Sarex

Vol. 6, Issue 21, Jan. 2013

Saraquest

Exclusive Insight

SURFACTANTS IN DETERGENTS

Water, the liquid commonly used for cleaning, has a property called surface tension. In the body of the water, each molecule is surrounded and attracted by other water molecules. However, at the surface, those molecules are surrounded by other water molecules only on the water side. A tension is created as the water molecules at the surface are pulled into the body of the water. This tension causes water to bead up on surfaces (glass, fabric), which slows wetting of the surface and inhibits the cleaning process. You can see surface tension at work by placing a drop of water onto a counter top. The drop will hold its shape and will not spread.

In the cleaning process, surface tension must be reduced so water can spread and wet surfaces. Chemicals that are able to do this effectively are called surface active agents, or surfactants. They are said to make water "wetter."

Surfactants perform other important functions in cleaning, such as loosening, emulsifying (dispersing in water) and holding soil in suspension until it can be rinsed away. Surfactants can also provide alkalinity, which is useful in removing acidic soils.

Surfactants are classified by their ionic (electrical charge) properties in water: anionic (negative charge), nonionic (no charge), cationic (positive charge) and amphoteric (either positive or negative charge).

Soap is an anionic surfactant. Other anionic as well as nonionic surfactants are the main. A detergent is an effective cleaning product because it contains one or more surfactants. Because of their chemical makeup, the surfactants used in detergents

can be engineered to perform well under a variety of conditions. Such surfactants are less sensitive than soap to the hardness minerals in water and most will not form a film.

Detergent surfactants were developed in response to a shortage of animal and vegetable fats and oils during World War I and World War II. In addition, a substance that was resistant to hard water was needed to make cleaning more effective.

At that time, petroleum was found to be a plentiful source for the manufacture of these surfactants. Today, detergent surfactants are made from a variety of petrochemicals (derived from petroleum) and/or oleochemicals (derived from fats and oils).

Petrochemicals and Oleochemicals

Like the fatty acids used in soapmaking, both petroleum and fats and oils contain hydrocarbon chains that are repelled by water but attracted to oil and grease in soils. These hydrocarbon chain sources are used to make the water-hating end of the surfactant molecule.

Other Chemicals

Chemicals, such as sulfur trioxide, sulfuric acid and ethylene oxide, are used to produce the water-loving end of the surfactant molecule.

Alkalis

As in soapmaking, an alkali is used to make detergent surfactants. Sodium and potassium hydroxide are the most common alkalis.

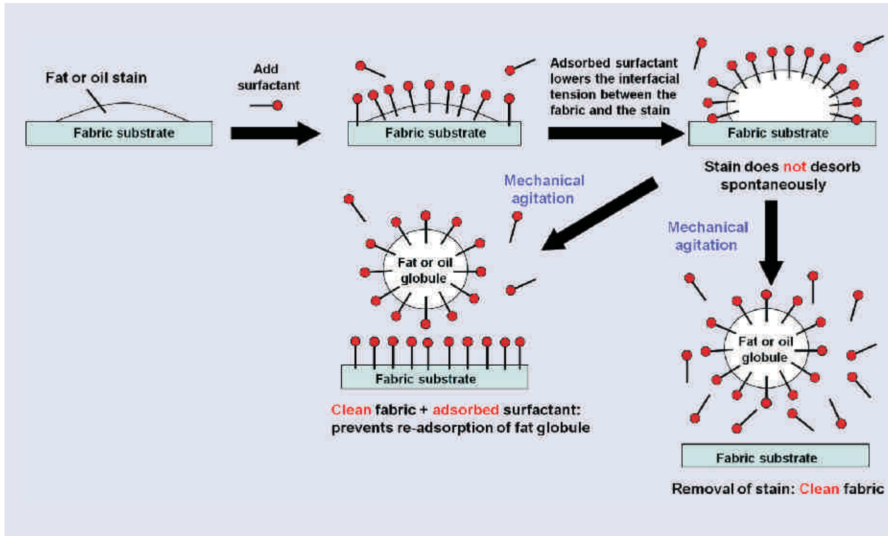
What is a surfactant?

A surfactant or surface active agent is a substance that, when dissolved in water, gives a product the ability to remove dirt from surfaces such as the human skin, textiles, and other solids.

In more technical terms:

- They enable the cleaning solution to fully wet the surface being cleaned so that dirt can be readily loosened and removed.

