Surfactants and Detergents

Because pure water can not remove oily, organic soiling detergents, soaps are used for cleaning. Soap cleans by acting as an emulsifier. Basically, soap allows oil and water to mix in such a way that oily grime can be removed during rinsing. Detergents were developed in response to the shortage of the animal and vegetable fats used to make soap during World War I and World War II. Detergents are primarily surfactants, which could be produced easily from petrochemicals.

Surfactants, also known as wetting agents, lower the surface tension of a liquid, allowing easier spreading, and the interfacial tension between two liquids. The term surfactant is a contraction of "Surface active agent". Surfactants are usually organic compounds that are amphipathic, meaning they contain both hydrophobic groups (their "tails") and hydrophilic groups (their "heads"). Therefore, they are typically sparingly soluble in both organic solvents and water. Surfactants reduce the surface tension of water by adsorbing at the air-water interface. They also reduce the interfacial tension between oil and water by adsorbing at the liquid-liquid interface.

Modern detergents contain more than surfactants. Cleaning products may also contain enzymes to degrade protein-based stains, bleaches to de-color stains and add power to cleaning agents, and blue dyes to counter yellowing.

Surfactants are toxic especially to fish and should be monitored.

Alkyl Ethoxylate

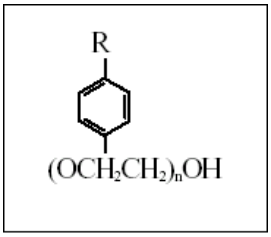
AE is an abbreviation for Alkyl Ethoxylate, also called polyoxyethylene alkyl ether. AE belongs to the class of non ionic surfactant and it is used mainly in residential detergents. Production of AE has been increasing yearly. The foaming ability of AE is equal to or more than that of anionic surfactants, which require the continuous monitoring for the control of drinking water quality.

$CH_3(CH_2)_n\text{-}O\text{-}(C_2H_4O)_mH$

$n = 8\text{-}15,\ m = 5\text{-}13$

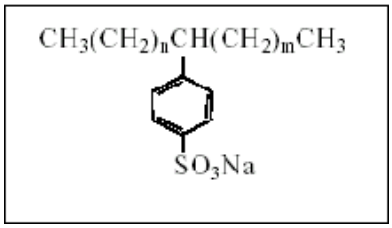
Alkylphenol Ethoxylate

Alkylphenol Ethoxylate (APE) belongs to the class of non ionic surfactant and it is used in industrial detergents or emulsifiers. Ethylene oxide chains in APE are subject to microbial decomposition, generating toxic and hydrophobic biodegraded compounds. APE has been suggested to be a precursor of endocrine disruption chemicals.



Linear Alkylbenzene Sulfonate

LAS is an abbreviation for Linear Alkylbenzene Sulfonate, the most widely used synthetic detergent and the major component amongst methylene blue active substances (MBAS). LAS have been found to cause fish toxicity through bioaccumulation.

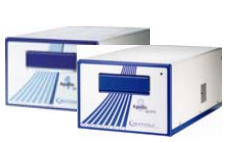


Selection of surfactant and detergent detection kits:

Absorbance technology:

Kit:
- Alkyl Ethoxlate EIA Kit (Biosense Laboratories)
- Alkyl Ethoxylate ELISA Kit (Abraxis)
- Alkylphenol Ethoxlate EIA Kit (Biosense Laboratories)
- Alkylphenol Ethoxylates ELISA Kit (Abraxis)
- Linear Alkylbenzene Sulfonate (LAS) EIA kit (Biosense Laboratories)
- Linear Alkylbenzene Sulfonate (LAS) ELISA kit (Abraxis)

BERTHOLD instruments:
Apollo Absorbance Readers LB 911/LB 912
Mithras Multimode Reader LB 940



Publications:

Gloxhuber (1974): Toxicological properties of surfactants. Arch. Toxicol. 32(4): 245-70