

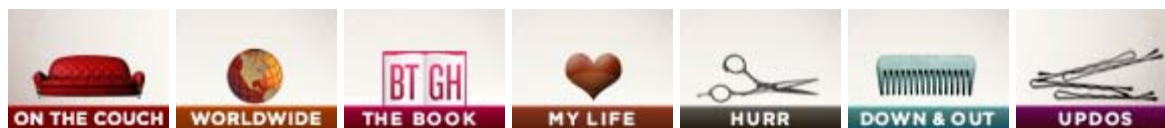
How To Remove Eye Bags

90 second trick erases your under eye bags and wrinkles

▶ [REMOVE BAGS](#)



FILTER BY CATEGORY



april 5, 2012

INGREDIENTS 101- CATIONIC SURFACTANTS

[curly hair ingredients](#) [guest blogger](#) [hair science](#) [ingredients 101](#)



by Tonya McKay of *NaturallyCurly*

Occasionally discussions arise in the hair product-focused community concerning several

cationic surfactants, such as cetrimonium chloride, behentrimonium methosulfate and stearamidopropyl dimethylamine.

For good reason, the INCI (International Nomenclature of Cosmetics Ingredients) names of these molecules are often confused with silicones, sulfate detergents and preservatives. It can be surprising to hear that a "sulfate" is a desirable conditioning agent for many people. A brief review of the different types of surfactants and their various applications, as well as a closer examination of cationic surfactants in particular seems useful to bring some clarity to the confusion.

What are Surfactants?

Surfactants are molecules that possess dual-polarity, having both hydrophobic (water hating) and hydrophilic (water loving) segments. Although hydrophobic is the term most often used to describe non-polar substances, the term lipophilic (oil loving) is perhaps a more accurate descriptor, because they do not so much hate water as they prefer oils. The unique quality of being both lipophilic and hydrophilic is described as being amphiphilic. Molecules that are amphiphilic characteristically possess a long segment that is a non-polar hydrocarbon chain and a polar head group that can be ionically-charged or not.

Due to the uniquely polar properties of water, immersion of an amphiphilic molecule in an aqueous solution results in very interesting behavior. Water molecules have strong intermolecular hydrogen bonding that creates a predictable geometric structure within the bulk of the liquid. This hydrogen bonding forms a tightly stretched molecular film at the interface between air and the liquid. This gives water its characteristically high surface tension. Placing a molecule with hydrophobic properties into that environment disturbs that local structure, so the water excludes the hydrophobic molecule from the solution by pushing it to the surface.

You have certainly witnessed this yourself when you have seen the rainbow display of oil on the surface of a water puddle. What happens when the molecule has both a hydrophilic portion and a hydrophobic portion is that the polar head group is solvated into the solution just below the air-water interface, while the hydrophobic tail group juts out above the surface. This disrupts the hydrogen bonding at the surface of the water, which substantially decreases the surface tension. For this reason, amphiphilic molecules are said to be "surface active agents" and are called surfactants.

Eventually, if the concentration of amphiphilic material is increased, the surface of the solution becomes saturated, and an intriguing phenomenon occurs. In order to preserve as much of the polar structure of water as possible, the amphiphile molecules aggregate together into tiny spheres in the bulk of the solution, with the hydrophobic portions clustered in the center of the sphere, which is surrounded by a hydration shell comprised of the polar head group. These amazing aggregates are called micelles, and are the foundation for many biological functions. They are also useful for many functions such as cleansing, emulsion stabilization, targeted and/or controlled release drug delivery, formation of liquid crystalline structures and many

other applications.

Surfactant molecules are classified according to the ionic charge of the hydrophilic head group. These classes consist of anionic, cationic, nonionic, and zwitterionic surfactants. The ionic surfactants are available in salt form with an appropriate alkali metal or ammonium counterion. Nonionic surfactants typically possess several repeat units of ethylene oxide as the hydrophilic moiety. Dual-charged (zwitterionic) surfactants also have utility in hair care products. Many polymers have amphiphilic qualities as well, and they are quite interesting in their properties. However, in this discussion, for the sake of brevity and focus, we shall confine our examination of surfactants to those which are small molecules, and exclude discussion of polymeric surfactants.