- They clean greasy, oily, particulate-, protein-, and carbohydrate-based stains.
- They are instrumental in removing dirt and in keeping them emulsified, suspended, and dispersed so they don't settle back onto the surface being cleaned.



Each surfactant molecule has a hydrophilic (water-loving) head that is attracted to water molecules and a hydrophobic (water-hating) tail that repels water and simultaneously attaches itself to oil and grease in dirt. These opposing forces loosen the dirt and suspend it in the water. The mechanical agitation of the washing machine helps pull the dirt free.

Surfactants are one of the major components of cleaning products and can be regarded as the 'workhorses': they do the basic work of breaking up stains and keeping the dirt in the water solution to prevent re-deposition of the dirt onto the surface from which it has just been removed. Surfactants disperse dirt that normally does not dissolve in water.

As anyone who uses oil based dressings in the kitchen knows, oil and water do not mix unless shaken vigorously in the bottle. They separate almost immediately afterwards. The same is true when washing your dishes or clothes. With the addition of surfactants, oil, which normally does not dissolve in water, becomes dispersible and can be removed with the wash water.

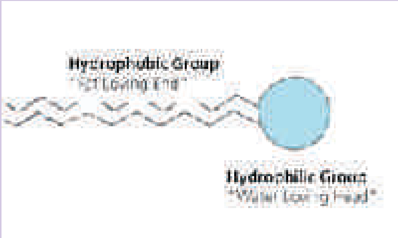
Synthetic Surfactant or Soap ?
You may well ask why soap, which served well for so many years, was eventually displaced. Soaps are cheap and they are manufactured from a renewable source, whereas many of the synthetic detergents are made from petrochemicals. Soaps are also biodegradable; that is, they are readily broken down by bacteria, and thus they do not pollute rivers.

However, due to their gelling properties, soaps do have a greater tendency to clog sewerage reticulation systems than synthetic detergents. The grease trap of a non-sewered house was often laden with soap. But the most important reason for the displacement of soap is the fact that, when a carboxylic acid soap is used in hard water, precipitation occurs. The calcium and magnesium ions, which give hardness to the water, form insoluble salts with the fatty acid in soap and a curd-like precipitate occurs and settles, of course, on what ever is being washed.

By using a large excess of soap, it is possible to redisperse the precipitate, but it is extremely sticky and difficult to move. This problem with soap can be demonstrated by a simple experiment in which a concentrated solution of hard-water salts is added to a 0.1% solution of soap and also to a 0.1% solution of synthetic surfactant. The soap precipitates, but the synthetic surfactant remains clear because it's salts are water soluble.

You may live in an area where the water is extremely soft. But calcium and magnesium ions are present in the dirt that you wash out of your clothes, so that some precipitation still occurs if soap is used, and gradually deposits are built up in the fabric.

There are other disadvantages with soap; it deteriorates on storage, and it lacks cleaning power when compared with the modern synthetic surfactants, which can be designed to perform specialised cleaning tasks. Finally and very importantly from a domestic laundry point of view, soap does



not rinse out; it tends to leave a residue behind in the fabric that is being washed. A residue gradually builds up and causes bad odour, deterioration of the fabric and other associated problems.

What's the Difference ?

What's the difference between a surfactant and soap ? In general terms, the difference can be likened to the difference between cotton and nylon.

On the one hand, soap and cotton are produced from natural products by a relatively small modification. On the other hand, synthetic surfactants and nylon are produced entirely in a chemical factory. Synthetic surfactants are not very new, either. Back in 1834 the first forerunner of today's synthetic surfactants was produced in the form of a sulfated castor oil, which was used in the textile industry.

The development of the first detergents in an effort to overcome the reaction of soaps with hard water provides a good illustration of one of the standard chemical approaches. If a useful substance has some undesirable property, an attempt is made to prepare an analogue, a near chemical relation, which will prove more satisfactory.

The petroleum industry had, as a waste product, the compound propylene, CH3-CH=CH2, which used to be burnt off. By joining four of these propylene molecules together and if benzene is attached at the double bond, the resulting compound reacts with sulphuric acid. Then sodium hydroxide is added to neutralise the sulfonic acid and a sodium salt is obtained. The new substance is closely related to an ordinary soap, and is an excellent detergent.

What does a surfactant "look like"?

