

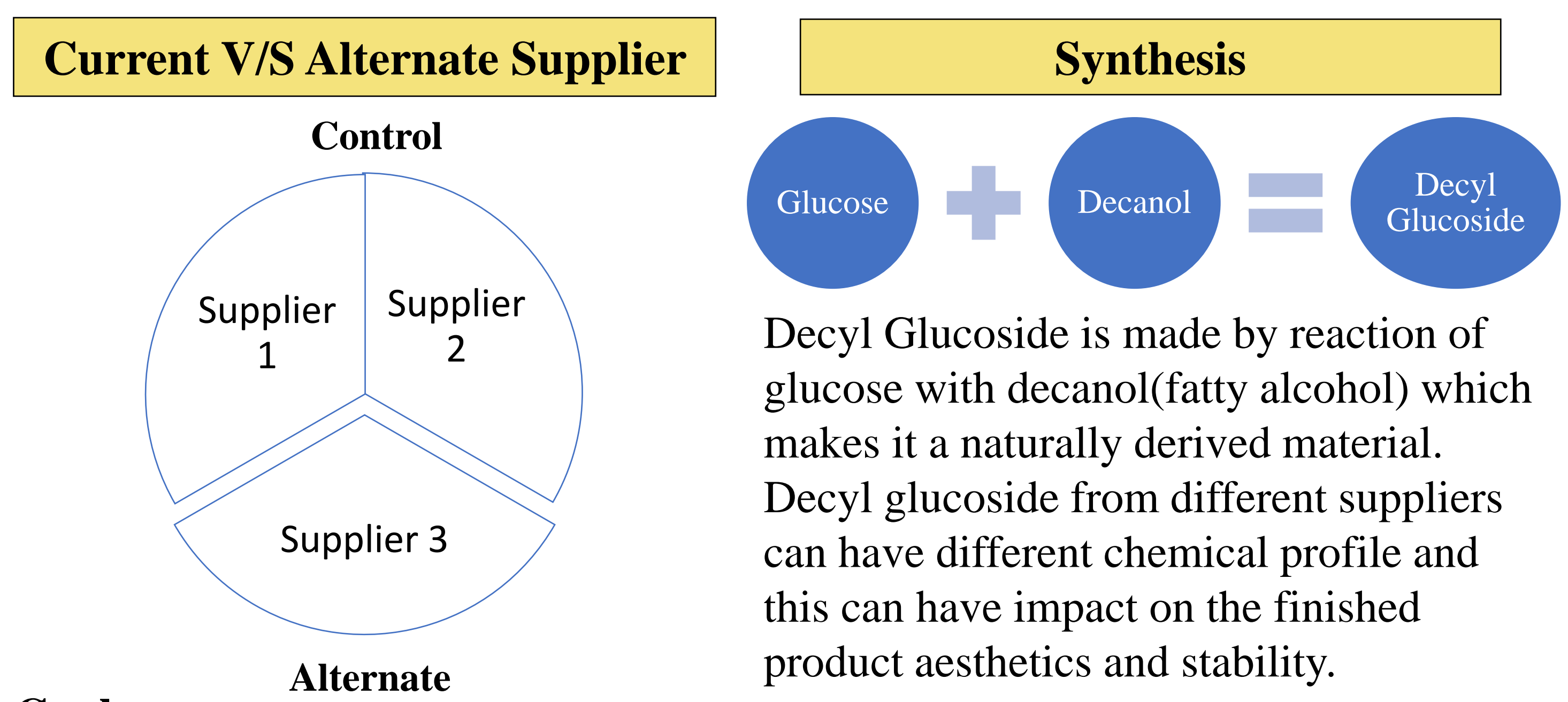
Background

Material Equivalency Science (MES) is a science-based approach to assess the impact of changes in the supply chain of a raw material.

