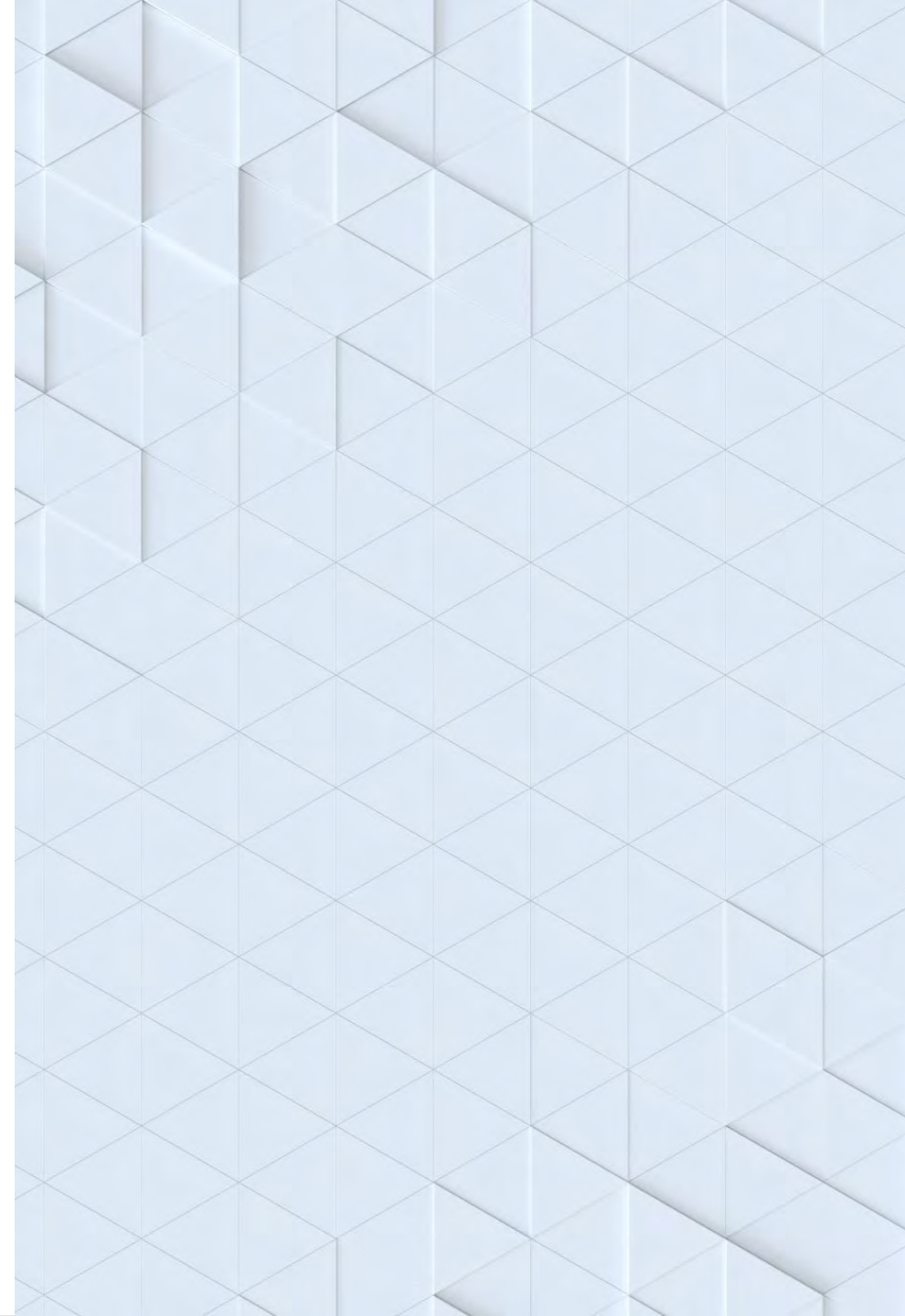


# **Investigating Effects of Surfactants in Hair Care Products on Texture and Weight of Hair Extensions**

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MARTYNA LASZCZ

PHYSICS 607



# Rationale

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We use hair care products such as shampoo and conditioner every day of our lives - but do you know what the ingredients in these products do?

