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A REVIEW ON SODIUM LAURYL SULPHATE- A SURFACTANT

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ABSTRACT

Surfactants are compounds that reduce the surface tension between two phases. It is a polymer like substance which has both polar and nonpolar groups. Surfactants are generally classified into Anionic, cationic, amphoteric and non-ionic. Among surfactants, anionic surfactant -Sodium lauryl sulfate (SLS) has unique properties such as Anionic emulsifier, detergent, solubilizers, Tablet and capsule lubricant, wetting agent and as excipient in dissolvable dosage forms. It is naturally derived from coconut and/or palm kernel oil. It usually consists of a mixture of sodium alkyl sulphates, mainly the lauryl alcohol. It is also employed in a wide range of nonparenteral formulations, cosmetics and food additives.

KEYWORDS: SLS, Surfactant, Anionic emulsifier, Solubilizers.

INTRODUCTION

Surfactants are termed as amphiphiles indicating that they have hydrophilic group which has affinity to water and hydrophobic group which has no affinity to aqueous solvents. Generally surfactants are classified into Anionic, cationic, non-ionic and amphoteric. Table 1.

Table 1: Classification of Surfactants.

Surfactant type	Example
Anionic Surfactant	Alkyl sulphates, Soaps, texapon
Cationic Surfactant	Quaternary ammonium salts
Non-ionic Surfactant	Polyoxyethylene surfactant
Amphoteric Surfactant	Betaines, Amphoacetates

Sodium Lauryl Sulfate, SLS (also termed as Sodium dodecyl sulfate, SDS) is an anionic (negatively charged) surfactant used as a cleansing agent (detergent) in cosmetics.

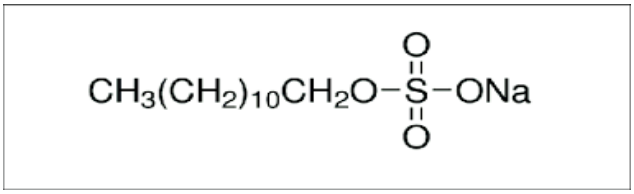
The concentration of SLS found in consumer products varies by product and manufacturer but typically ranges from 0.01% to 50% in cosmetic products[1] and 1% to 30% in cleaning products.

Description of SLS

Sodium lauryl sulfate is dodecyl sodium sulphate sodium salt; Elfan 240, natrii laurilsulfas, sufuric acid monododecyl ester, sodium salt; Texapon K12P.

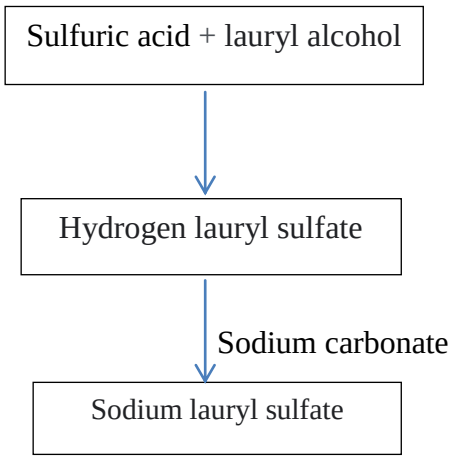
Sodium lauryl sulphate occurs as white or cream to pale yellow coloured crystals, flakes, or powder. It has soapy bitter taste and a faint odour of fatty substances.

Structure



Method of Manufacture

Sodium lauryl sulfate is prepared by sulfation of lauryl alcohol, followed by neutralization with sodium carbonate



Cosmetic applications

- Shampoos,
- Bath products,

- Hair colorings,
- Facial makeup,
- Deodorants,
- Perfumes, and
- Shaving preparations;

Pharmaceutical applications

- **Anionic surfactant**

Anionic surfactants are added on solid dispersion of drug Indomethacin.[2] Anionic surfactant systems are preferred in MEKC (Micellar electrokinetic chromatography.[3] Anionic surfactants work best to remove dirt, clay, and some oily stains.

- **Detergent**

Sodium lauryl sulphate [SLS] is a most commonly used toothpaste detergent. Detergents are employed for the isolation and purification of integral membrane proteins found in biological cells.[4]

Solubilization of cell membrane bilayers requires a detergent that can enter the inner membrane monolayer.[5]

- **Wetting agent**

Wetting agents are used to improve the flow of the liquid vehicle across the particle surface. Surfactants are used in capsule and tablet formulations as wetting agents to aid dissolution.

- **Emulsifying agent**

Surfactant molecules incorporated in the formulation can affect drug availability and its interaction with various sites in several ways. The surfactants may influence the desegregation and dissolution of solid dosage forms, by controlling the rate of precipitation of drugs administered in solution form, by increasing membrane permeability and affecting membrane integrity.

Release of poorly soluble drugs from tablets and capsules for oral use may be increased by the presence of surfactants.

