32nd IFSCC Congress
London 19–22 September 2022

SEPPIC — A company Air Liquide HEALTHCARE

In vitro Method to Evaluate the Cleansing Performance of Surfactants Dedicated to Micellar Water Formulations

515

ROSO Alicia[1] ; **CUQ-ARNAUD Elodie**[1*] ; CAVAILLÈS Maïté[1] ; DUMAINE Marion[1] ; LAUBÉ Florian[1].

[1] *Seppic Research & Innovation, 127 chemin de la poudrerie, BP 90128, 81105 Castres, France.*

**CUQ-ARNAUD Elodie, Seppic, 127 chemin de la poudrerie – BP 90128, 81105 Castres, France, (+33) 563726969, elodie.cuqarnaud@airliquide.com*

INTRODUCTION

- An easy way to formulate gentle skin cleansers is to reduce the dose of surfactants, as is the case in micellar waters. However this poses the challenge of finding a good compromise with the cleansing properties, especially for makeup removal.
- Surfactant characteristics such as CMC (Critical Micellar Concentration) [1], wetting properties [2], help in comparison but the measurement condition is far from the final formulation combining them with other ingredients (A). A method closer to the application condition is needed.
- **Objective: develop a simple, quick and reproducible, *in vitro* method to select effective cleansing ingredients for micellar water and guide the development of the formula.**

Materials & Methods

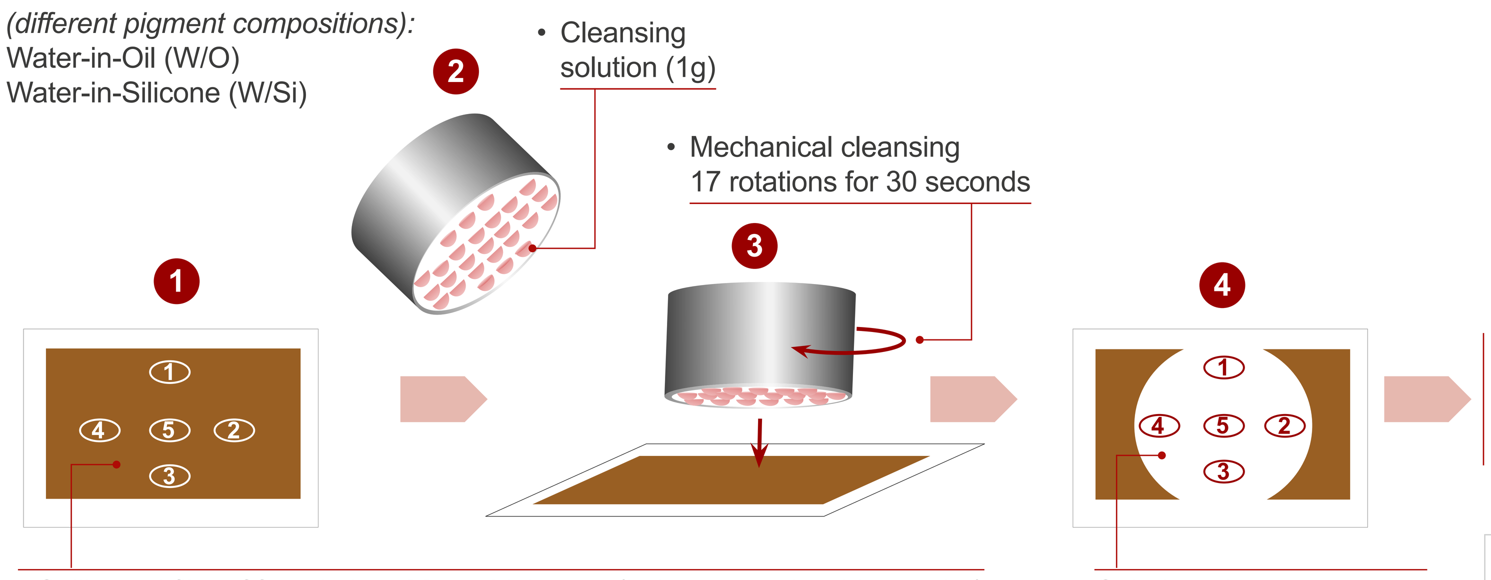
• Materials

- Ingredients tested at the same concentration (% AM: Active Matter in demineralized water) alone or in combination.
- Micellar waters benchmark used as such, as in their condition of use.