Most shampoos and conditioners include a surfactant as a main ingredient. The different types of surfactants have differing roles and cleansing abilities. The type of surfactant in your hair care products may result in a completely different wash day from one day to the next.

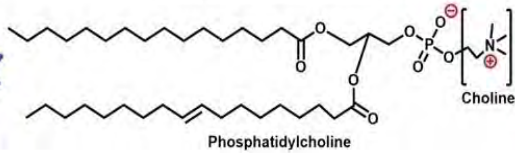
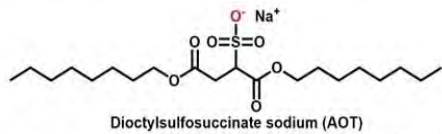
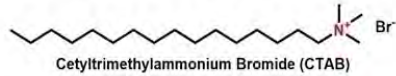
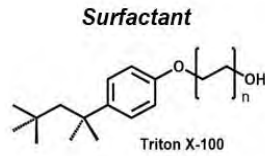
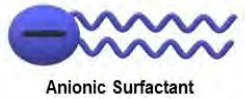
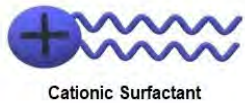


Karolina Grabowska, pexels.com, 2020

# Background

## Types of Surfactants:

Hydrophilic head Hydrophobic tail



a

b

## Uses of surfactants:

- Cleansing
- Foaming
- Polymer deposition

## How do they work?

- In short, decrease surface tension at water/oil interface
- 4 mechanisms at work:
  - Roll up
  - Spontaneous emulsion
  - Penetration
  - Micelle

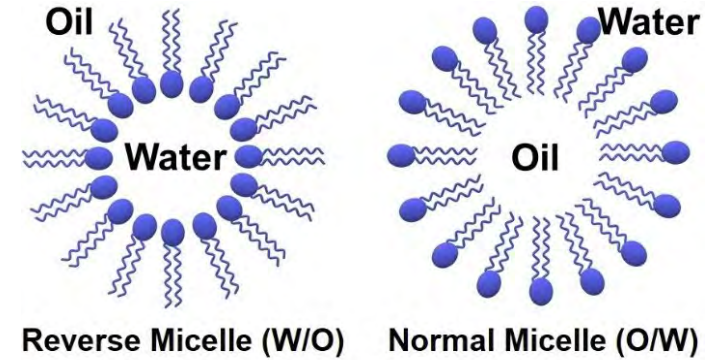


TABLE 27.1 Classification of Surfactants			
SHAMPOO SURFACTANTS			
Class	Example	Characteristics	
Anionic	Ammonium lauryl sulfate, sodium laureth sulfate, sodium lauryl sarcosinate, sodium myreth sulfate, sodium pareth sulfate, sodium stearate, sodium lauryl sulfate, $\alpha$ olefin sulfonate, ammonium laureth sulfate	Deep cleansing	
Cationic	Trimethylalkylammonium chlorides and the chlorides or bromides of benzalkonium and alkylpyridinium ions	Hair softener Mild cleansing	
Nonionic	Fatty alcohols, cetyl alcohol, stearyl alcohol, cetostearyl alcohol (consisting predominantly of cetyl and stearyl alcohols), and oleyl alcohol	Mild cleansing	
Amphoteric	Alkyl iminopropionates and (amido) betaines	Do not irritate the eyes Moderate cleansing	



