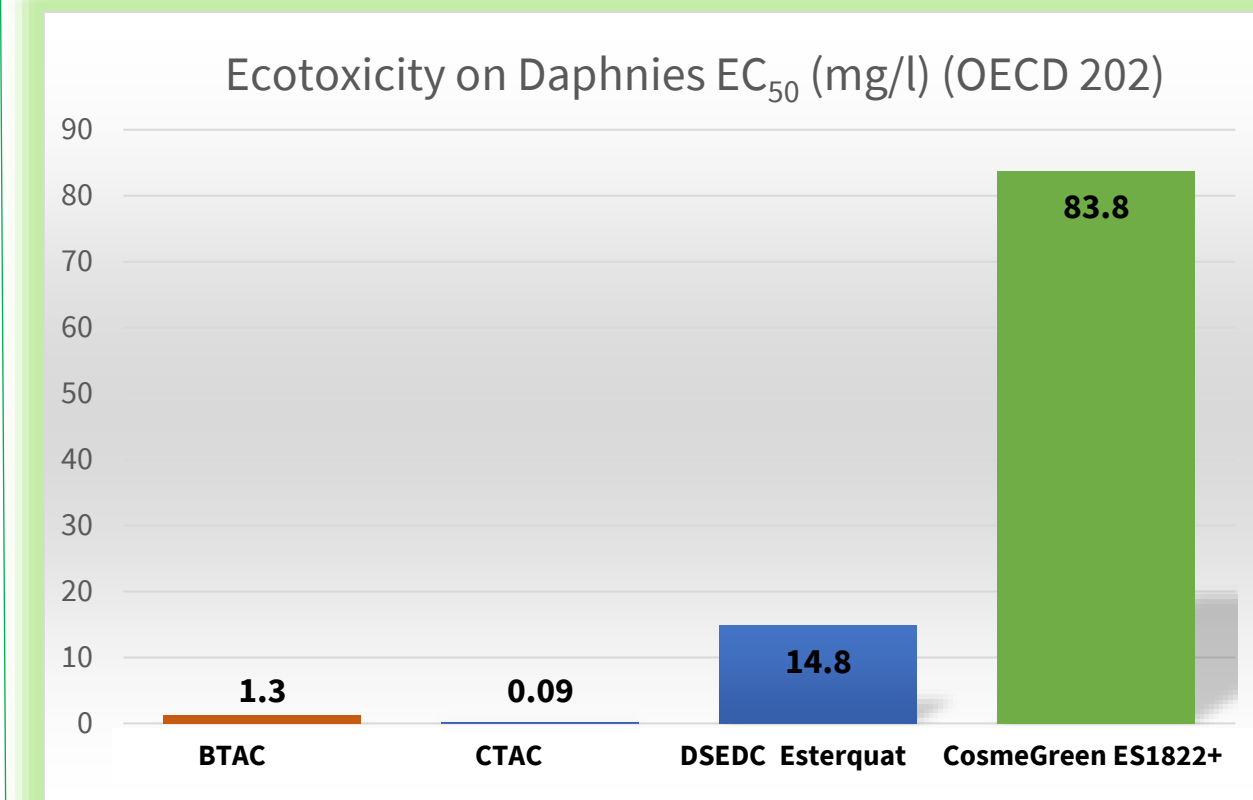


# Eco-friendly process and product

- Low-waste materials

Line of Business	E-factor (kg <sub>waste</sub> / kg <sub>product</sub> )
<b>CosmeGreen ES1822+</b>	<b>0.04 (only water)</b>
Fine chemicals	5 – 50
Pharmaceutical compounds	25 → 100

- Atom economy **97%**
- Low toxicity and ecotoxicity
- Solvent-free process**
- Use **biodegradable** and **renewable raw materials**
- No purification step
- Biodegradable** product (**94% in 28 days**)
- 100% biobased ( ISO16128 )**



- \* BTAC: Behentrimonium Chloride
- \* CTAC: Cetrimonium Chloride
- \*DSEDC: Distearoylethyl dimonium chloride



# About CosmeGreen ES1822+



INCI Name: **Arachidyl/Behenyl betainate esylate (and) Arachidyl/Behenyl alcohol**