• Methods:

- Evaluation of make-up removal performance based on colorimetric measurement (L*, a*, b*) on a standard film of foundation before and after mechanical cleansing.
- Protocol adapted to be representative of the final micellar water routine.

- Selection of 2 difficult to clean foundations benchmarks *(different pigment compositions):*
  - Water-in-Oil (W/O)
  - Water-in-Silicone (W/Si)



- Calibrated film of foundation: 30µm thickness (in-house made white carrier)
- L* parameter (clarity) measurement, after 12h to 24h drying at 40°C / 5 different places of the film (chromameter CR400 - Minolta company)

- Colorimetric measurement L* parameter

- Average % of make-up removal

$$\frac{[L^* \text{ (with make-up)} - L^* \text{ (white control)}] - [L^* \text{ (after cleansing)} - L^* \text{ (white control)}]}{[L^* \text{ (with make-up)} - L^* \text{ (white control)}]}$$

Controls:
- Negative: Cotton alone (rubbing effect)
- Negative: 1g of hard water (30° french hardness).
- Positive: Caprylic/ Capric Triglyceride applied on a W/Si benchmark

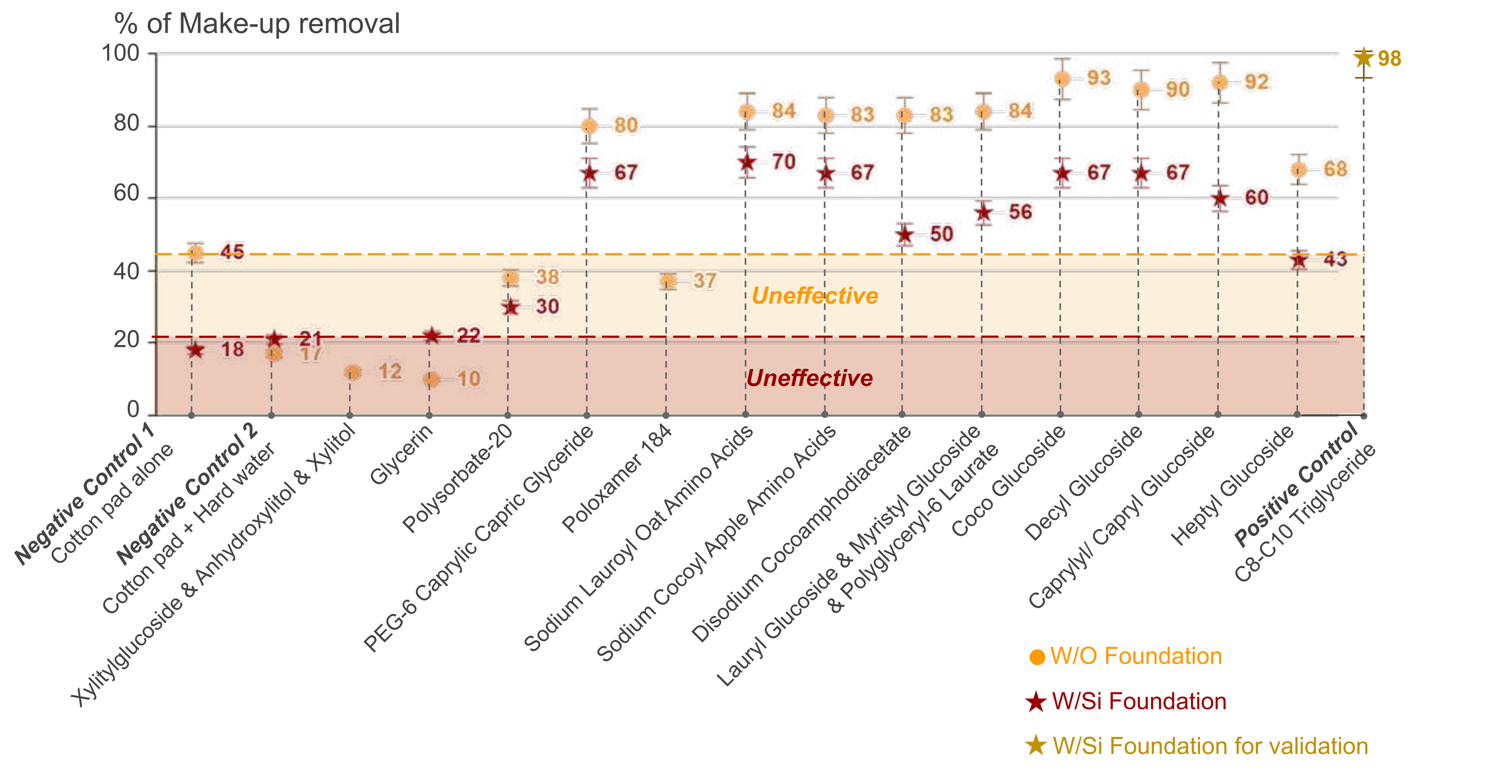
Results & Discussion

• Method adaptation

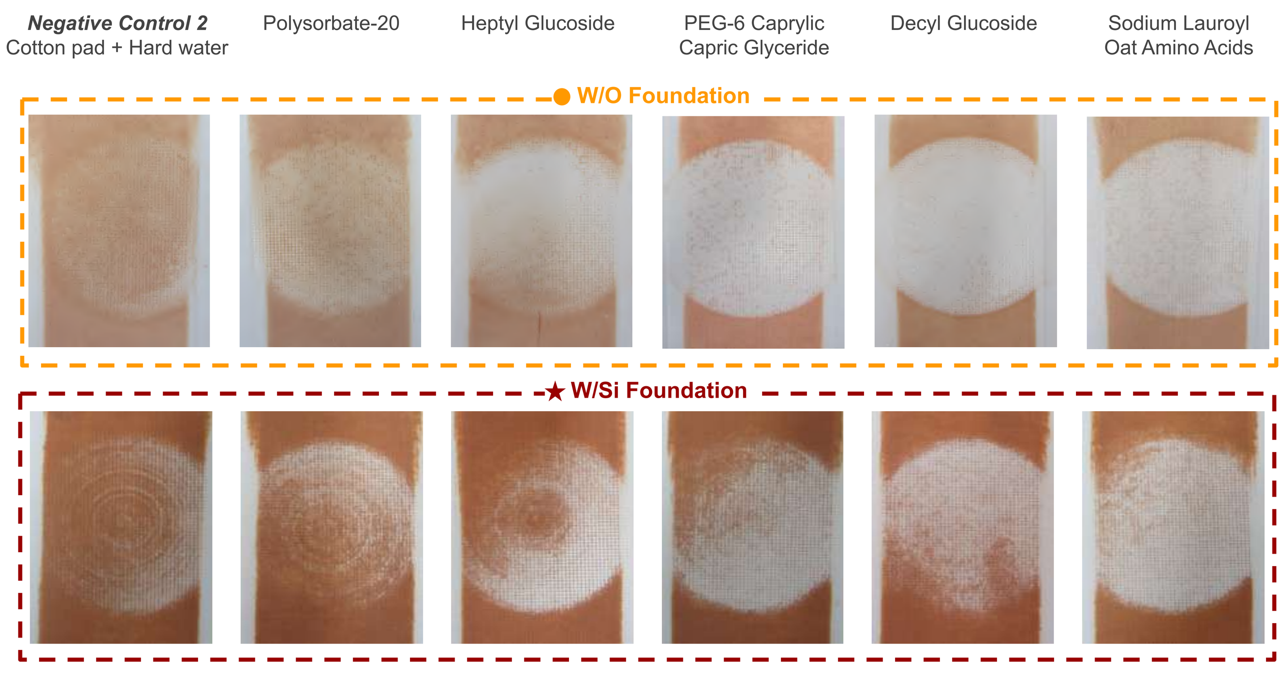
- No effect of the pH of the surfactant solutions (4 to 11) on performance
- Strong impact of the surfactant concentration → 1% AM selected

