fragrance retention, release and sensory perception from surfactant-rich rinse-off cosmetics

session: sensory evaluation of fats

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agenda

critical role of fragrance oils in cosmetics

*in-vivo* instrumental method to evaluate fragrance impact
- liquid body wash with polymer technology
- soap bars with polymer technology
- screening polymers for fragrance retention/release

review of innovations: fragrance encapsulation

testing stability and performance of fragrance encapsulates
- leakage potential and capsule integrity in formulations
- expert performance evaluation

conclusion
solving for efficient delivery of fragrance

challenge: very low level of fragrance deposited from rinse-off cosmetics

product sight, smell, touch

mood & sensorial experience

multisensory perception

consumer satisfaction / repurchase

fragrance impact vs investment

Ashland always solving
critical role of fragrance oils in cosmetics

- delivers a pleasing scent
- masks an unpleasant odor
- immediate / lingering scent provides a hedonic impact
- reinforces perception of the products purpose and efficacy
- fragrances are considered the most effective “value-booster” and “brand differentiators” in cosmetics
fragrance deposition from body wash

new method

daily conditioning body wash is a prototype that contains a polymeric deposition technology (GHPTMC)
sampling setup - twister bar

- Sample preparation: an area of 18cm² of the volar forearm was washed with the cleansing formulation for 30 seconds, wait 10 seconds, and rinsed with tap water for 30 seconds then towel dried.

- The washed area of the arm was exposed to the twister bar setup for 15 minutes. This step is repeated at 1 hour intervals, three times, for head space extraction.

- After extraction the twister bar is removed and placed into clean glass thermal desorption tubes for fragrance analysis.
GC/MS with GERSTEL MPS robotic sampler, thermal desorption unit (TDU), and cooled injection system (CIS) option is used to monitor the fragrance release profile as a function of time.
comparison of SPME fiber to twister bar
conditioning polymer enhances fragrance deposition on skin after rinse

Guar hydroxypropyltrimonium chloride
(GHPTMC: N-Hance™ CCG45)
results from fragrance evaluator

Formulation with N-Hance CCG-45 (GHPTMC) shows improved initial bloom, deposition and retention on skin

- 1 – no scent
- 2 – Weak
- 3 – Medium
- 4 – Moderately Strong
- 5 - Strong
polymers tested – soap bar study

benecel™ K200M
hydroxypropylmethylcellulose

N-Hance SP-100
acrylamidopropyltrimonium chloride/acrylamide copolymer

n-hance™ 3196
guar hydroxypropyltrimonium chloride (GHPTMC)

ceraphyl™ RMT
maleic anhydride/ castor oil adduct (1:1)
superior fragrance deposition and reduced cracking
all polymers tested significantly enhances dihydro-myrcenol retention on skin
screening of polymer N-Hance SP100: effect of concentration and no polymer
review of innovations - encapsulates

- capture perfume oils
- protect & store in formulation
- slow and sustained release
- triggers - UV light, heat, pH, rubbing, hydrolysis, enzymes, O₂

**current technologies**
- polymeric shell around fragrance oil composed of melamine resin crosslinked with formaldehyde through interfacial precipitation
- poly-urea based shell crosslinked with isocyanate through interfacial polymerization

**new technology**
- melamine/formaldehyde and amine free shell chemistry
- more surfactant tolerant shell
- fragrance loading ~ 30%
- size of capsules 5-30 microns
formulations tested

Standard SLES/CAPB surfactant system tested with 1.0% total fragrance

- 1: 100% Fragrance Oil
- 2: 80% Fragrance Oil/20% Encapsulated Fragrance
- 3: 50% Fragrance Oil/50% Encapsulated Fragrance
- 4: 0% Fragrance Oil/100% Encapsulated Fragrance
acceptable viscosity over time at 25°C and 45°C

Viscosity over time 25°C formulas

Viscosity over time 45°C formulas

1% Encapsulate in 12 Weeks
1% encapsulate in surfactant formulation
45°C & 25°C after 90 days

encapsulates remain intact after 90 days in both
temperature conditions

40X magnification
GERSTEL MPS as headspace autosampler coupled to agilent technologies GC 7890B with MPS

- 180 samples, 1g each
- Critical for all samples to be filled same time
- Samples removed at scheduled time intervals for measuring GC head space of fragrance notes
formulation with 1% encapsulates shows greatest protection & lowest leakage of fragrance
at 45°C, the formulations with higher level of neat fragrance shows less protection & higher leakage

**Limonene peak at 45°C**

- Red: 1% Fragrance 45°C
- Purple: 0.2% Encapsulate +0.8% Fragrance 45°C
- Green: 0.5% Encapsulate +0.5% Fragrance 45°C
- Blue: 1% Encapsulate 45°C

**Graph Details:**
- X-axis: Time (weeks)
- Y-axis: GC area count
Formulations with encapsulated fragrance options show longer lasting fragrance perception.
conclusions

- perfume design and creation of novel fragrance oils are essential steps to satisfy consumer need in cosmetic products
- use of polymeric ingredients can enhance the deposition of fragrances from liquid and bar soap formulations
- encapsulation of fragrance oils can lead to improved fragrance intensity, bloom and longevity
- an *In-Vivo* instrumental method was used to evaluate and differentiate fragrance impact
- melamine, formaldehyde and amine free fragrance encapsulates with loadings above 30% can be created to protect fragrance oils from leakage with good capsule integrity as demonstrated by testing stability for 12 weeks
- next steps: develop method for evaluating bloom in shower
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thank you

questions?
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