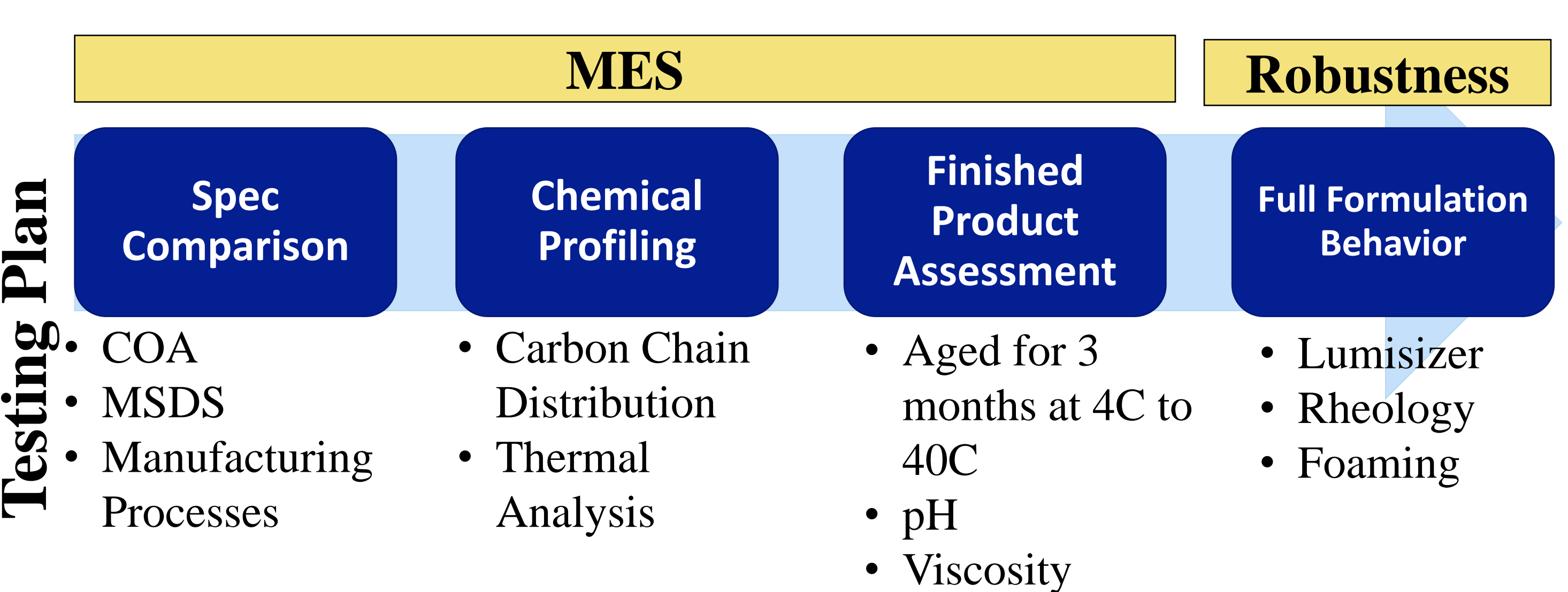
This approach involves a combination of :

- 1.Raw Material Characterization
 - 2.Solution behavior
 - 3.Assessing impact on finished product stability and performance and aesthetics.
- Impact on finished product parameters is evaluated using accelerated stability protocols and advanced product characterization techniques.

The focus is on one of the non-ionic surfactants, Decyl Glucoside which is majorly used in baby products like shampoos and washes and in scrubs and cleansers for adults.



- Goal :**
1. Access the physico-chemical equivalency between tradenames from different suppliers.
 2. Making impacted finished products in the lab and performing accelerated stability studies.
 3. Characterize finished products using advanced product robustness techniques to predict any negative impact.