% Cationic	25 – 30%
Melting point	~75°C



**COSMOS  
APPROVED**



Used for different market segments



**Liquid**



**Solid**

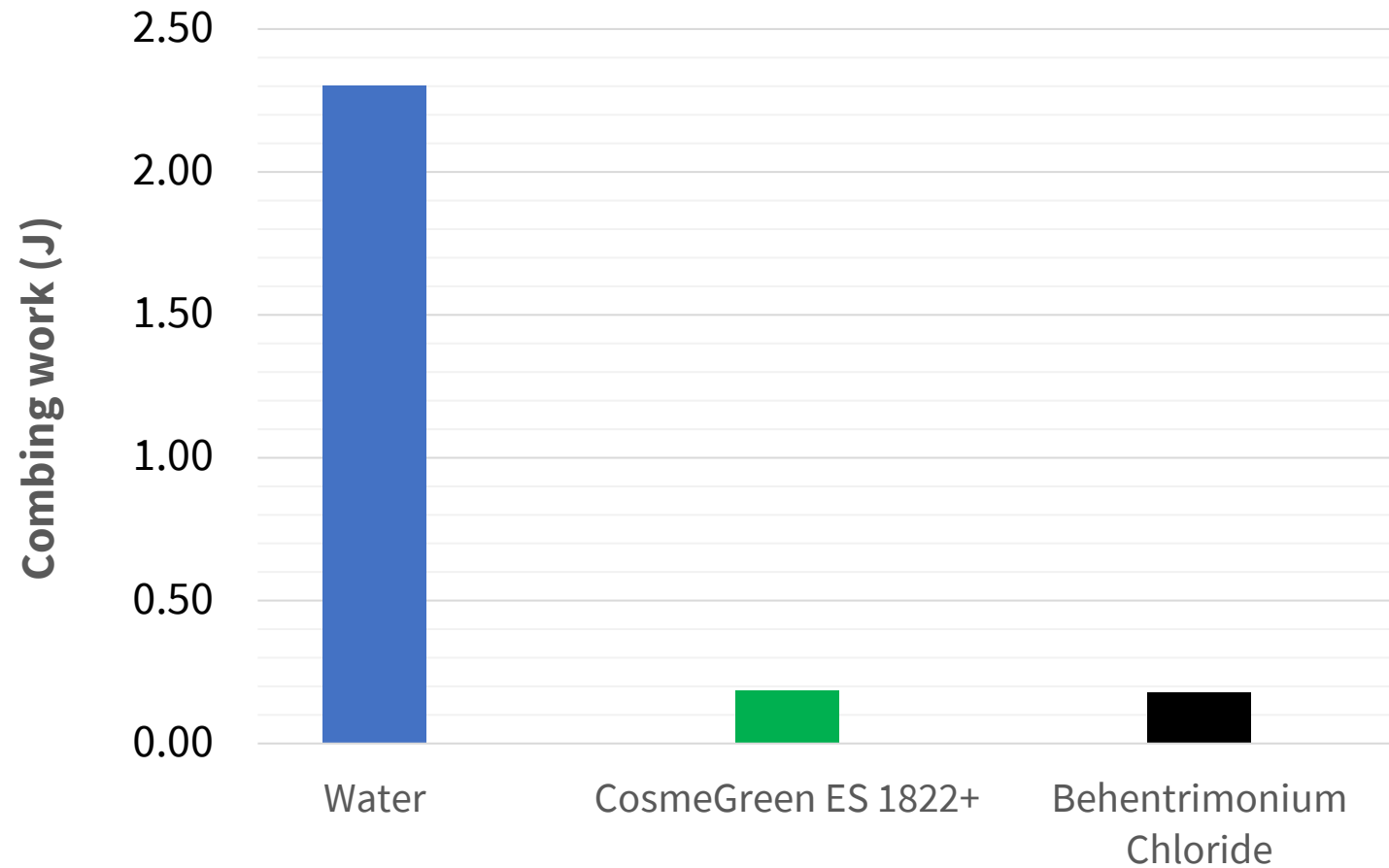
APPLICATION	CosmeGreen ES1822+ %
Solid 2-in-1 shampoo	5-15
Solid Conditioner	40-80
Deep Conditioning Mask	6-12
Leave-In Conditioner	2-4

Benvegna, T. *et al*, Bio-based cationic surfactants: new applications in cosmetic formulations. *Expr. cosmétique* 2021, 323–327.  
 Galle, F. *et al*, Utilisation d'un dérivé de glycine bêtaïne comme agent de conditionnement des cheveux. 2019, FR3099058.  
 Antoine, J.-P. *et al*, . Surfactant composition method for production thereof and cosmetic comprising said composition 2005, WO2005/121291.

