nutmeg newsletter

May 2021

CTSCC May Chapter Meeting

The Science of Hair Color, Blonding, and Hair Repair

May 25, 2021
12:00 PM EST
Virtual Event

Registration
Online at www.ctscc.org

Abstract The science of hair color and blonding are performed on many and understood by few. Learn the fundamentals of what chemical reactions are behind hair color and hair lightening from a hair color chemist. We'll review basic hair morphology, what occurs on the hair fiber during the coloring or lightening process, what ingredients make up hair color and lightener, and how to formulate hair care products to repair the hair fiber when the damage is done.

Speaker **Valerie George**
Vice President of Research & Development
John Paul Mitchell Systems

Speaker Bio Valerie George is a cosmetic chemist, science communicator, educator, leader and avid proponent of transparency in the beauty industry. She works on the latest research in hair color and hair care as Vice President of Research & Development at John Paul Mitchell Systems, a leading salon professional brand based in Los Angeles, CA. She is a two-time past chair of the California Chapter of the Society of Cosmetic Chemists, past chair of the Committee on Scientific Affairs for the National Society of Cosmetic Chemists, and is a recipient of the lifetime Chapter Merit Award for her services to the Society. Valerie is the co-host of The Beauty Brains podcast and can be found on Instagram at @cosmetic_chemist.

Inside this issue:

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Letter from the Chair

Dear CTSCC Members and Friends,

Happy Spring! This time of year is always filled with excitement and opportunity as the days get warmer and longer, and the air fills with the smells of lilacs and cut grass. This year, there is even extra excitement as friends and families report back on their vaccinations, and it feels like the world is starting to open once more. Although we still have a long way to go, the CTSCC board is happily looking forward to the day when we can finally socialize and be together once more.

I would like to extend my sincere appreciation to Dr. David Marsh for sharing with us his love of baking and his presentation, "Using Science to be a Better Cook." I was fascinated learning about the reaction that takes place when you form gluten, and promptly shared with my family that you simply need to input energy to drive the reaction! Method and technique do not matter to the chemical equation. It was a great talk and brought a unique and exciting insight to something we all do routinely, and usually without considering the science.

I am very excited for our upcoming webinar in May. Valerie George, VP of R&D at John Paul Mitchell Systems will be teaching us all about hair color. This is a super niche area of the cosmetic industry, and as a hair color aficionado myself, I am very interested to learn about how hair color products work, the different types of products, how they are formulated and any tips or tricks I can get! Please join us May 25 for a lunchtime virtual meeting at 12pm EST.

Finally, I want to send a huge thank you to the CTSCC board. As we have navigated the past year and figured out how to remain supportive of our members, I am beyond grateful to work with this group of dedicated volunteers. The CTSCC is a great community to be a part of, and I encourage anyone and everyone to join us. We are always happy to gain any new volunteers or hear any feedback from our members. If you have an idea for a webinar, or would like to volunteer on our board, please do not hesitate to contact me. Looking towards next year, we would love to have someone to help us with our website and newsletter, let me know if that person is you! I look forward to seeing you all virtually in May, and hopefully in person in months to come.

Thank you all for your support,

Jen Macary
2021 Chair, Connecticut Chapter
Society of Cosmetic Chemists

In Memoriam

We are deeply saddened to learn of the passing of Charles Moses. He was an industry expert in hair color, and a consultant, colleague, and friend to many of our members. We send our deepest condolences to his family.

Charles E. Moses

September 5, 1955 - March 29, 2021

Charles E. Moses, 65, of Stamford, CT passed away peacefully on March 29th, 2021 after a challenging battle with Frontotemporal Dementia (FTD). He was born on September 5, 1955 in Glenridge, NJ. He received his BS degree in Chemistry from Fairfield University in Connecticut and started his career as a chemist with Clairol 1978. He continued to work in the beauty care industry until his retirement in 2020.