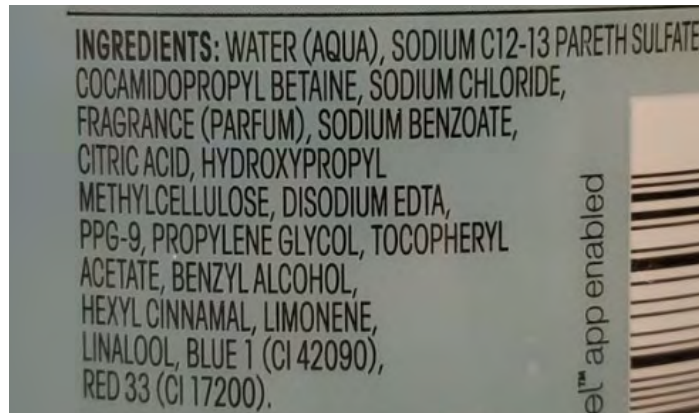
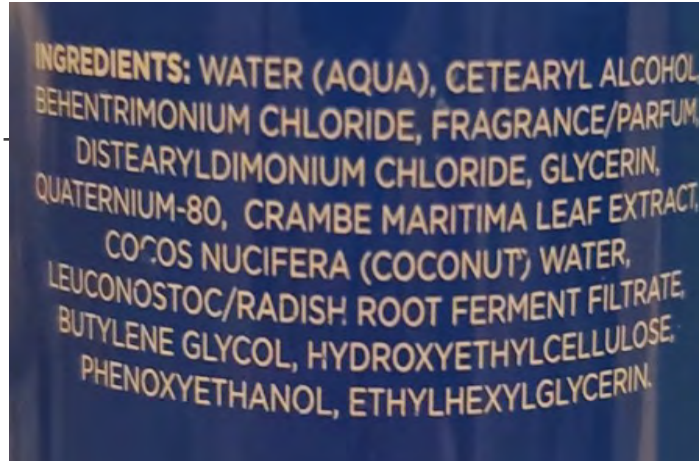
# Experimental Procedure

Each extension washed 20 times with respective product.

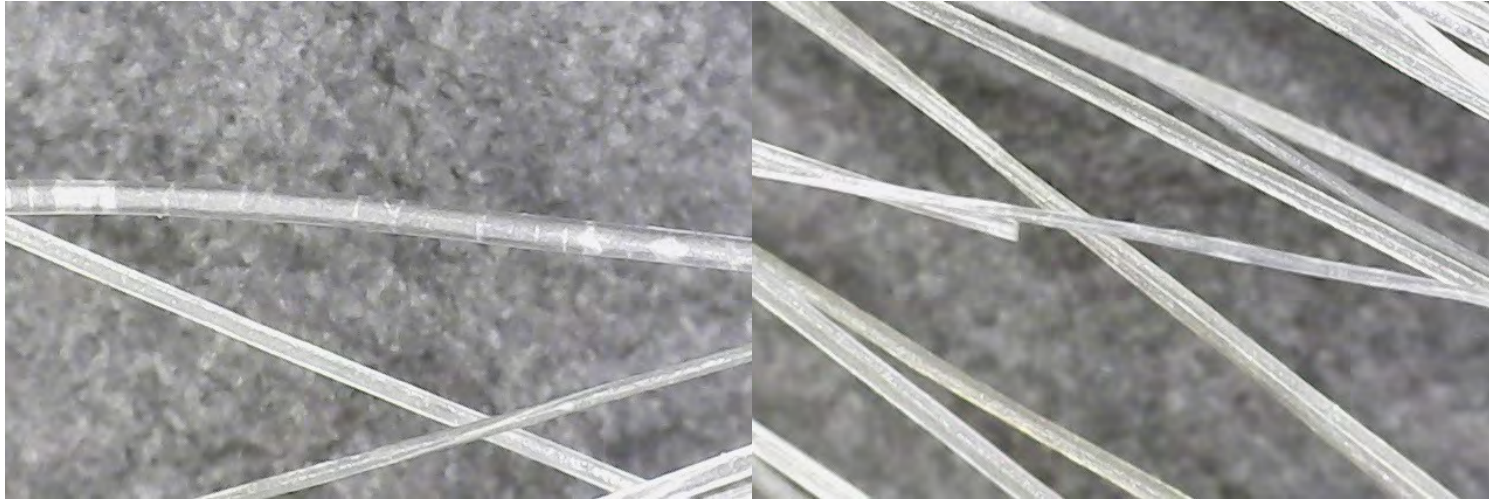
Weighed and photographed every 5 washes.