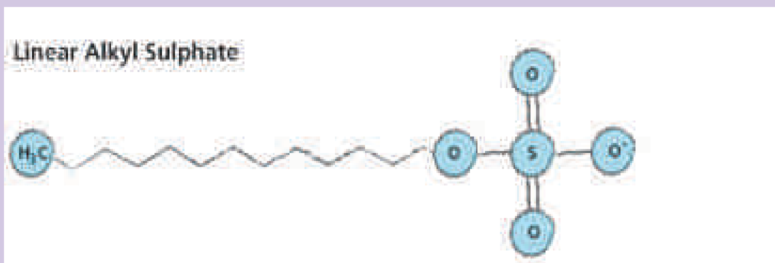
A tadpole! A surfactant consists of a hydrophobic (non-polar) hydrocarbon "tail" and a hydrophilic (polar) "head" group.

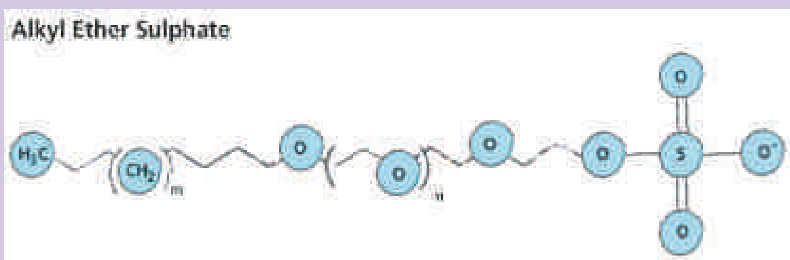
This appearance is key to its behaviour. The dirt-loving or hydrophobic tail absorbs to the oil and grease in dirt and stains.

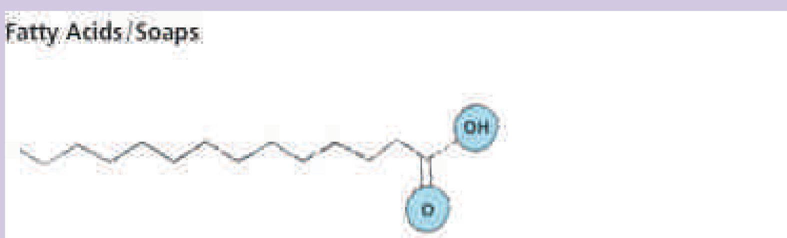
Are surfactants of natural or synthetic origin ?

They can be either. Surfactants from natural origin (vegetable or animal) are known as oleo-chemicals and are derived from sources such as palm oil or tallow. Surfactants from synthetic origin are known as petro-chemicals and are derived from petroleum.

Having the flexibility to use both oleochemical and petrochemical







surfactants allows our formulators to create products that maximize the value in the bottle of detergent, so to speak, by optimizing cleaning ability under a variety of laundry conditions while keeping the price low in the current market.

These days, our formulation scientists focus quite a lot on developing detergents that perform well at lower wash temperatures. This approach will continue to yield energy savings during the consumer use phase, hence a reduction of CO2 emissions.

Surfactants also have an important role in our body, where they are used to reduce surface tension in the lungs. The human body does not start to produce lung surfactants until late in foetal development.

Therefore, premature babies are often unable to breathe properly, a condition called Respiratory Distress Syndrome. Untreated, this is a serious illness and is often fatal, but administration of artificial surfactants virtually eliminates this health problem.

Are there different types of surfactants?

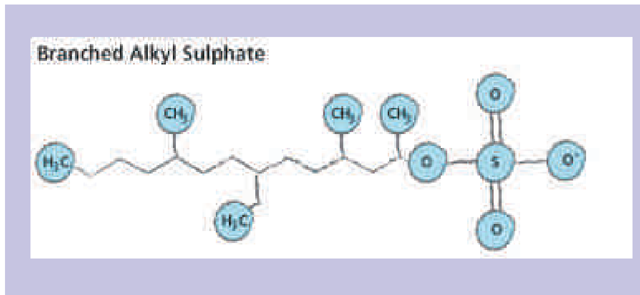
There is a broad range of different surfactant types, each with unique properties and characteristics: the type of dirt and fabric on which they work best, how they can cope with water hardness. Detergents use a combination of various surfactants to provide the best possible cleaning results. There are four main types of surfactants used in laundry and cleaning products. Depending on the type of the charge of the head, a surfactant belongs to the anionic, cationic, non-ionic or amphoteric/zwitterionic family.

Anionic surfactants

In solution, the head is negatively charged. This is the most widely used type of surfactant for laundering, dishwashing liquids and shampoos because of its excellent cleaning properties and high . The surfactant is particularly good at keeping the dirt away from fabrics, and removing residues of fabric softener from fabrics.