Charles is survived by his wife of 21 years, Dona (Fearing) Moses, their daughter Claudia; daughters from first marriage to Olwyn Shirley, Amber Mersier (Na'eem) and Christina Reed (Jalil); grandchildren Lateef and Akira Reed, Na'eem Jr. and Ahmad Mersier. Brothers Clarence and Wayne Moses, sisters Lillian Waters, Ruth (Bruce) Washington and Kathleen Coppedge, as well as a host of loving nieces, nephews, cousins and dear friends.

He was preceded in death by his mother Victoria (Fisher) Moses and father Primes Moses; brother Joseph, sisters Cynthia Drakeford, Sharon Webb and brother-in-law George Waters.

Charles was known for his amazing athletic abilities and competitive nature. His greatest joy was passing on his love for basketball to his daughters and watching them play during their school years. (Go Montclair Mounties and Stamford Black Knights!) His excellent culinary skills on his grill were appreciated by many, including his legendary steaks, which he perfected with the help of his faithful sidekick Buddy.

Visitation and Funeral will both be held at the First United Methodist Church, 42 Cross Road, in Stamford, CT. The Visitation is Friday May 14th 4 – 7 pm and funeral service will be Saturday, May 15th at 11 a.m. (Covid-19 safety measures will be implemented.)

The Thomas Gallagher Funeral Home is assisting the Family with the funeral arrangements. To view full obituary and leave an online condolence, please visit https://gallagherfuneralhome.com/

In lieu of flowers, contributions may be made in memory of Charles to “The Association for Frontotemporal Degeneration”. Online donations may be made using the following link: https://www.theaftd.org/support-aftds-mission/

Published in Stamford Advocate on Apr. 1, 2021.

Technical Corner

Thank you to Patricia Singh for coordinating and contributing this article to the newsletter!

AlkylPolyglycoside and the benefits of liquid crystals on the lipids of the stratum corneum

Authors: Patricia Singh, Sophie Cambos and Alicia Roso

Background

Alkyl PolyGlycosides are 100% bio-based surfactants produced by Fischer's glycosylation reaction (Fig. 1) between the sugar, Glucose and fatty alcohols. A strong glycosidic linkage is responsible for the resistance of APGs to hydrolysis and provides excellent compatibility with active ingredients including D.H.A. and hydrogen peroxide at extreme pH conditions and being non-ionic in nature, this extends their usage even further, to cationics.

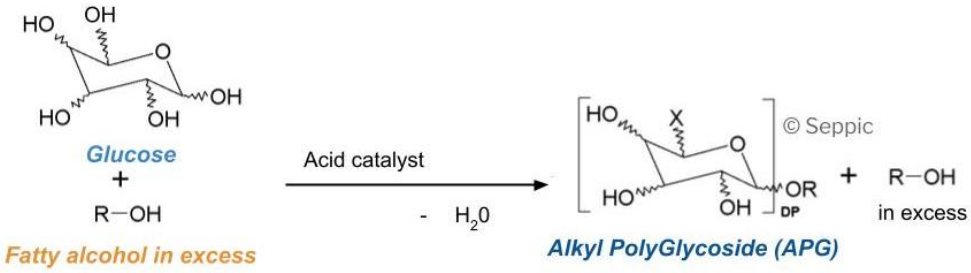

Fig 1 - Fischer's glycosylation of fatty alcohol by a sugar

The reducing sugar, glucose used can be sourced from wheat or corn starch and it is reacted with excess fatty alcohol with the option to remove at the end of the process. The choice of the linear, fatty alcohol is very important, it will define the Hydrophilic-Lipophilic Balance (HLB) and also the final applications of surfactant. Short chains fatty alcohol (<C8), produce APGs with physical and chemical properties, suitable for applications in solubilizing and detergency while the intermediate chains, between C8 and C12, will bring the foaming benefits and long chains (> C-12), which we will discuss here, will have the emulsifying power.