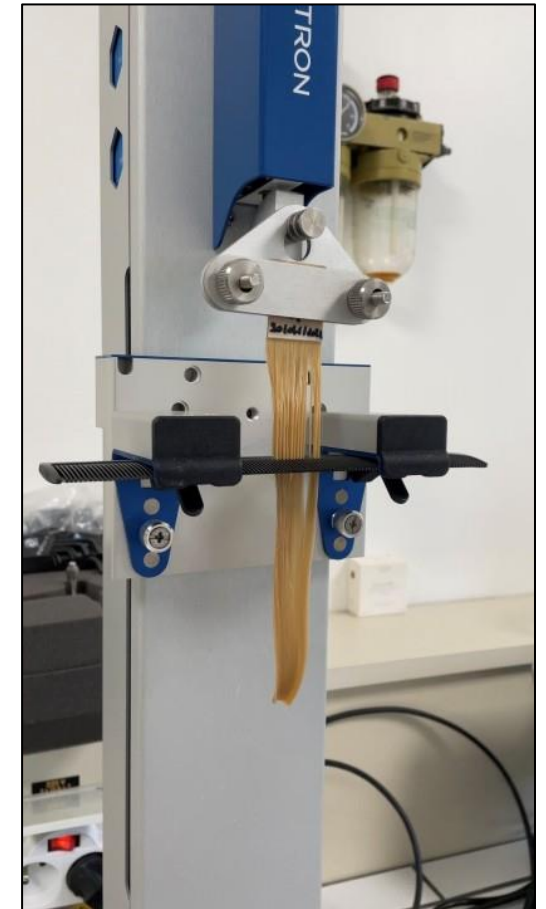


# CosmeGreen ES1822+: effective detangling

Detangling on wet hair  
1% active compounds



**CosmeGreen ES1822+ as efficient as BTAC**

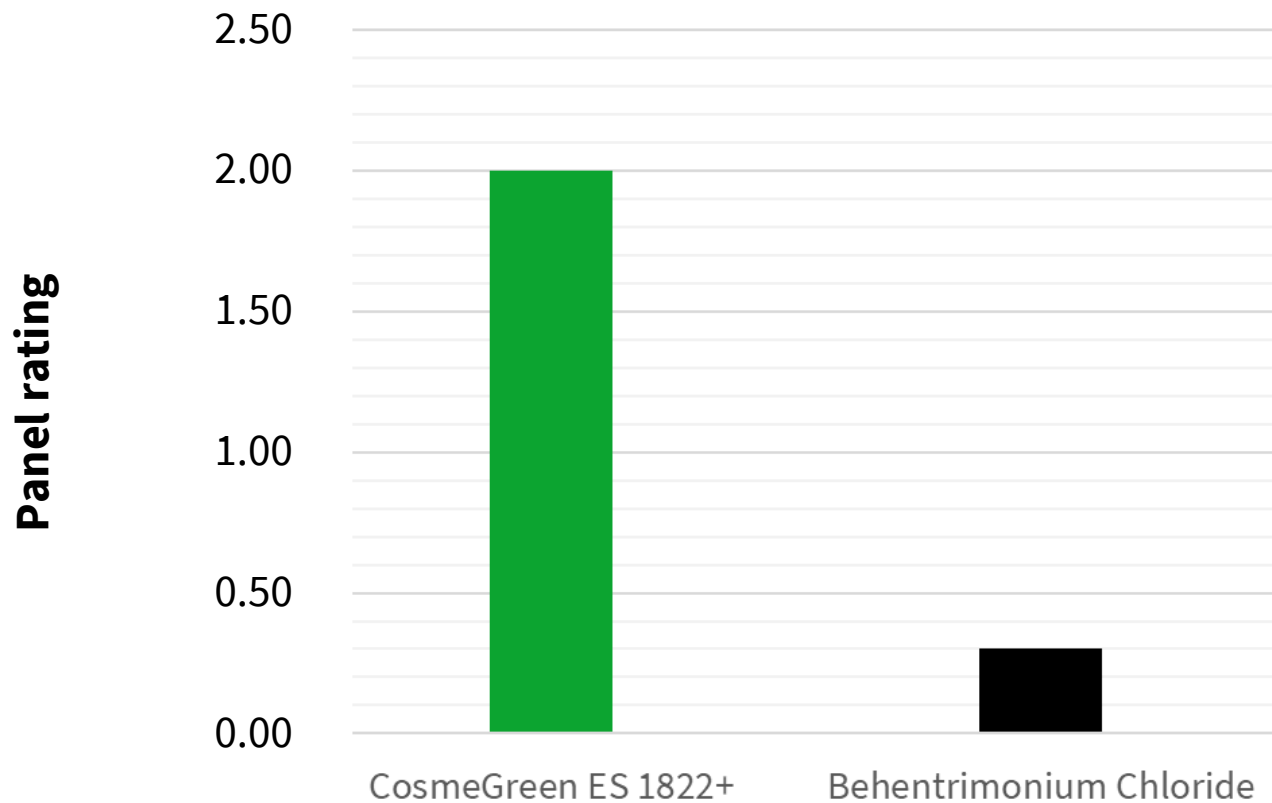


***Dia-stroon Fibra.one***



# CosmeGreen ES1822+: an incomparable softness

Hair softness  
2% active compounds



⇒ **CosmeGreen ES1822+ much more efficient than BTAC**



# Conclusion



## Advantages of CosmeGreen ES1822+ :

- 100 % biobased product (ISO16128 )
- Respects the principles of green chemistry
- Used for solid or liquid formulation
- COSMOS and NATRUE approved
- Biodegradable, low toxic and ecotoxic product
- Better softness than BTAC
- Same detangling efficiency as BTAC

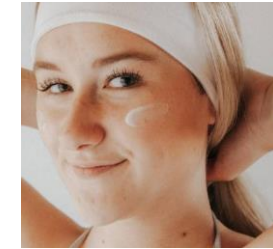
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# Perspectives

- Expansion of the CosmeGreen range :



**Sun Care**



**Skin Care**

- Development of other ionic surfactants for detergence and bitumen emulsion applications



# Thank you for your attention



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