Anionic surfactants are particularly effective at oily soil cleaning and oil/clay soil suspension. Still, they can react in the wash water with the positively charged water hardness ions (calcium and magnesium) , which can lead to partial deactivation. The more calcium and magnesium molecules in the water, the more the anionic surfactant system suffers from deactivation. To prevent this, the anionic surfactants need help from other ingredients such as builders (Ca/Mg sequestrants) and more detergent should be dosed in hard water.

The most commonly used anionic surfactants are alkyl sulphates, alkyl ethoxylate sulphates and soaps.



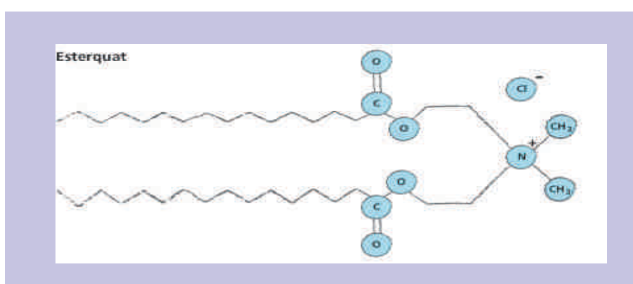
Cationic surfactants

In solution, the head is positively charged. There are 3 different categories of cationics each with their specific application:

In fabric softeners and in detergents with built-in fabric softener, cationic surfactants provide softness. Their main use in laundry products is in rinse added fabric softeners, such as esterquats, one of the most widely used cationic surfactants in rinse added fabric softeners.

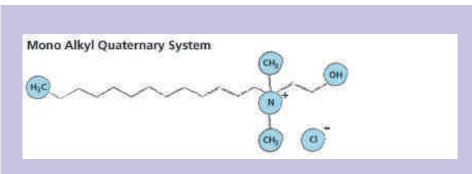
An example of cationic surfactants is the esterquat.

In laundry detergents, cationic surfactants (positive charge) improve the packing of anionic



surfactant molecules (negative charge) at the stain/water interface. This helps to reduce the dirtl/water interfacial tension in a very efficient way, leading to a more robust dirt removal system. They are especially efficient at removing greasy stains.

An example of a cationic surfactant used in this category is the mono alkyl quaternary system.

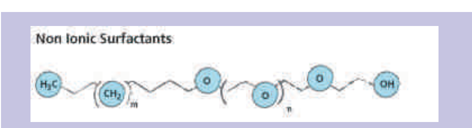


In household and bathroom cleaners, cationic surfactants contribute to the disinfecting/sanitizing properties.

Non-ionic surfactants

These surfactants do not have an electrical charge, which makes them resistant to water hardness deactivation. They are excellent grease removers that are used in laundry products, household cleaners and hand dishwashing liquids.

Most laundry detergents contain both non-ionic and anionic surfactants as they complement each other's cleaning action. Non-ionic surfactants contribute to making the surfactant system less hardness sensitive.
The most commonly used non-ionic surfactants are ethers of fatty



alcohols

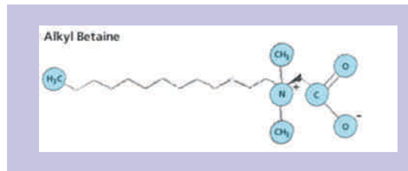
Amphoteric/zwitterionic surfactants

These surfactants are very mild, making them particularly suited for use in personal care and household cleaning products. They can be anionic (negatively charged), cationic (positively charged) or non-ionic (no charge) in solution, depending on the acidity or pH of the water.

They are compatible with all other classes of surfactants and are soluble and effective in the presence of high concentrations of electrolytes, acids and alkalis.