A range of oil in water emulsifiers was created by playing on the length of the linear fatty alcohols ranging from C12 to C22. APGs designed with high C16 to C18 fatty alcohol contents provided a rich skin feel compared to the light skin feel obtained with the longer, C20-C22 fatty alcohols. The unreacted fatty alcohol, lends to emulsions' stabilization and sensoriality, for this benefit, they are not removed at the end of the process.

APG emulsions & liquid crystals formation

Emulsifiers can set up varied organization at the water oil interface because of their amphiphilic nature. Alkyl Polyglucoside emulsifiers, paired with fatty alcohols with the same chain length, are known for their versatile ability to create lamellar liquid crystals [1] involved in O/W emulsion stabilization mechanisms. Two distinct structures are observed with APGs due to the synergistic effect between the surfactant and free fatty alcohol.

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Technical Corner

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First are the birefringent liquid crystalline or onion-type organization, visible with a classical microscope under polarized light, as the colorful Maltese cross around oil droplets. This “shell” structure of the lamellar bilayer, prevents the coalescence of the oil droplets (Fig. 2). Second, is the lamellar tridimensional elastic network in the continuous aqueous phase which prevents exudation or sedimentation by structuring the water phase. This second network which can be measured by rheology oscillatory experiments is only visible using scanning electron microscopy. In addition, with classical surfactant interface effect, these lamellar structures help to limit the movement of oil droplets [2], and explain the powerful emulsifying properties of APGs, especially with difficult to stabilize natural oils.

Liquid crystal formation is a common phenomenon of APGs, the slow mixing without shear in the cooling step (50°C) is required to allow for the layered arrangement. Studies with fatty alcohols of varying chain lengths show that longer fatty chains, from C16 to C22 form a more robust organization with a stronger stabilizing effect, especially when the emulsion is stored between 40–50 °C. They present consistently higher elastic character to the emulsions. Emulsifiers with C20 to C22 chains are especially efficient in stabilizing oils from concentrations, as low as 0.5 to 1%, whereas 2% is required for shorter lipophilic chains.

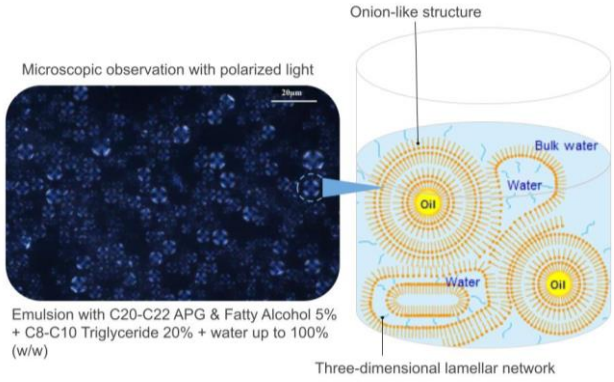

Fig. 2 - Lamellar phase schematic organization in O/W APG emulsion

Liquid crystal and the skin benefits

The lamellar liquid crystals bring stability to the emulsion but there are advantages for the consumers as well. Apart from emulsion stability, lamellar liquid crystals further impart two specific benefits. Firstly, a lamellar structure is similar to lipid organization in the stratum corneum: the emulsions are naturally biocompatible [3,4,5] secondly, due to free OH groups in APG and free alcohols, hydrogen bonds can form with water molecules which become “entrapped” in the lamellar phases. Therefore, lamellar phases act as water reservoirs and impart intrinsic moisturizing potential [6,7].

The aim of this study was to investigate an APG with long C20-22 fatty chains to determine end-users skin benefits, with a minimalist emulsion compared to the appropriate reference. Complementary evaluations were conducted, using classical corneometry measurements for moisturizing effect and the latest visualization imaging technology to evaluate effects on skin roughness. A second part was dedicated to better understanding the mechanism of action of the liquid crystals by further exploring with X-Ray microdiffraction what happens to the emulsion after application. How does the liquid crystals formed in the emulsion interact with the components of the stratum corneum?