• Cleansing performance of Ingredients tested alone

I Ingredient at 1% Active Matter (AM) in demineralized water - Initial pH



I Films after cleansing (Make-up removal with ingredient at 1% Active Matter (AM) in demineralized water - Initial pH)



- Good cleansing properties on both films of foundation: *PEG-6 Caprylic Capric Triglyceride, Sodium Cocoyl Apple Amino Acids, Sodium Lauroyl OAT Amino Acids, Coco and Decyl Glucoside.*
- No effect of humectant & moisturizing essential additives: *Glycerin; Xylitylglucoside complex.*
- Ineffective materials: *Sodium Cocoyl Glutamate*, Sodium Lauroyl Sarcosinate*, Cocamidopropyl Betaine*, Poloxamer 184, PEG-40 Hydrogenated Castor Oil and Polysorbate-20.*
- Effects of Solubilizers: performance of *Heptyl glucoside > PEG-40 Hydrogenated Castor Oil = Polysorbate-20.*

**data not shown*

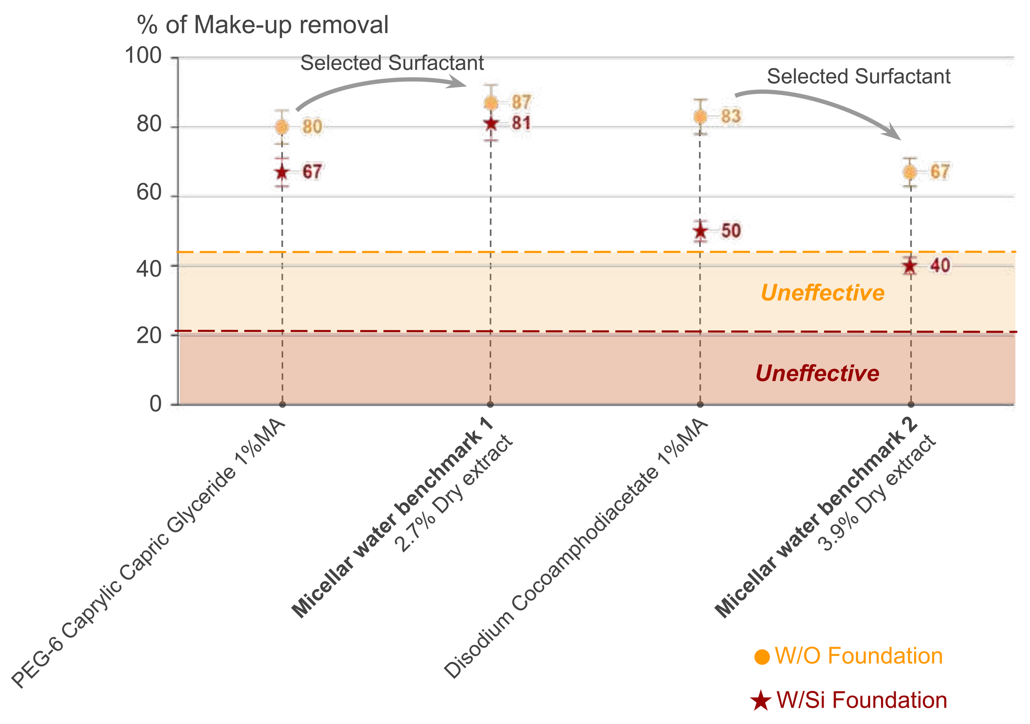
I Illustration of discrepancies with physico-chemical parameters

A	CMC (g/L product at 30%AM)	Wetting time (s)	Make-up removal performance
*Sodium Lauroyl Sarcosinate**	2.9	25	- - Uneffective
Sodium Lauroyl OAT Amino Acids	2.4	46	++ Good