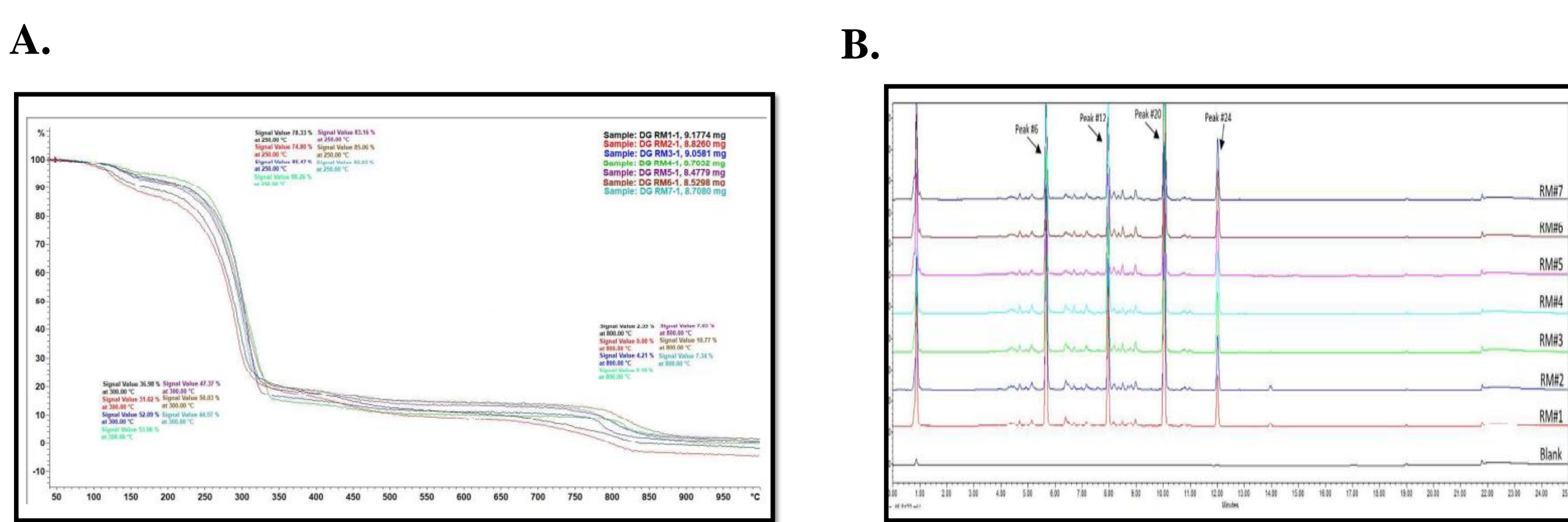


Spec Comparison

Decyl Glucoside		
Non-ionic		
Tradename 1	Tradename 2	Tradename 3
NA Supplier1	APAC Supplier 2	Global(Alt) Supplier 3
pH: 11.8	pH: 11.39	pH: 11.7
Active %: 50.70 %	Active %: 53.41%	Active %: 51.3 %

- Each raw material has similar parameter across suppliers, however, Tradename 1 has lower amounts of active ingredients and pH as compared to Tradenames 2 and 3.

Raw Material Characterization



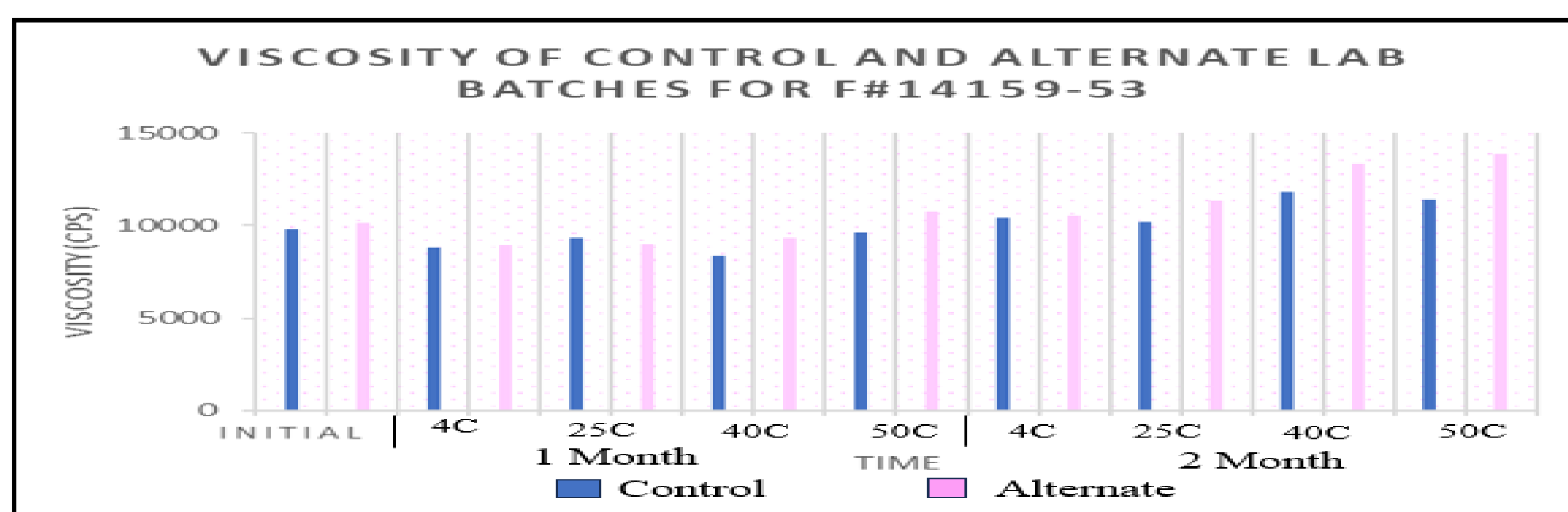
Graph 1. Chemical profiles of raw materials