Anionic surfactants, such as sodium lauryl sulfate, ammonium laureth sulfate and sodium cocoyl isethionate carry a negative charge on the polar head group. These materials are typically incorporated into shampoo formulations for their detergency properties. They are highly effective at removing dirt and oil from the hair and scalp. Many consumers with delicate, curly hair find these to be too drying and damaging for frequent use, and they either seek shampoos with different types of surfactants or opt to use cleansing conditioners.

Nonionic surfactants are those such as decyl glucoside and PEG-10 laurate, which have no residual electric charge at all. These surfactants can perform a variety of functions in a formula, such as emulsion stabilization, mild detergency and viscosity modification.

Zwitterionic (or amphoteric) surfactants are dual-charged (have both a positive and negative charge on the molecule). Many display pH-dependent charge behavior, having one charge at lower pH's and the opposite charge at higher pH's. These types of surfactants, such as cocamidopropyl betaine, are valued for being mild both to skin and hair. They also provide foam-boosting to shampoos that contain anionic surfactants, which enhances lather, a property preferred by many consumers.

Cationic surfactants such as cetrimonium chloride and stearamidopropyl dimethylamine, have a positive charge on their head group. The composition of the molecules can vary, but is typically a fatty, acid-derived, hydrophobic tail with a nitrogen-containing head group. The nitrogen-containing group can be either a tertiary or quaternary amine. Typically these surfactants are either alkyl amine salts or alkyl quaternary ammonium salts.

What Sets Cationic Surfactants Apart

Cationic surfactants, as their counterparts, are quite versatile, due to their amphiphilic character. However, rather than being used primarily for detergency, cationic surfactants are more often used for very different applications, especially in hair care products. Perhaps the most important use for cationic surfactants in hair care is as conditioning agents.

You may recall that the surface of hair has an overall negative charge, which becomes more prevalent if the cuticle is damaged. The head groups of these cationic surfactants experience

electrostatic attraction to these negatively-charged sites and adsorb onto the surface of the hair. The hydrophobic portion of the surfactant molecule lies flat along the surface of the hair, forming a film that smoothes the cuticle. This film has multiple effects, including reduction of static, reduction of combing forces, increase in pleasing tactile feel of the hair, and a decrease in tangle formation. Cationic surfactants used for these purposes have also been found to aid in color retention for artificially dyed hair.

Alkyl quaternary ammonium salts, such as cetrimonium chloride and behentrimonium methosulfate have been found to build up on the surface of hair after multiple uses. They can be rather difficult to remove once this happens. They are also incompatible with anionic surfactants in shampoos, as they form an insoluble complex in the solution. Another undesirable property for use in shampoos is that they depress the foaming ability in such formulae. For this reason, they are most preferred in conditioning products.

Alkyl amine salts, such as stearamidopropyl dimethylamine actually adsorb onto the surface of the hair to a lesser extent than the quaternary compounds. They are also more easily rinsed and removed, and thus have less incidence of undesired accumulation. Alkyl amines can be neutralized into a salt via addition of small amounts of weak acids, such as citric, lactic, or propionic to form the corresponding ester (stearamidopropyl dimethylamine lactate). These neutral salts are quite compatible with anionic surfactants and do not interfere with foam formation, rendering them quite suitable for use in conditioning shampoos.

Cationic surfactants are also quite useful for the emulsification and solubilization of hydrophobic additives, such as silicones. They achieve this by encapsulating the non-polar material inside the interior of their micellar structures. Once the solution is diluted by water in the shower, the micelle structures break down, facilitating deposition of the conditioning agent onto the surface of the hair. This enables them to perform multiple functions in the same formula; emulsion stabilizer as well as conditioning agent.

Overall, cationic surfactants contribute many excellent properties to both shampoos and conditioners. They can be effective mild cleansers in a conditioner, due to their surfactant structure, but their most valuable contribution is as film-forming conditioning agents. They are water soluble, but the quaternary variety bind rather tightly to the hair surface and can build up, so be aware of the potential for that issue. The alkyl amines seem to have no significant drawbacks for a curly girl or guy, and many users report enjoying their effects.