Weights recorded to compare change in hair loss over time.

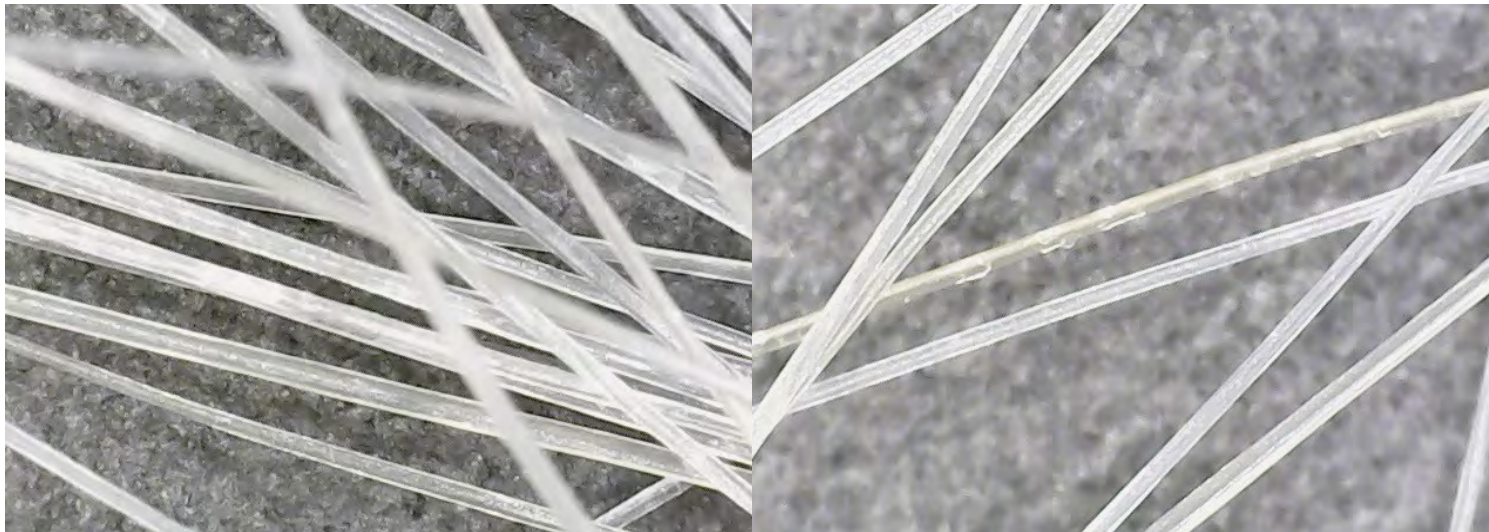
Textures observed from photographs.



# Results



Top:  
Cuticle damage after 5 washes with SC12-13PS  
Breakage after 10 washes with SC12-13PS