- The TGA profiles (**Graph 1A**) and HPLC chromatograms (**Graph 1B**) of Decyl glucoside from all suppliers are overall similar. In both the graphs, RM 1-7 represent different lots of decyl glucoside from different suppliers.

Finished Product Assessment

Viscosity

- Viscosity profile for the Aveeno Positively Radiant Skin Brightening Scrub(F#141-59-53 having 5% w/w Decyl Glucoside) at different temperatures was analyzed to predict the overall stability of the formulation after 3 months.



Graph 2. Viscosity profile for F#14159-53

- The Control and the Alternate samples show similar viscosity profiles all well within range. (Range : 4000-36000 cps)

Robustness Testing

Lumisizer

Principle –A centrifuge with automated optical detection of changes like sedimentation and phase behavior at different temperatures, speed and measurement intervals The rate of change in the sample is quantified as lumisizer instability index.

Higher lumisizer instability index means lower stability .

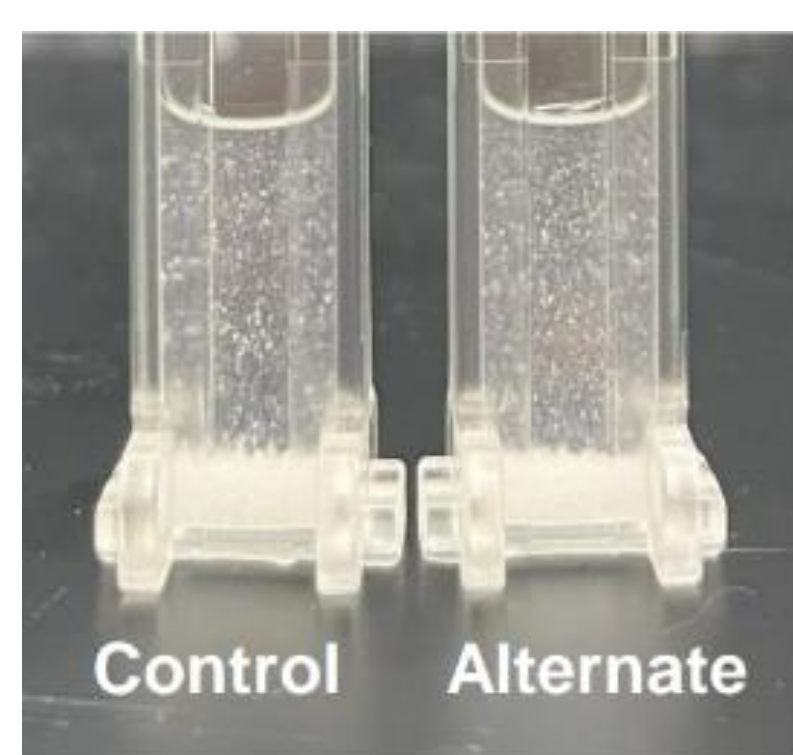


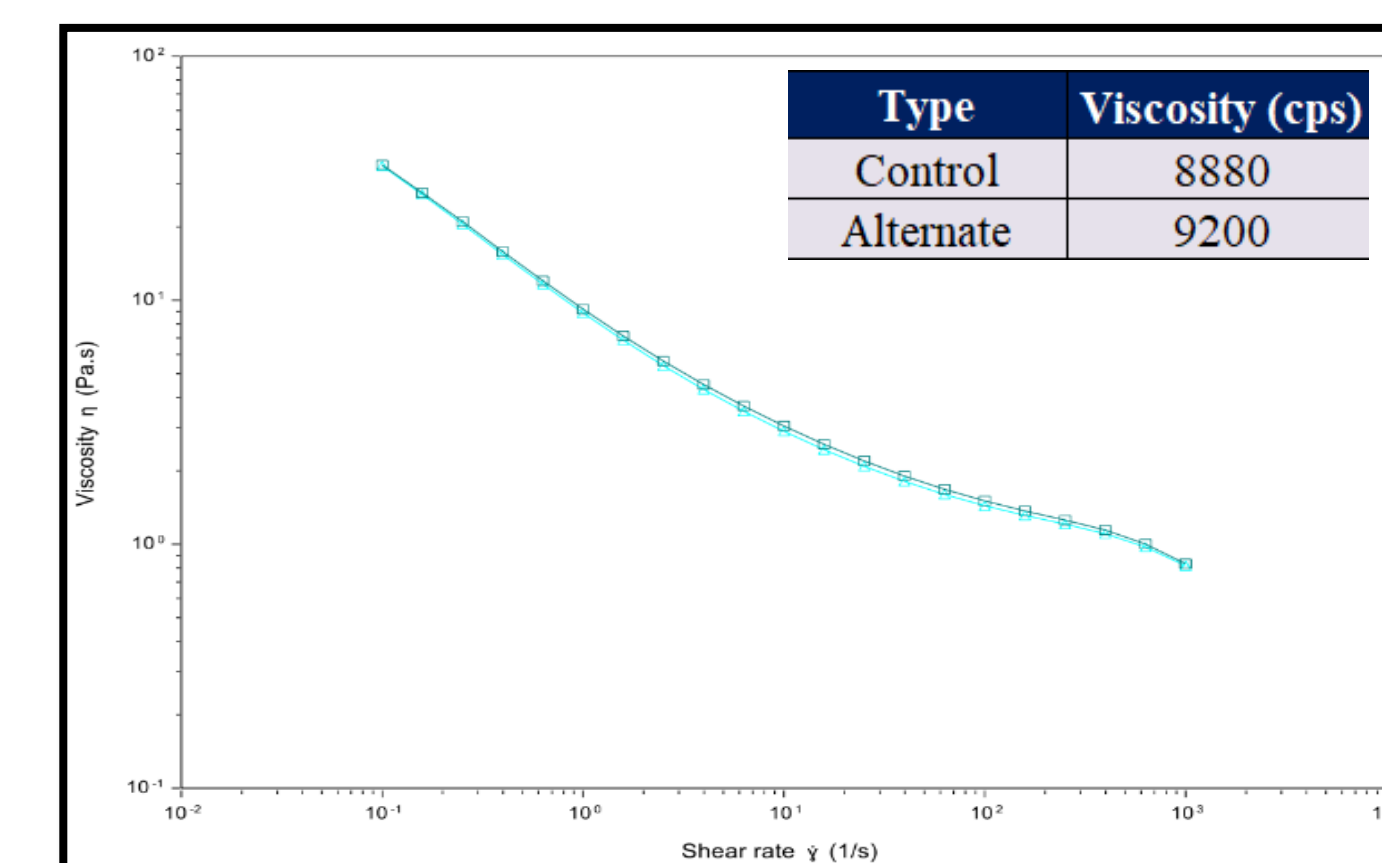
Image 1. Instability Index for F#14159-53

Type	Instability Index
Control	0.385
Alternate	0.388

Table 1. Instability Index for F#14159-53

Conclusion – The instability indexes for both the samples are similar and low meaning the change in Decyl Glucoside supplier change did not impact the sedimentation rates and still as robust as alternate.