**data not shown*

• Cleansing performance of micellar water benchmarks

I Micellar waters

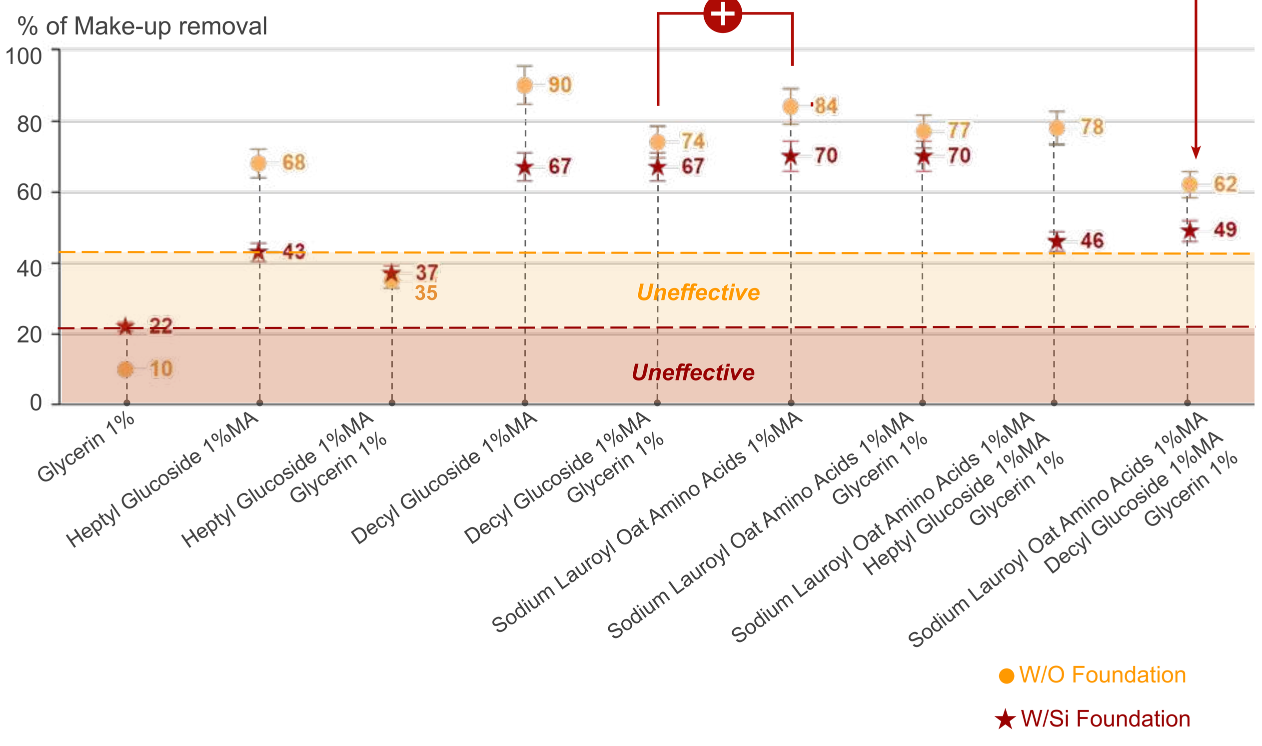


- Suitable method to evaluate finished micellar waters.
- Same reaction pattern between micellar water and their respective surfactant regarding versatile effect/ or not on the 2 foundations.
- Noticeable impact of other ingredients on the cleansing.

• Cleansing performance of Ingredient combinations

I Combinaison of ingredients in demineralized water - Initial pH

No demonstrated interest in surfactant combinations despite double active matter content.



- Confirmed impact of other ingredients than surfactants, depending on surfactant nature.
- Water-in-Silicone foundation overall harder to remove on the 2 foundations.
- Noticeable impact of other ingredients on the cleansing.

References

1. Rolls, E. (2020). Clean Chemistry–The Science Behind Cleansing Products. Discovering Cosmetic Science, 19.
2. Noh H, Kang T, Ryu JS, Kim SY. Oh S-G (20169) Synergy effect for performance of anionic SDS/ADS mixtures with amphoteric and nonionic surfactants.J. of Korean Oil Chemists' Soc. 33; 3: 449~45.

CONCLUSION

- Development of a simple & reproducible *in vitro* test (maximum standard deviation of 6 %) to screen the make-up removal performance of surfactant solutions, at a concentration level similar to those used in micellar waters.
- Method also suitable for studying the influence of ingredient combinations to optimize micellar water formulations.