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Technical Corner

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Methodology

In a first approach, the moisturising effect was measured with a simple formula to minimise interactions with the other ingredients and evaluate only the effect of the emulsifier on skin hydration. Skin rugosity and interaction of the stratum corneum were assessed on an even more basic emulsion, with a reduced oil quantity and without a thickening polymer. Appropriate references were chosen according to the parameters being measured (Tab. 1).

Moisturizing effect
(versus reference: without emulsifier)

Ingredients (INCI name)	% w/w
Arachidyl Alcohol & Behenyl Alcohol & Arachidyl Glucoside (APG C20-22)	3.00
Cetearyl Ethylhexanoate	20.00
Sodium Acrylate/ Sodium Acryloyldimethyl Taurate Copolymer & Isohexadecane & Polysorbate 80	0.50
Preservative	as required
Demineralized water	up to 100
pH	5.5 to 6.0

Skin rugosity
(versus reference: emulsifier Cetearyl Olivate & Sorbitan Olivate)

Ingredients (INCI name)	% w/w
Arachidyl Alcohol & Behenyl Alcohol & Arachidyl Glucoside (APG C20-22)	3.00
Caprylic/ Capric Triglyceride	5.00
Preservative	as required
Demineralized water	up to 100
pH	5.5 to 6.0

Interaction with stratum corneum
(versus reference: untreated stratum corneum)

Ingredients (INCI name)	% w/w
Arachidyl Alcohol & Behenyl Alcohol & Arachidyl Glucoside (APG C20-22)	3.00
Caprylic/ Capric Triglyceride	5.00
Preservative	as required
Demineralized water	up to 100
pH	5.5 to 6.0

Tab. 1 - Tested emulsions with C20-22 APG emulsifier

Hydration kinetics was assessed first with classical *in vivo* corneometry measurements (Corneometer® CM 825 from Courage + Khazaka) on 20 volunteers with dry skin (<50 a.u.). The corneometry was monitored for five hours after a single application of the emulsion on the legs.

The effect of the emulsion on the skin texture was evaluated with the ColorFace® [8] acquisition system (Newtone company). This system, including a rotation at −45°, 0°, +45°, allows a 3-Dimensional high-resolution full-face image acquisition in real time without requiring movement from the volunteer. The study was conducted on 20 women with uneven skin texture and shiny skin. The face photography of ¾ profiles with cross polarised and parallel polarised lights were analysed at 0 and 30 minutes, after a single application of 300 mg of each emulsion on half-face (C20-22 emulsifier versus reference on the other half-face). Results are compared using the skin surface roughness index to the ratio between the developed area (relief) and the total area analysed.

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Technical Corner

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To better understand what happens to the formulation after application to the skin, the impact of the emulsion on stratum corneum (*ex vivo*; triplicate; 2 mg of emulsion/ cm2) was analysed by x-ray microdiffraction at wide and small angles (WAXS and SAXS respectively). The x-ray beam was parallel to the stratum corneum and images were acquired with a sweep from the external face of the stratum corneum to its internal face lasting one hour [9]. X-ray diffraction provides information on the more or less orderly organisation of molecules and their orientation. In the present case, it was applied to study the packing of intercellular lipids and inter-layer and intra-layer lipid arrangements (amorphous, hexagonal and orthorhombic) inside the stratum corneum before and after application of the emulsion. The diffraction intensity is proportional to the diffracting material content, i.e. lipids in the present study.