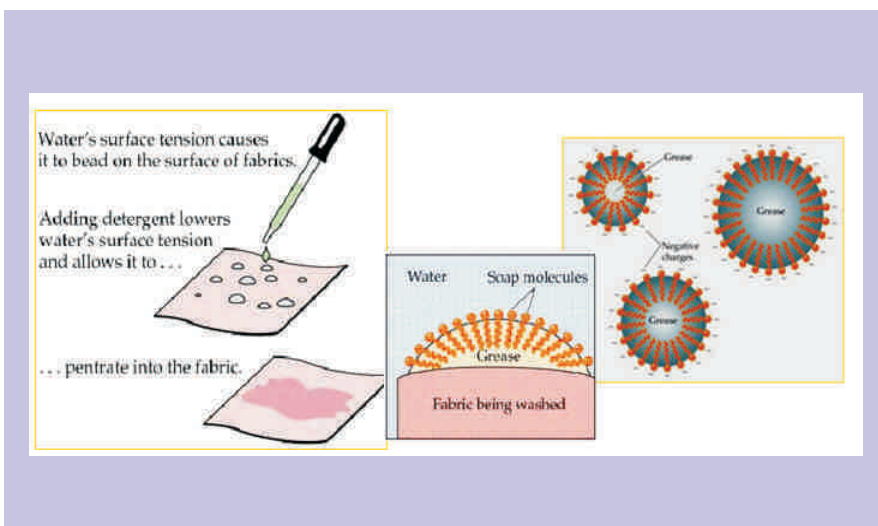
These surfactants may contain two charged groups of different sign. Whereas the positive charge is almost always ammonium, the source of the negative charge may vary (carboxylate, sulphate, sulphonate). These surfactants have excellent dermatological properties. They are frequently used in shampoos and other cosmetic products, and also in hand dishwashing liquids because of their high foaming properties.

An example of an amphoteric/zwitterionic surfactant is alkyl betaine.



How can surfactants prevent dirt from being re-deposited?

Surfactants have a vital role to play in preventing the re-deposition of soils like greasy, oily stains and particulate dirt on the surface or fabric from which they have just been removed. This works by electrostatic interactions and steric hindrance.



effect:

1. Chemical energy provided by the soap or detergent
2. Thermal energy provided by the warm water and
3. Mechanical energy provided by a machine or hands.

These types of energy interact and should be in proper balance. Let's look at how they work together.

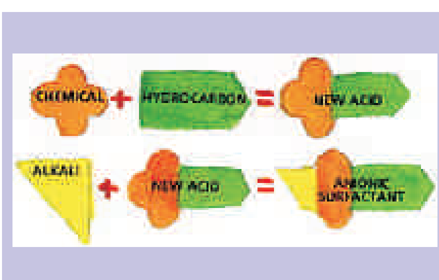
Let's assume we have oily, greasy soil on clothing. Water alone will not remove this soil. One important reason is that oil and grease present in soil repel the water molecules.

Now let's add soap or detergent. The surfactant's water-hating end is repelled by water but attracted to the oil in the soil. At the same time, the water-loving end is attracted to the water molecules.

These opposing forces loosen the soil and suspend it in the water. Warm or hot water helps dissolve grease and oil in soil. Washing machine agitation or hand rubbing helps pull the soil free.

Electrostatic interactions:

Anionic surfactants are adsorbed on both the surface of the dirt which is dispersed in the detergent solution, and the fabric surface. This creates a negative charge on both surfaces, causing electrostatic repulsions. This repulsion prevents the soil from re-depositing on the fabric.



In the presence of hardness, however, this mechanism acts like a 'bridge' between the suspended soil and the fabric. This is another reason why hardness sequestrants (a chemical that promotes Ca/Mg sequestration) are often used in detergents.

Steric hindrance:

Non-ionic surfactants like alcohol ethoxylates also adsorb on the dirt. Their long ethoxylated chains extend in the water phase and prevent the dirt droplets or particles from uniting,, and from depositing onto the fabric surface.

This is shown in the illustration below:
(1) Dirt is present in solution
(2) The non-ionic surfactants adsorb to the dirt particles.
(3) Their long hydrophilic heads extend in the water phase and as a result prevent the dirt particles/droplets from uniting and from re-depositing onto fabrics.

What does a surfactant actually do?

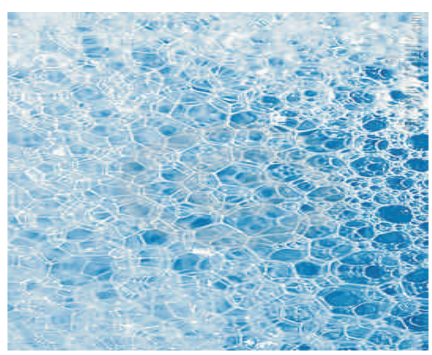
Surfactants are also referred to as wetting agents and foamers. Surfactants lower the surface tension of the medium in which it is dissolved. By lowering this interfacial tension between two media or interfaces (e.g. air/water, water/stain, stain/fabric) the surfactant plays a key role in the removal and suspension of dirt.