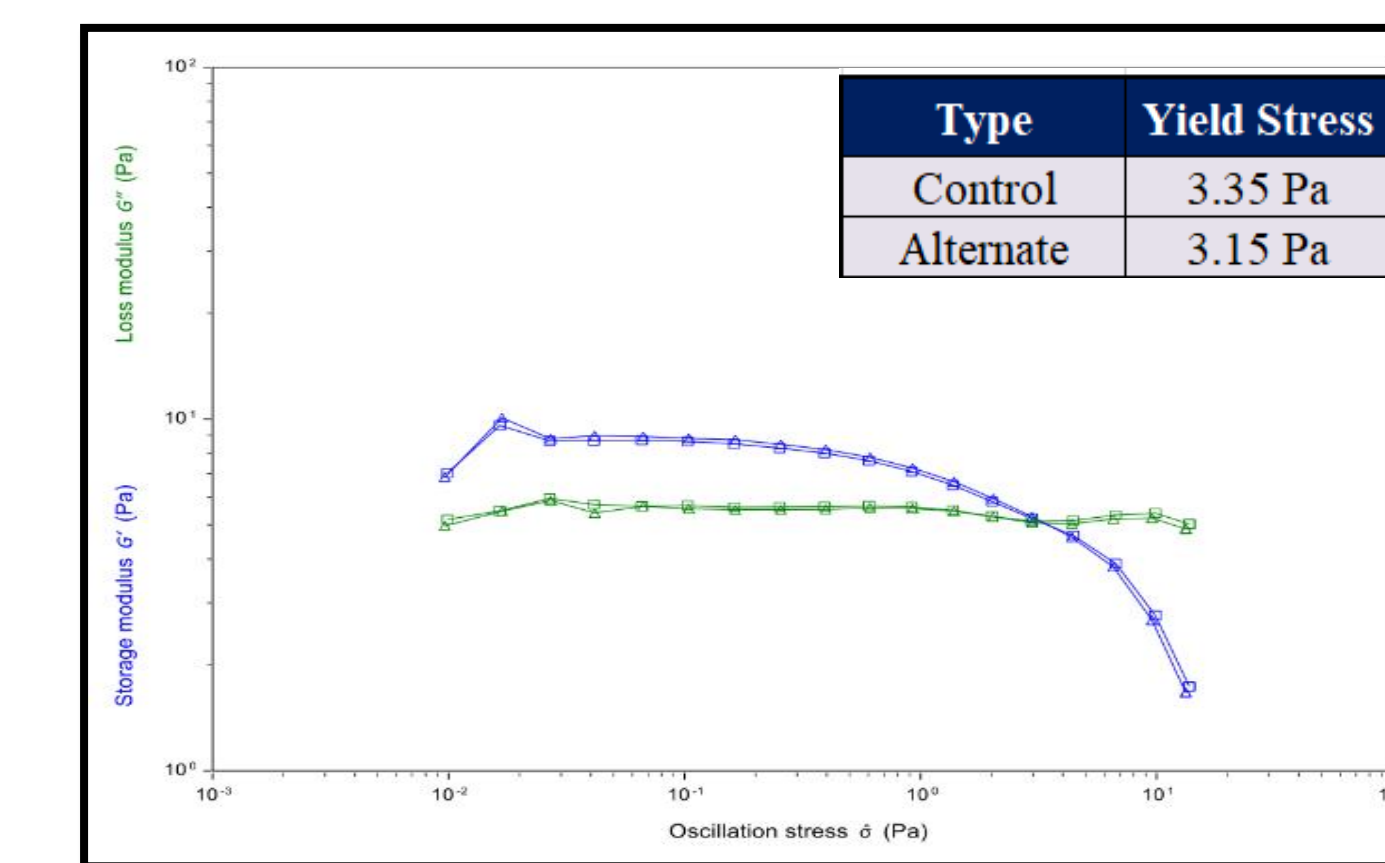
Rheology – Viscosity & Yield



Graph 3. Viscosity v/s shear rate for F#14159-53

Viscosity goes down as a function of shear rate for both prototypes and the curves were found to be overlapping indicating that the flow properties are not impacted.

