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Review Article

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DETERGENTS AND ENVIRONMENT

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ABSTRACT

Detergents are compounds belonging to various groups of chemicals having an important characteristic common lo lower the surface tension of medium thatswhy commonly called as surfactants All this detergent comes to our water bodies either along with sewages or through industries effluents, deteriorating the physico- chemical characteristics of water and depleting its life sustaining qualities. Most of the detergents like Alkyl Aryl Sulphates, Alkyl benzene sulphonates and linear Alkyl Benzene suphonates have ability to bind with proteins as well as affect several biochemical and physiological processes by altering enzyme activity.

KEYWORDS: Detergents, surfactants Sulphonate.

Details

In the last thirty years overconciouness regarding cleanliness of human beings and their surroundings resulted in heavy use of detergents in household as well as in industries sector throughout world. India is second largest market of detergent after U.S.A. having annual turnover of about 6716 crores rupees. All this detergent comes to our water bodies either along with sewages or through industries effluents, deteriorating the physico-chemical characteristics of water and depleting its life sustaining qualities.

By definition detergents are "Substances or products which are capable of dislodging, removing and dispersing solid and liquids soils from the surface being cleaned are known as detergents''. Natural detergents are saponin, Chile salt peter, ox-bile, fullers earth etc. the bile salts act like biological detergent. Commonly used term detergent is presently applied for synthetic detergents, which has an advantage over soap being equally effective in hard water.

Detergents are compounds belonging to various groups of chemicals having an important characteristic common lo lower the surface tension of medium thatswhy commonly called as surfactants.

Detergents were introduced in Great Britain market in 1920 and got its production momentum in 1950. in 1960 linear Alkyl Benzene Sulphonate replaced almost all Alkyi Benzene Sulphonate due to their easy biodegradability and lower toxicity. In India there are about 75% anionics, 25% ionics and 25% non-ionics in the market. According to behavior in aqueous solution detergents can be classified in various group VIZ, Anionics, Cationics, Non-ionics and Zwiterionics.

(A) Anionics:- In these compounds property of detergency is inherited in the negatively charged ions, which contain the oil soluble portion of molecule, which has to be neutralized with an alkaline or basic material before full detergency developed. Among these main compounds are-

1. ***Alkyl Aryl Sulphonates***:- An aromatic nucleolus is the key note of this class of compounds' which is combined with an aliphatic straight chain or branched chain, Dodecyl Benzene (DDB) is the leading member of this group.
2. ***Long chain (Fatty) Alcohol Sulphates***:- Long chain fatty alcohol with no. of C atoms between C12 Cjg produced by Ziegler process, using ethylene as staring material, and Aluminum hydroxide as a chtalyst.
3. ***Sulphate ethers*** -These are most important anionics. The partial -ethorxylation of fatty alcohols produces ethers, which still have an -
4. OH group at eh end of molecule, able to be sulphate. These have very good foaming properties and therefore are very suitable raw material for making hair shampoos.
5. ***Olefine sulphates and Sulphonates***: - These are also called third generation detergents and are resultants of sulphonation of olifines by So_3 cascade sulphonation system, which do not employ any special sulphonation acids. The resulting products, a mixture of alkane sulphonic acid, after neutralization

yield detergents, which have found tremendous use in the field of cosmetic preparation.

6. ***Alkane Suphonates***: - Being heat sensitive, they are not fit for making powder but used in formation of liquid detergents. These are highly soluble in water at room temp, and possess good detergency.
7. ***Igepons***: - There are two types of Igenes (i) with two CH2 groups between amido and sulphonate group (ii) with NH group between ester and sulphonate group.

(B) Cationic Detergents: - Mostly these are amino compounds which behave quite apposite to the action of soaps ie. The oil soluble portion of these compounds is positively charged. They have high* germicidal properties and used in washing bottles in commercial scale and not for cloth washing.

(C) Non- ionic Detergents: - These condensation products of ethylene oxide and high molecular weight compound with an active hydrogen atom. These do not ionize, but their hydrophilic character is attributed to the presence of an oxygenated side chain as an propylene butylenes oxides. Glycerol and epoxide from glycerine and related chlerohydrins.

(D) Amphoteric or Zwiterionics: - These are the compounds which behave both as cationics as well as anionics. They have strong bactericidal properties and are toxic in nature.

In Indian market detergents are made largely from a row material called acid slurry which chemically is a derivative of LAB (Linear alkyle benzene) LAB is petroleum product and treated with sulphuric acid or olium sulphar trioxide gas to obtain LABS. LABS is then neutralized with caustic soda ash and formulated with variety of builders fillers which includes phosphates (eg. STPP Sodium tripolyphosphate).

Technically a detergents powder should have a certain minimum content of active matter so that when added to water in recommended dose it is able to form “Micelles”. These are minute droplets of fat layer in solution which trap oily matter and soil.

LABS, the active ingredient in most detergents is per so a primary skin irritant largely due to its ability to perpetrate the epidermis (Outer skin). Skin irritation due to detergent might not be a significant problem in countries where machine washing is the rule but in India where washing is largely done ' by hands, it assumes great importance. New detergents like Alfa olefin sulphonate (AOS) are likely to be contaminated with sultenes, which are known skin sensitizes and possible carcinogens (Suri et al. 1991).

Detergents when comes to water bodies like ponds rivers, and lakes, either along with municipal wastes or with industrial effluents. Causes farming of rivers. Detergent phosphates create eutrophication of water bodies ie. Increased growth of algas contents of water thereby making water misfit for aquatic life. Being fat soluble they interact with cell membranes causing heavy tissues damage to aquatic animals. The adverse effects of detergent on fish gill, skin, liver and its behavior are well known (Abel 1974; Lai et al. 1984; Misra et al. 1985; misra et al. 1987; Varsteeg and Rawling 2003). Effects of detergent on fresh water prowns are also well known (Sharma and Shukla 1990; Shukla 1993) like hyperactivity, asphyxiation, uncoordinated movements, reduced feeding along with heavy damage to gill, kidney & hepatenpancreas. Human beings are exposed to detergents either during washing or through drinking water. Other routs of exposures are like improperly washed kitchen utensils and extensive use of toothpaste. Most of the toothpaste have 0.5-1% detergent to form foam which is much above the recommended level of WHO. The effects of detergents on intertinel musosa and kidney are well known in experimental animals like mice, Dog and Guinea pig.

Most of the detergents like Alkyl Aryl Sulphates, Alkyl benzene sulphonates and linear Alkyl Benzene suphonates have ability to bind with proteins as well as affect several biochemical and physiological processes by altering enzyme activity.

The rapid biodegradability of LAS is also under question as indicated by recent studies. The accumulation of various detergents in tissues of animals is also known nowda ys which again put a question mark on their ecofreiendly nature. Though search for new detergents like Alpha olefin suphonates (Third generation detergents) and enzyme based detergents (Fourth generation) is going on but the cost effective considerations makes them not so popular as LAS. The search for real ecofriendly detergent is necessary till then regulated use of detergents and its treatment before releasing into environment can minimize the damage to the ecosystem

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