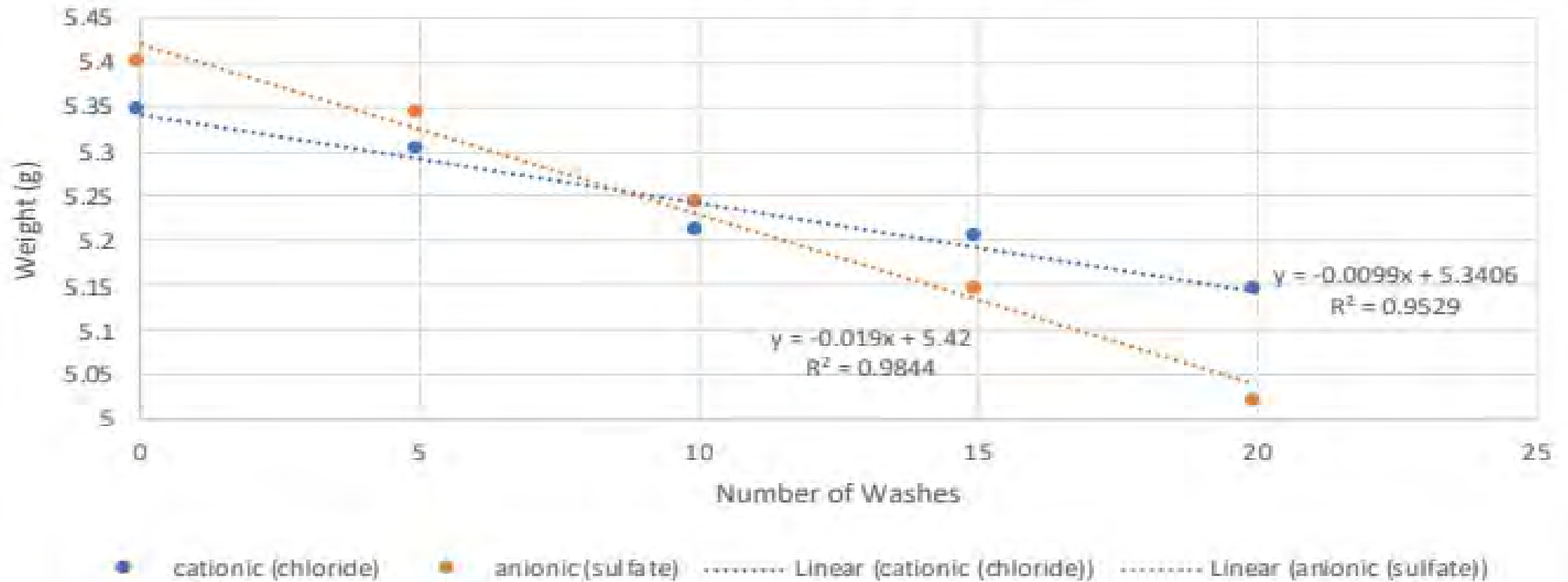


Bottom:  
Cloudy buildup after 5 washes with Behentrimonium Chloride  
Cuticle damage or build up after 20 washes with Behentrimonium Chloride.



# Results

Change in Weight of Hair Extension After Washing With Surfactant-Based Hair Care Products



# Conclusions

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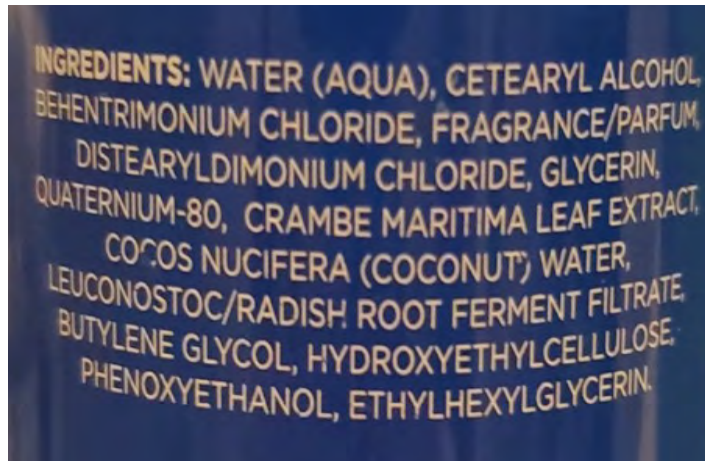
- Hair washed with SC12-13PS based product demonstrated quicker loss of hair, and evidence of damage and breakage sooner.
- Hair washed with Behentrimonium Chloride based product demonstrated slower loss of hair, and experienced build up.
- These products should be used in combination.
- Selection of products with specific ingredients may have an impact on overall hair health.

# Limitations and Next Steps

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Limitation:

Lack of controlled ingredient usage



Next steps:

- More controlled ingredient usage: acquire higher concentrations of these products
- More specific measurements. Ex: tensile stress testing

Special interest:

Nanotool  
ingredient  
deposition