Quick Round-Up

Alkyl-quaternized ammonium salts:

- Stearalkonium chloride
- Cetrimonium chloride
- Cetrimonium bromide
- Behentrimonium methosulfate

Behentrimonium chloride

- Benzalkonium chloride
- Cinnamidopropyltrimonium chloride
- Cocotrimonium chloride
- Dicetyldimonium chloride
- Dicocodimonium chloride
- Hydrogenated Palm Trimethylammonium chloride
- Lauryltrimonium chloride
- Quaternium-15
- Quaternium-22

Alkyl amines or amine salts:

- Stearamidopropyl dimethylamine (lactate, citrate, propionate)
- Isosteamidopropyl dimethylamine
- Isosteamidopropyl morpholine
- Wheatgermamidopropyl dimethylamine
- Behenamidopropyl dimethylamine

CN Says:

Had to put on the old thinking cap for this one! I love products that contain behentrimonium methosulfate... I actually seek out conditioners that have this ingredient in the top 5. I suppose its magical cuticle smoothing action contributes to that lovely slippery feeling I get when detangling. Sucks that it has a tendency to build-up, but such is life.



8 Comments

curlynikki

Login ▾

Recommend **1**

Share

Sort by Oldest ▾



Join the discussion...



sammiegotsoul • 5 years ago

I've found that product made of mostly bm and apart from surfactants aloe vera give me a lot of slipp !

  • Reply • Share ›



ernestbord • 5 years ago

I like to target on how to accept your hair in the express that it was birthed and how to change your hair back into the organic state if you are not presently embracing it.

Online Pharmacy No Prescription

  • Reply • Share ›



Anonymous • 5 years ago

Geez! Its seems as if you have to be a scientist to be a natural/curly haired beauty!

  • Reply • Share ›



Anonymous • 5 years ago

This article reminds me that I have a chemistry quiz coming up that I really should study for. lol

2   • Reply • Share ›



Anonymous • 5 years ago

That was UBER helpful :)

  • Reply • Share ›



mangomadness • 5 years ago

Behentrimonium methosulfate is my favorite moisturizer--Alba Botanica Leave-In Conditioner. It's super slippery, moisturizing, inexpensive and has awesome ingredients.

Behentrimonium chloride is in my favorite detangling conditioners--Shea Moisture Purification

«FORTH AND FORTH

TOP | CURLYNIKKI.COM

BACK, BACK»

Subscribe to: Post Comments (Atom)

Around The Web



Stop Doing This to Your Natural Hair



I Had Shedding & Breakage Until I Made These 3 Changes



The Best Short Hairstyles For Natural Hair



6 Reasons Your Natural Hair is Not Longer



Want CurlyNikki.com exclusives, discounts and email updates?

Yes! Give me updates!

NEWBIE? START HERE

MY BOOKS



Download your **FREE** copy!

better than good hair



amazon.com

BARNES & NOBLE
BOOKSELLERS

Available on the
iBookstore

Also available from
IndieBound
Books-a-Million



MEET CURLY NIKKI

Licensed Psychotherapist.
Professional Blogger.
Best-selling Author.
Natural Hair Lover.
Wife. Mother.
Daughter. Sister.

BEST OF THE BEST



Essential CurlyNikki!
Best of the Best from 2008-2013!



Ways to Browse

Looking for your favorite natural celebrity interviews?
Reviews on the latest hair products?

Find what you need below!

SEARCH CURLY NIKKI

HOT TOPICS

Choose a Topic to View

BACK IN THE DAY

Back in the Day

SPONSORED



STYLEWE



FREE SHIPPING [Shop Now](#)

LIKE ME ON FACEBOOK



CurlyNikki 
743,544 likes

[Like Page](#) [Liked](#) [Sign Up](#)

You like this [Be the first of your friends to like this](#)



THIS WEEK ON CN

How I Achieved Long and Healthy Type 4 Natural Hair

How to Grow Out Type 4 Natural Hair Faster

Soften Hyperpigmentation Naturally

3 Things to do When You're Tired of Your Natural Hair

The Best Black Makeup Artists on Instagram

NEW Product: Color Gray Hair & Restore Pigment Without Chemicals!