The lower surface tension of the water makes it easier to lift dirt and grease off of dirty dishes, clothes and other surfaces, and help to keep them suspended in the dirty water. The water-loving or hydrophilic head remains in the water and it pulls the stains towards the water, away from the fabric. The surfactant molecules surround the stain particles, break them up and force them away from the surface of the fabric. They then suspend the stain particles in the wash water to remove them

Surfactants can work in three different ways:

1. Roll-up,
2. Emulsification and
3. Solubilization.

Roll-up mechanism:
The surfactant lowers the oil/solution and fabric/solution interfacial tensions and in this



way lifts the stain of the fabric.

Emulsification:
The surfactant lowers the oil-solution interfacial tension and makes easy emulsification of the oily soils possible.

Solubilization:
Through interaction with the micelles of a surfactant in a solvent (water), a substance spontaneously dissolves to form a stable and clear solution.

How detergent surfactants are made

Anionic Surfactants

The chemical reacts with hydrocarbons derived from petroleum or fats and oils to produce new acids similar to fatty acids.

A second reaction adds an alkali to the new acids to produce one type of anionic surfactant molecule.

Nonionic Surfactants

Nonionic surfactant molecules are produced by first converting the hydrocarbon to an alcohol and then reacting the fatty alcohol with ethylene oxide.

Nonionic surfactants do not produce ions in aqueous solution. As a consequence, they are compatible with other types and are excellent candidates to enter complex mixtures, as found in many commercial products. They are much less sensitive to electrolytes, particularly divalent cations, than ionic surfactants, and can be used with high salinity or hard water.

Cationic Surfactants

They are not good detergents nor foaming agents, and they cannot be mixed in formulations which contain anionic surfactants, with the exception of non quaternary nitrogenated compounds, or when a catanionic complex synergetic action is sought. Nevertheless, they exhibit two very important features.

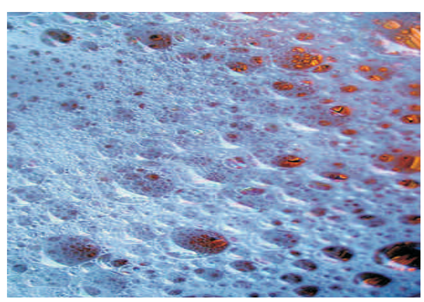
First, their positive charge allows them to adsorb on negatively charged substrates, as most solid surfaces are at neutral pH. This capacity confer to them an antistatic bahavior and a softening action for fabric and hair rinsing. The positive charge enables them to operate as floatation collectors, hydrophobating agents, corrosion inhibitors as well as solid particle dispersant

On the other hand, many cationic surfactants are bactericides. They are used to clean and aseptize surgery hardware, to formulate heavy duty desinfectants for domestic and hospital use, and to sterilize food bottle or containers, particularly in the dairy and beverage industries.

There are many other cationic surfactants, but only a few are used in practice. Linear diamines contain 2 or 3 methylene groups between the two amine groups, which are not equivalent.

Another important cationic class contains aromatic or saturated heterocycles including one or more nitrogen atoms. This is the case of a well used n-dodecyl pyridinium chloride, which
is prepared by reacting dodecyl chlorure on pyridine, an aromatic amine similar to benzene, in which a CH is remplaced by a nitrogen, e.g., C5NH5. N-dodecyl pyridinium chloride is used as batericide and fungicide. If a second hydrophilic group is added (amide, ethylene oxide) the product is the both a detergent and a
bactericide.

The last cationic class worth citing here are morpholine compounds. Morpholine is a saturated cycle containing both a oxygen and a nitrogen atom. The dialkylation of the nitrogen atom results in a salt called N,N dialkyl-morpholinium. When quaternization is carried out withdodecyl methyl sulfate, the resulting substance exhibits two surfactant ions, e.g. lauryl sulfate and N,N cetyl-methyl morpholinium. These stange surfactants are called equionic because they contain both an anionic and a cationic surfactant specie.



New Development at Sarex

Celdet R

We at the Sarex have a wetting-cum-detergent product, *Celldet R, Saraclean M* and *Supernol OT* with low foaming characteristics, for bleaching of cellulosic yarn or fabrics.

A study of Celldet R was carried out In Sarex Lab.. Bleaching was carried out on grey single-jersey cotton-knit fabric at a liquor ratio of M:L = 1:10, Temp. 98°C, for 45 min. 80°C. Drain Hot wash Neutralise and dry .