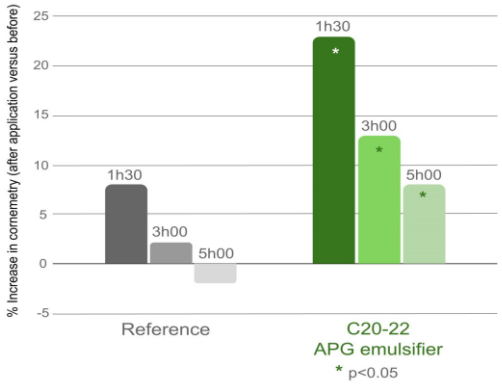

Fig. 3 - Corneometry evolution over time

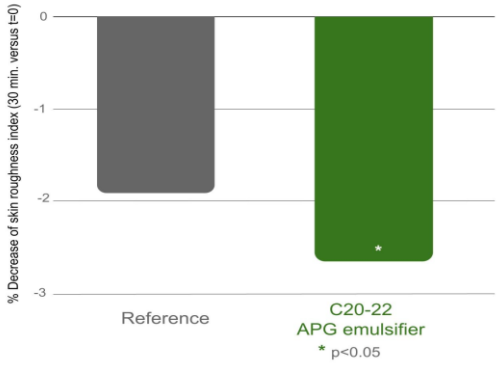

Fig. 4 - Skin roughness index

Results and discussion

Moisturising effect

The simple emulsion with C20-22 non-ionic emulsifier has a better moisturising effect than the reference (Fig. 3). The effect is prolonged and still significant five hours after application. This result confirms a previous publication highlighting moisturising effects lasting up to five hours with medium-chain triglyceride and avocado oil but achieved with a higher dosage of the non-ionic emulsifier [10].

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Technical Corner

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Influence on skin surface texture

The analysis of skin surface texture demonstrates a significant decrease in skin roughness at 30 minutes with the C20-22 non-ionic APG compared to baseline, whereas the reference provides non-significant results (Fig. 4). Despite the fact that it can be perceived as common, this is the first evidence obtained from direct analysis of skin images after application of a minimalist emulsion.

Interaction of C20-22 APG with the stratum corneum

In a normal stratum corneum, lipids surrounding the corneocytes are organised in a three-dimensional lamellar bilayer structure, predominantly parallel to the skin surface. Inside the lamellae, the lipids are arranged laterally in three types of packing from the non-ordered state to the more densely packed: liquid or amorphous, crystalline hexagonal and orthorhombic lipids [11,12].