- **Modified-release agent**

Modified-release dosage is a mechanism that (in contrast to immediate-release dosage) delivers a drug with a delay after its administration (delayed-release dosage) or for a prolonged period of time (extended-release [ER, XR, XL] dosage) or to a specific target in the body (targeted-release dosage).[6]

Modified-release dosage and its variants are mechanisms used in tablets (pills) and capsules to dissolves a drug over time in order to be released slower and steadier into the bloodstream while having the advantage of being taken at less frequent intervals than immediate-release (IR) formulations of the same drug. For example, extended-release morphine enables people with chronic pain to only take one or two tablets per day.

- **Penetration enhancer**
- Sodium lauryl sulfate (SLS) is known to penetrate skin and cause cutaneous irritation. It is also evaluated to assess the toxic potential of topically applied SLS. Permeability studies indicate that typical cationic and non-ionic surfactants are weak penetrants, unlike anionic surfactants, as exemplified by sodium lauryl sulfate (SLS), which readily penetrates and tends to destroy the integrity of stratum corneum membranes in a matter of hours.
- Sulfates are anionic surfactants that are used in cleansers and other cosmetic products to produce a lather or foam.

- **Solubilising agent**
- Sodium lauryl sulfate (SLS) is one of the common solubilizing agents in pharmaceutical sciences. Micellar solubilization is a great method for increasing drugs solubility in aqueous environments.
- The micelles of the surfactant cause solubilization of the substrate, producing an isotropic solution of the chemical. The process of solubilization is also important in detergency, whereby fats and oils are removed by incorporation into the hydrocarbon core of the micelles.

- **Tablet and capsule lubricant**

A **lubricant** is a substance that helps to reduce friction between die walls and tablets formed during ejection. Lubricants make the encapsulation process smooth.

Sodium lauryl sulfate used as water-soluble lubricants. Hydrophilic tablet lubricant

- **Suspending agent**

In nasal spray formulations, SLS used to reduce the rate of settling of suspended active ingredients**.**

- **Antimicrobial activity:** Sodium lauryl sulfate has some bacteriostatic action against Gram-positive bacteria but is ineffective against many Gram-negative microorganisms. It potentiates the fungicidal activity of certain substances such as sulphanilamide and sulfathiazole.

- **Use in medicinal products**

SLS has a number of functional uses in pharmaceutical preparations.

Use	Concentration
Skin cleanser in topical applications	1% w/
Tablet lubricant (for dispersible tablets)	0.5 – 2% w/w
Wetting agent in dentifrices (toothpastes)	1 – 2% w/w
Releasing agent in suppositories and pessaries	0.4 – 1% w/w
Dissolution / wetting agent in solid oral dosage forms	0.2 – 1.5% w/w
Foaming / lathering agent in shampoos	10 – 25% w/v

Chemical Properties

Alkalinity- pH = 7.0–9.5 (1% w/v aqueous solution)

Acid value -0

Critical micelle concentration -8.2 mmol/L

HLB value-40

Interfacial tension -11.8 mN/m

Physical properties

Density -1.07 g/cm3

Melting point -204–207 deg.C (for pure substance)

Moisture content -45%;

Sodium lauryl sulfate is not hygroscopic

Solubility

- Freely soluble in water producing opalescent solution;
- Practically insoluble in chloroform and ether.

Spreading coefficient -7.0 (0.05% w/v aqueous solution)

Surface tension -25.2 mN/m for a 0.05% w/v aqueous solution at 30 deg.C

Wetting time (Draize test) 118 seconds (0.05% w/v aqueous solution) at 308C

Stability and Storage Conditions

- Should be stored in a well-closed container.
- It is stable under normal conditions.

Safety

SLS is widely used in cosmetics, oral and topical pharmaceutical preparations**.**

SLS is readily biodegradable under aerobic and anaerobic conditions and, therefore, does not persist in the environment.[7-9]

SLS helps to provide a product with very high cleaning ability that is gentle to the teeth and oral soft tissues.[10]

Incompatibilities

Sodium lauryl sulfate reacts with cationic surfactants, causing loss of activity even in concentrations too low to cause precipitation.

Sodium lauryl sulfate is incompatible with salts of polyvalent metal ions, such as aluminium, lead, tin or zinc, and precipitates with potassium salts. Solutions of sodium lauryl sulfate (pH 9.5–10.0) are mildly corrosive to mild steel, copper, brass, bronze, and aluminium.

Compatibility

It is compatible with dilute acids and calcium and magnesium ions.

Handling Precautions

- Inhalation and contact with the skin and eyes should be avoided;
- Prolonged or repeated exposure should be avoided.

CONCLUSIONS

Surfactants play a major role in the pharmaceutical field to increase the solubility of poorly soluble drugs. Compared to other types of surfactants, Anionic surfactants has many advantages like cleansing property, antimicrobial property, skin penetrant property, biodegradable property, etc. Thus, the anionic surfactant, Sodium lauryl sulfate has various applications based on their concentration.

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