Control Alternate For graphs 3 & 4

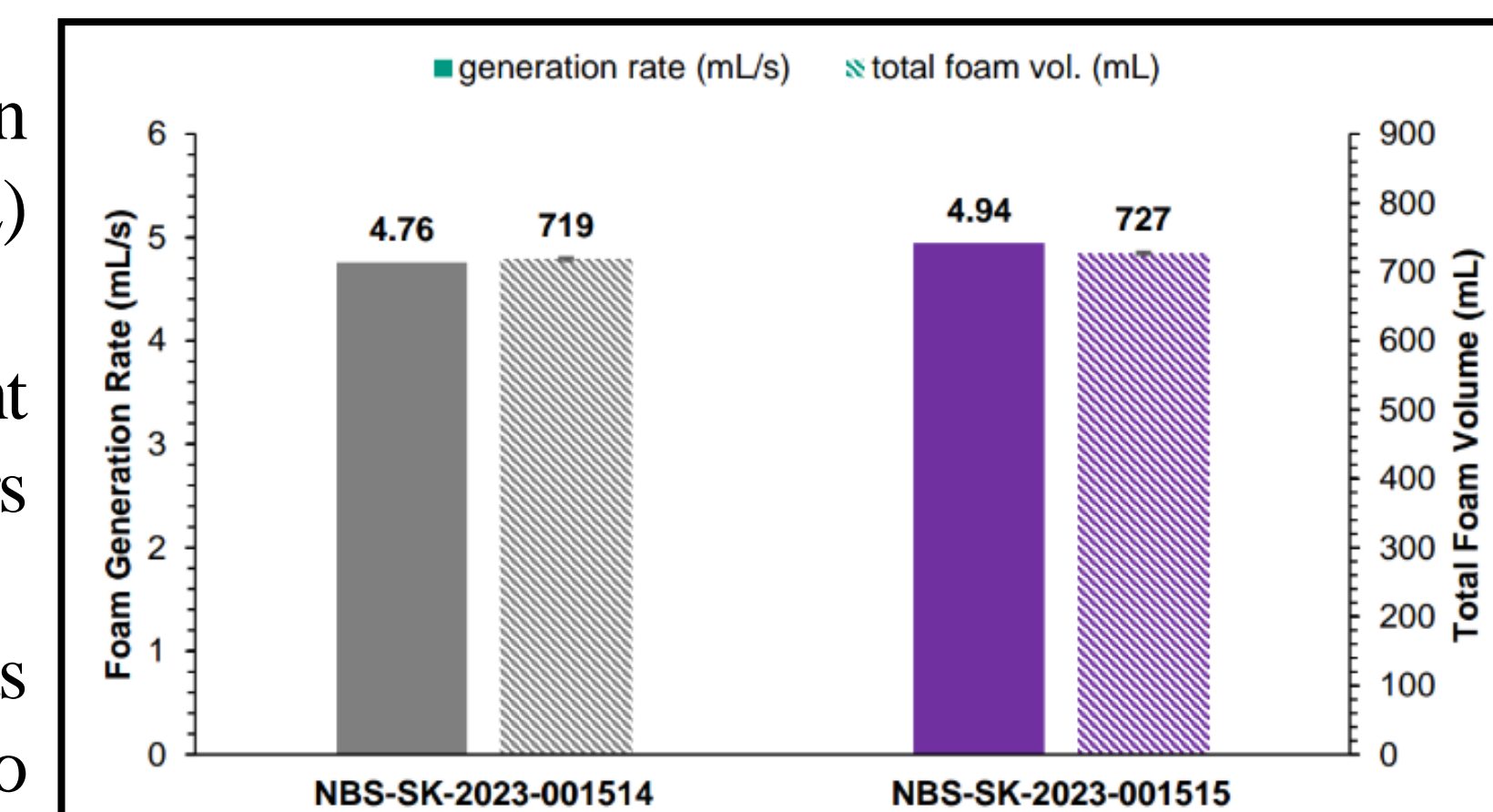


Graph 4. Yield stress for F#14159-53

This evaluates the suspending capabilities of a product . Critical here since this being a scrub, important to note the suspending capabilities of the beads impacting the end-product. Both control and alternate shows the same yield stress.

Foaming Profiles

- The samples were diluted at 0.3 % in simulated hard water (100 ppm CaCl2) with total volume of 250 ml.
- In **Graph 5**, solid bar represent generation rate and the dotted bars represent foam volume.
- Conclusion** – The alternate sample has similar foaming profiles compared to control.



Graph 5. Foam Generation and Foam Volume for F#14159-53

Discussion & Conclusions

- Similar work was done for other ingredients : Coco glucoside and glyceryl oleate, Cocamidopropyl betain.
- Further assessment for claims and regulatory would be done for qualification.
- Documenting all these MES testing on a user-friendly database system called **CONFLUENCE** so that it could be easier for other teams to have a look upon a particular ingredient to know what are the critical to performance attributes for testing.

Next Steps

- Enhancing the supply chain and promoting cost-saving initiatives for existing consumer products in the global portfolio.
- Working on Raw Material Qualification simplification in terms of documentation and finding better ways for communication.

Acknowledgements

Prashant Bahadur	Kenneth Narvaez	Jay Zhou	Elizabeth Veliath
Saroja Narasimhan	Sherry Lam	Christine Bang	Scott Pomarico
Shriram Sundarraj	Jeff Martin	Mamta Chauhan	COUNT Team
Candida Alvarez	Aliaksandr Zhuk	Siddharth Dantu	2023 Co-Ops & Interns