The bleached fabric was evaluated for different performance properties, such as wetting efficiency, absorbency, rewetting and foaming tests.

Foam Test: Foaming characteristics were measured at 1g/l concentration and in presence of 2g/l caustic in soft water as follows:
400ml of solution was taken in a glass cylinder and solution was stirred at 200rpm for 5 minutes. Foam height was measured immediately and after 2 minutes.

Wetting Efficiency by Draves Test: Wetting efficiency was tested by AATCC Test Method 17–1989. In this method, 5gm of 2/40s (30-tex) yarn is folded to two folds (9'x 2'). One end of the loop is attached to a hook (3gm) and a 40gm weight is attached to the hook. The other end is cut loose with scissors and entered into a measuring cylinder containing 500ml of 1g/l wetting agent. The time taken to sink the yarn is noted.

Absorbency Test: Absorbency of the bleached fabric was tested by AATCC Test Method 79-1986. In this test, the fabric is mounted on an embroidery loop (6" diameter) and a drop of the water is allowed to fall from a distance of 2cm on to the taut surface of a test specimen. The time required for the specular reflection of the water drop to disappear is measured and recorded as wetting time.

Rewetting Property: In this test a 1" x 1" fabric sample was added in 200ml of distilled water. The time taken to sink the bleached fabric was noted.

Results and Discussion

Experimental results showed that Celdet R is showing better wetting efficiency and very less foaming behaviour C. Also, the fabric bleached with Celldet R shows very good absorbency and rewetting property at 0.7% concentration.

Celldet R is a cost-effective and economical low-foaming, APEO and NPEO free wetting-cum-detergent agent.

CLOUD POINT

What is cloud point? Why is it important?

Cloud point is the temperature above which an aqueous solution of a water-soluble surfactant becomes turbid. Knowing the cloud point is important for determining storage stability. Storing formulations at temperatures significantly higher than the cloud point may result in phase separation and instability. Wetting, cleaning and foaming characteristics can be different above and below the cloud point.

Generally, nonionic surfactants show optimal effectiveness when used near or below their cloud point. Low-foam surfactants should be used at temperatures slightly above their cloud point.

The cloud point of a nonionic surfactant or glycol solution is the temperature where the mixture starts to phase separate and two phases appear, thus becoming cloudy. This behavior is characteristic of non-ionic surfactants containing polyoxyethylene chains, which exhibit reverse solubility versus temperature behavior in water and therefore "cloud out" at some point as the temperature is raised. Glycols demonstrating this behavior are known as "cloud-point glycols" . The cloud point is affected by salinity, being generally lower in more saline fluids.

Cloud points are typically measured using 1% aqueous surfactant solutions. Cloud points range from 0° to 100°C (32 to 212°F), limited by the freezing and boiling points of water. Cloud points are characteristic of nonionic surfactants. Anionic surfactants (with negatively charged groups) are more water-soluble than nonionic surfactants and will typically have much higher cloud points (above 100°C).

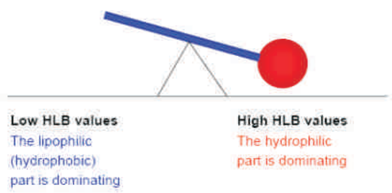
The presence of other components in a formulation can depress or increase the solution's cloud point. For example, the addition of a coupler or hydrotrope can increase the cloud point of a solution, whereas builders or other salts will depress the cloud point temperature.

After the cloud point temperature it is said that the nonionic products do not exhibit its intrinsic properties, such as wetting, scouring, rewetting, emulsifying etc. So if a wetting agent's cloud point is 70°C, then it should be understood that above 70°C, it should not used as wetting agent. For example if you are doing scouring and bleaching at 90°C, then a 70°C cloud point wetting agent is not suitable for this purpose. Most of the non-ionic wetting agents have the cloud of more of less 70°C.

Water solubility of a nonionic surfactant/defoamer varies inversely with temperature.

WHAT IS HLB ?

The Hydrophilic-lipophilic balance [HLB]of a surfactant is a measure of the degree to which it is hydrophilic or lipophilic, determined by calculating values for the different regions of the molecule.