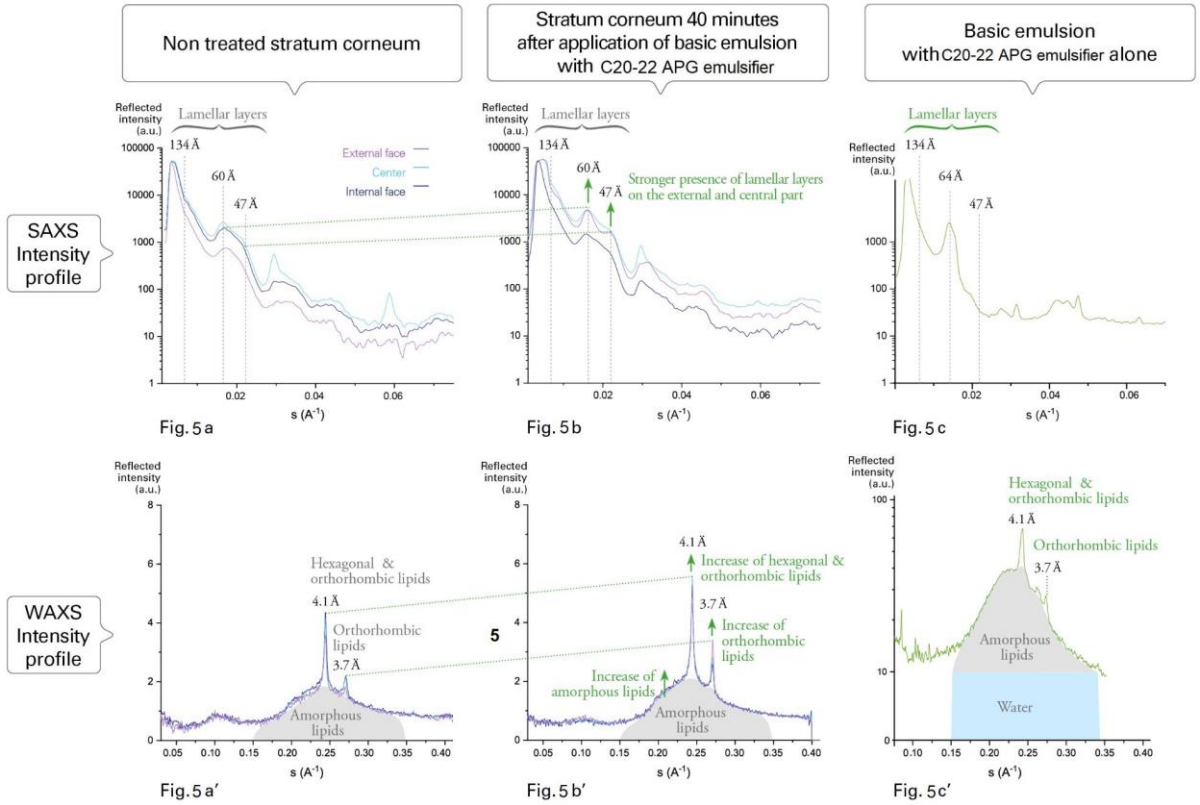

Fig.5 X-Ray microdiffraction intensity profiles

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Technical Corner

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Fig. 5a and 5a' reflect the typical x-ray diffraction pattern of a normal stratum corneum. The SAXS profile (Fig. 5a) is characterised by a series of peaks at around 134 Å, 60 Å and 47 Å representative of the stratum corneum bilayer structure. The WAXS profile (Fig. 5a') shows a large signal coming from amorphous lipids, and two peaks indicating crystalline lipids, at 4.1 Å for hexagonal and at 4.1 Å and at 3.7 Å for dense orthorhombic lipids. There is wide agreement on the high importance of this organisation of lipids for a healthy, functional skin barrier. Some publications have reported that orthorhombic lipids, less permeable to water, are essential to control trans-epidermal water loss [13]. Other investigations suggest that the overall organisation and balance of the lipids are more important in maintaining the skin barrier's functionality than the orthorhombic lipids themselves [14]. Indeed, evidence of a change in the balance of the distribution of intra-lamellar crystalline hexagonal and orthorhombic lipids was observed in lamellar ichthyosis and atopic dermatitis skin diseases, associated with an impaired skin barrier [12]. Moreover, disruptions of the equilibrium between the three types of packing with transitions from solid orthorhombic or hexagonal crystalline phase to liquid amorphous lipids were reported to occur after application of some compounds at the surface of the skin in combination with disturbed skin barrier integrity [15]. More recently, potential disturbance of stratum corneum lipid arrangements by classical non-ionic emulsifiers has been described, according to their chemical structure and HLB value [16]. Fig. 5b and 5b' show the X-ray diffraction profile of the stratum corneum 40 minutes after application of the emulsion with the C20-22 APG. A first reading, compared to the stratum corneum alone, shows clearly that the general profile is identical in SAXS and WAXS, with the same peak positions. The preservation of diffraction signal quality demonstrates that the APG does not disrupt the inter-lamellar (SAXS) and intra-lamellar (WAXS) organisation of lipids in the stratum corneum. Moreover, closer observation taking into account comparable intensity scales between profiles shows that the signal intensity increases, in particular around 60 Å in SAXS (Fig. 5b), and in the whole SAXS profile (Fig. 5b') meaning that the lamellar structure is strengthened, in addition to amorphous, crystalline hexagonal and orthorhombic lipid organisation (peaks at 4.1 and 3.7 Å in Fig. 5b') increasing in the stratum corneum.