7 Ways to Get Super Moisturized Natural Hair Right Now!

5 Tips For Straightening 4C Hair without Heat Damage

Use THIS to Naturally Darken Your Hair!

How I Improved My Mortifying Scalp Condition...

SPONSORED

"Emails are the best way to communicate with our customers."

- MATT JUSZCAK
Co-Owner, Turnstyle Cycle



BE A MARKETER,
LIKE MATT

Constant Contact
Email Marketing
makes it easy.

TRY EMAIL FREE

Constant Contact 

AROUND THE WEB



5 Conditioners That Instantly Melt Tangles Away



3 Ingredients For Hair Growth



Twist Your Hair Perfectly

CN'S MOST POPULAR - G.O.A.T.

Crochet Braids with Marley Hair - Protective Style Tutorial

Castor Oil: The Natural Solution to Hair Growth

Homemade Deep Conditioner Recipes-- Natural Hair

About Me

'CurlyNikki Approved' Natural Hair Products (2013)

3 "Secrets" to Natural Hair Growth You're Overlooking

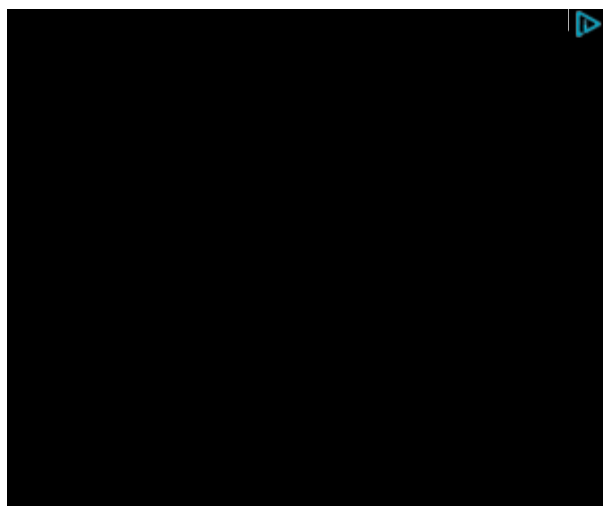
How I Grew Long Natural Hair Using the 'Indian Oiling Method'

The Ingredient You Need for Your Softest Natural Hair Ever

Teyana Taylor Just Increased Gym Memberships Nationwide By 63%

Why I Stopped Deep Conditioning Overnight

SPONSORED



CURLYNIKKI.COM

[Advertise](#) | [Contact](#) | [Privacy Policy](#)

[Terms of Use](#) | [Community Policy](#)

The views expressed on curlynikki.com belong to the blogger Nikki Walton and do not necessarily reflect the views of TextureMedia, LLC, NaturallyCurly or their affiliates or any of the brands discussed or featured on curlynikki.com.

FOLLOW + SUBSCRIBE

[Posts](#) | [Newsletter](#)



DOWNLOAD & PURCHASE

Better Than Good Hair

Curly Nikki Forum App

for iPhone and iPad
for Android

CURLFRIENDS

[The Curly Nikki Forums](#)
[Natural Hair Meetups](#)
[Curl to Curl](#)

BE FEATURED

[How to Be Featured on CN](#)
[Celebrities with Natural Hair](#)
[The Big Chop](#)
[Transitioning to Natural Hair](#)
[Natural Hair Journeys](#)

FREE STUFF

HOT LINKS

[Natural Kids](#)
[Natural Hair FAQ's](#)
[Henna](#)
[Hair Tutorials](#)
[Natural Hair Dictionary](#)
[Natural Hair Style Ideas](#)

Copyright © 2016 TextureMedia, LLC

Design: Brittany Smarr
Created by: Nikki Walton, LPC

TextureMedia, LLC | 6604 North Lamar | Austin, TX | 78752