The Concept of HLB

The term "HLB" was first employed by the lab staff of the Atlas Powder Co. in America. Amphiphilic surfactants are characterized by the hydrophilic-lipophilic balance (HLB): a relative ratio of polar and non-polar groups in the surfactant. This means the balance between the oil soluble and water soluble moieties in a surface active molecule, and is expressed as the "Hydrophile-Liphophile Balance". more oil-soluble emulsifier shows a lower HLB and a more water-soluble emulsifier shows the reverse. HLB is a very useful method in selecting an emulsifier, but it still has several limitations to application for every surfactant.

HLB concept is not enough to describe all the characteristics of emulsion.

Calculation of the HLB number from a mixture of surfactants

The HLB number of a mixture composed of x% of surfactants of HLB A and y% of surfactants of HLB B is obtained by the following formula.

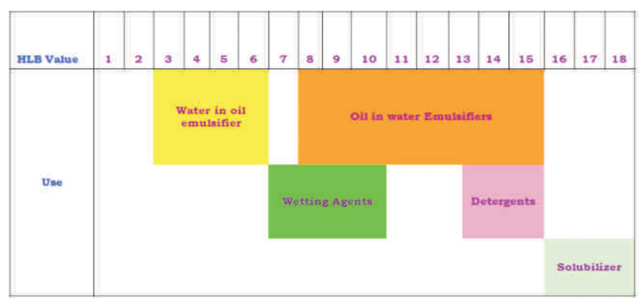
$$HLB (A + B) = (Ax + By) / (x + y)$$

For instance, if 60 wt.% of POE(3) Octyl Phenol of HLB number 8 is mixed with 40 wt.% of POE(5) Nonyl Phenol of HLB number 10, then the HLB number of this mixture becomes 8.8.Reversely, to make the mixture of HLB number 11 which is composed of POE(15) Nonyl Phenol of HLB number 15 and POE(2) Nonyl Phenol of HLB number 5.5, then one should mix 42 wt.% of POE(2) Nonyl Phenol wuth 58 wt.% of POE(15) Nonyl Phenol.

HLB ca. 1 to 3.5: Antifoams
HLB ca. 3.5 to 8: Water-in-Oil Emulsifiers
HLB ca. 7 to 9: Wetting and spreading agents
HLB ca. 8 to 16: Oil-in-Water Emulsifiers
HLB ca. 13 to 16: Detergents
HLB ca. 15 to 40: Solubilizers

It is useful to correlate the characteristics of surfactants with the properties that are needed to make various heterogenous systems. A common system which is used to do this is the HLB system. The HLB value for a given surfactant is the relative degree to which the surfactant is water soluble or oil soluble. The lower the HLB, value the more lipophilic. The higher the HLB value, the more hydrophilic. I will not go over how these numbers are derived. You can look it up if you like. The range is usually between 1 and 20. Please note the one exception at the bottom of the table.

Significance of HLB value:



HLB Values and the use for those surfactants

HLB VALUE	USE	EXAMPLE
1	Antifoaming Agent	Oleic Acid
2	Antifoaming Agent	Sorbitan Tristearate
3	Antifoaming Agent	Glyceryl Monostearate
4	Emulsifying Agent W/O	Sorbitan mono-oleate (Span 80)
5	Emulsifying Agent W/O	Glyceryl Monostearate
6	Emulsifying Agent W/O	Diethylene glycol monolaurate
7	Emulsifying Agent W/O; Wetting ans Spreading Agents	{none}
8	Emulsifying Agent W/O; Wetting and Spreading Agents	Sorbitan monolaurate (Span 20)
9	Emulsifying Agent O/W; Wetting and Spreading Agents	Polyethylene lauryl ether(Brij 30)
10	Emulsifying Agents O/W	Methyl Cellulose(Methocel15 cps)
11	Emulsifying Agents O/W	Polyoxyethylene monostearate (Myrj 45)
12	Emulsifying Agents O/W	Triethanolamine oleate
13	Emulsifying Agents O/W ; Detergents	Polyethylene glycol 400 monolaurate
14	Emulsifying Agents O/W ; Detergents	(none)
15	Emulsifying Agents O/W ; Detergents	Polyoxyethylene sorbitan mono-oleate(Tween 80)
16	Emulsifying Agent O/W ; Detergents: Solubilizing Agents	Polyoxyethylene sorbitan monolaurate (Tween 20)
17	Solubilizing Agents	Polyoxylene lauryl ether(Brij 35)
18	Solubilizing Agents	Sodium oleate
19	Solubilizing Agents	None
20	Solubilizing Agents	Potassium oleate
40	Everything	Sodium Lauryl Sulfate (Tide)

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Want to know more ?

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