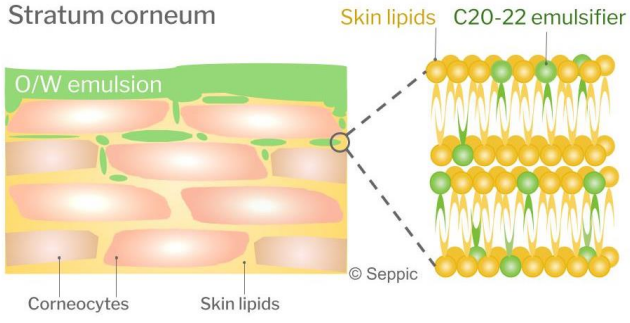

Fig. 6 - Interactions of C20-22 APG emulsifier with the stratum]corneum

These results indicate that the lipids of the emulsion align themselves with the lipids of the skin as illustrated in Fig. 6, thereby strengthening skin barrier and this explains the increase in moisturisation and the decrease in roughness.

Conclusion

Alkyl Polyglycosides provide a valuable tool for the formulator as they will create emulsions with long term stability, even at extreme pH and with various challenging active ingredients. The unique sensory signatures and assorted textures that can be generated are appealing to the consumes as evident in the number and range of marketed personal care products

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Technical Corner

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This work confirms that the non-ionic C20-22 glucoside emulsifier (INCI: Arachidyl Alcohol & Behenyl Alcohol & Arachidyl Glucoside), in addition, provides measured benefits to the skin, due to different mechanisms associated with its chemical structure. A bio-compatible emulsifier which gently inserts itself between the stratum corneum lipids bringing smoothness and hydration to the skin going far beyond its main function of emulsifying.

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Technical Corner

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Authors

Patricia Singh, Global Account Manager, joined Seppic Inc in 2005 and developed her expertise in the field of green, sugar based chemistry.. She holds a B.S. in Chemistry and her experience in personal care includes Senior Director of the Cosmetic Sales at Bio-Botanica Inc, R&D Chemist, United Guardian Laboratories and PALL Corporation Inc. An active member of the Society of Cosmetic Chemists, Patricia served as Chair of the CTSCC in 2017 and currently at the National level as Area I Director.

Sophie Cambos, in charge of a valorization project' team in the Research and Innovation department, joined Seppic in 1989. She is a Cosmetic Scientist and has worked for eighteen years in the cosmetic R&D team, firstly as lab technician then as lab manager. Sophie was named as Seppic Expert for health care formulation and mixtures in 2014.

Alicia Roso, scientific communication manager in the innovation direction team, joined Seppic France in 1986. She is a Chemical engineer and has worked for twenty years in the cosmetic R&D team, firstly as lab technician then as lab manager. She joined the marketing team in 2006 as product manager and gained a marketing MBA from ESSEC business school. Alicia was named as Air Liquide International Expert for health care formulation and mixtures in 2010 and is co-author of 23 patents on new ingredients or formulation technologies dedicated to cosmetology and dermopharmacy applications.

Member Spotlight

Michele Margherita

Senior Sales Executive, Brenntag Specialties

Member of SCC since: 2005

How did you get into the industry? I came to Brenntag North America thru acquisition of Quadra Chemicals in 2005 where I joined the Life Sciences marketing team (food, pharma and personal care). As Brenntag continued to support specialized industries I gravitated towards PC and joined BSI focusing only on PC.
I transitioned from marketing back to sales (where I started pre-Brenntag) and rediscovered my love of the freedom and satisfaction of calling on customers and being successful in problem solving and customer service. Its like running my own little business.

What's the best part about your job? I truly enjoy life on the road seeing new people everyday and none of the routine of going to an office every day. This pandemic is really cramping my style!

What's your favorite event that CTSCC (typically) hosts? I look forward to the golf outing-great to hang with colleagues and customers without an agenda and have fun with no pressure!

What advice would you give to someone just starting out in the industry? Learn, learn, learn-join the SCC, attend every meeting, webinar, ed seminar and meet as many chemists as you can and pick their brains! What was old is new again, so trends cycle and never completely disappear, what you learn today may be needed again in a few years.

How do you see the current pandemic shifting our industry for the long term? My fear is that companies may decide that face to face meetings aren't necessary, we are all still very busy and business is good. However once we have a choice, if we don't get back to in person meetings, so much value will be lost, Zoom meetings don't create relationships, they just keep them alive but not growing. We lose so much nuance without face to face meetings. I learn about my customers by what products are on the shelves in the lobby, what I see walking thru a warehouse and sitting in a lab, even how many cars are in the lot. You miss these via Zoom, phone and email.

Fun fact about you? I have been using my at home time to take a 16 week wine course to become a certified specialist of wine. Someday I want work in the wine industry when I get off this roller coaster and slow down a bit.

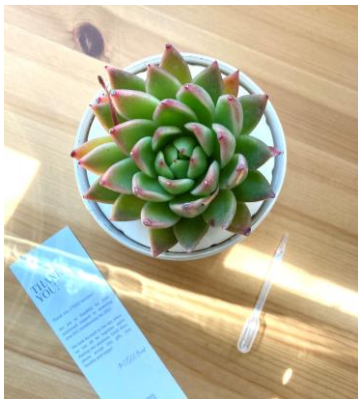
Favorite Restaurant in Connecticut? Blue Lobster, Berlin, CT. I'm a sucker for New England seafood and lobster rolls are on the top of my list.. This little place is near the eastern end of the Merritt, I often stop for a quick lunch or take out for the family on my way back to NJ.

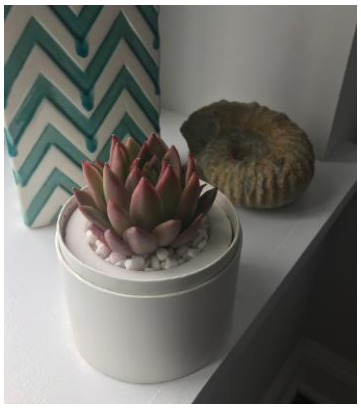
What was your favorite activity during lock down? I moved in Jan from my home in Bergen county to the jersey shore and love walking on the beach/boardwalk (weather permitting). It's been so quiet and I am loving the sea air, and the sunsets across the bay are amazing.

What are you most looking forward to in 2021? I am looking forward to getting back on the road! I am so tired of sitting in front of my computer! Also to make up for vacations cancelled last year-already planning a week in Sonoma in June (see fun fact above) and would love to get back to Italy and Denmark/Norway to visit family.

Succulents!

As an end-of-year thank you to our members for the continued support despite a challenging year, succulent gifts were sent to renewing members. Many thanks to Nina Miotto for leading this effort. Please enjoy these fun photos of succulents in our members' homes.





Upcoming Events

Michigan Chapter Webinar: Navigating buzzwords to address demand for naturality
May 11

New York Chapter: The Exposome – A Multilevel Cosmetic Active Target
May 12

New York Chapter: Leading in a Time of Uncertainty
May 25

Ontario Chapter Webinar: Decoding the "Crystal ball" Color Trends
May 27

SCC: Online CEP Course (w/ AOCS): Lipids in Personal Care
June 7-11

Connect with area professionals through the newsletter!

Do you have an ***employment opportunity*** in the Connecticut area or beyond?

Is there a ***technical article***, raw material insight, relevant writing, or other piece you'd like to share with the community?

Have you captured ***photos*** at CTSCC events?

Please contact Yingxia Wang to be featured in the newsletter (yingxia.wang@unilever.com).

Are you interested in supporting CTSCC with a newsletter ***sponsorship***? Please contact Michele Margherita for more information (mmargherita@brenntag.com) or visit *ctscc.org/advertising.*

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