

BHARAT SHIKSHAN SANSTHA

Shri Chhatrapati Shivaji College Omerga



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Fats Oils & Detergents

● Contents

Fats, oils and detergents

08 Hrs.

Natural fats, edible and industrial oils of vegetable origin, manufacture of soyabean oil by solvent extraction method and isolation and uses of essential oils.

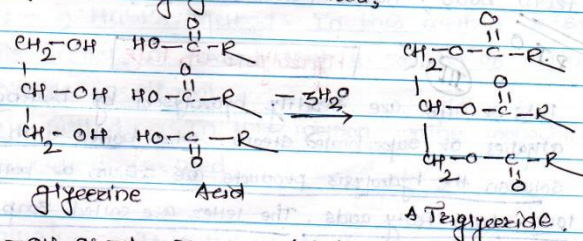
Types of animals fats and oils and definition of saponification value, iodine value, and acid value. Detergents: Definition, Introduction and preparation of sodium alkyl sulphonate, alkyl benzene sulphonate, and amide sulphonate, (one example each), Cleansing action of detergent.

① Introduction :- (Lipids includes - oils, fats, wax & phospholipids)

Fats & oils belong to the naturally occurring group of compounds called lipids. Lipids are constituents of plants & animals that are insoluble in water, but soluble in organic solvents e.g. CCl_4 , CHCl_3 etc.

Actually natural fats & oils are the triesters of glycerol with long chain of carboxylic acids (10 to 12 carbon). These are known as Triglycerides or Triacylglycerols.

They are represented by general formula:



If the all -OH group are esterified by same acid are called as simple glyceride & if two or diffnt acid used called as mixed glycerides.

Oils which are liquids at room temp, containing a larger proportion of unsaturated acids like oleic, linoleic, linolenic acid etc. Fats which are solids at room temp contain a larger proportion of saturated acids like lauric, myristic, palmitic & stearic acids.

The melting pt of a fat or oils depends upon its structure. Fat or oil occurs widely spread both in plants & animals.

A) In plants:- Plants store large quantities of fats in their seeds, roots, fruits, cotton seeds, castor beans, peanuts, coconuts, olive etc have a high fat contents.

B) In Animals:- In animals the fats deposits are to be found mostly under the skin & around the intestines & kidney. Lard (fat of hogs) & tallow (fats of cattle) sheep & horse are used for industrially for soap making.

General oils isolated from petroleum product are termed as mineral oils. mineral oils are mixture of various hydrocarbon of diff^{nt} mol. wt & diff^{nt} degrees of volatilities. These oils are used as fuels in automobiles & power industry, for making lubricants e.g. kerosene, petrol, Diesels etc.

Pleasant smelling volatile liquids which are isolated from plants are termed as essential oils e.g. turpentine oil, eucalyptus oil, clove oils, these are extracted from buds, flower petals, barks, leaves, roots etc.

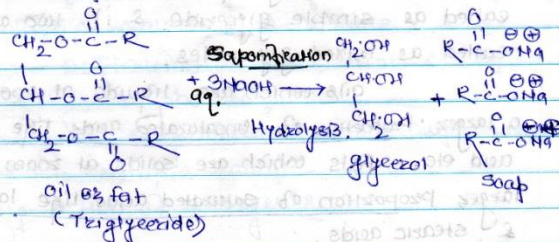
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III

Hydrolysis of fats

Fats or oils are readily hydrolysed by heating with acid or alkalies or superheated steam. When boiled with sodium or KOH solution the hydrolysis products are sodium or potassium salts of long-chain fatty acids. The latter are called soap & alkaline hydrolysis is referred to as saponification.

e.g.



* Analysis of oils & fats - (Determination of ① ② & ③ value)

Oils & fats are characterised by means of their physical constants like melting points, solidifying point, density & refractive index.

Type of fatty acids present in the oil or fat can be identified by the following chemical tests -

1) Saponification Value - It is the no. of milligrams of KOH required to neutralise the acids resulting from the complete hydrolysis of 1 gram of the oil or fats.

2) **Iodine value**:- It is the number of grams of iodine that combine with 100 grams of oils or fats. It gives the degree of unsaturation of the acids in the fat or oil.

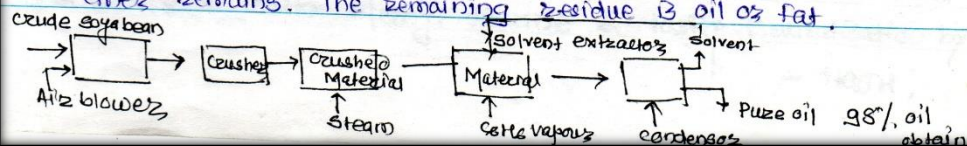
Different methods are used for determining iodine value:- a) **Hull's Method**:- In this method a soln of fat or oils in CCl_4 is treated with a solution of iodine & mercuric chloride in ethanol.

b) **Wij's method**:- In this method iodine monochloride in glacial acetic acid is used.

3) **Acid value**:- It is the no. of milligrams of KOH required to neutralize 1 gm of oil or fat. It indicates the amount of free acid present.

II Extraction of fat from soyabean:-

The sample of soyabean is dried by keeping overnight in a warm room or in oven, so the moisture is within 6-8%. It is grinded in small pieces with minimum exposure to air. Take 2gm quantity & placed in a filter paperfold, again with a second filter paper wrapped around it properly, which is left open at the top side. A piece of cotton wool is placed at the top to evenly distribute the solvent as it drops on the sample during extraction. The sample is extracted in a Soxhlet apparatus with petroleum ether (150 drop/min) for 6 hrs without interruption by gentle heating. Lastly it cooled, & evaporate the ether on steam bath until no odour of ether remains. The remaining residue is oil or fat.



IV (B) Detergents

Soap are sod. or potassium salts of fatty acids, chiefly oleic, stearic, palmitic, lauric & myristic acids. Ordinary soap are the products of hydrolysis of oils & fats with NaOH. Soaps are mixture of ~~soap~~ saturated & unsaturated long chain carboxylic acid containing 12 to 18 carbon atom.

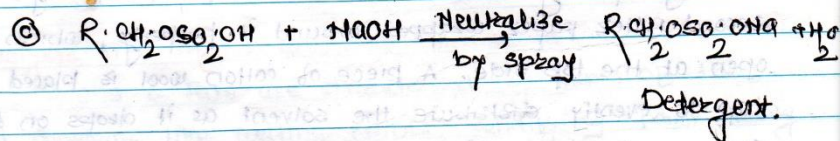
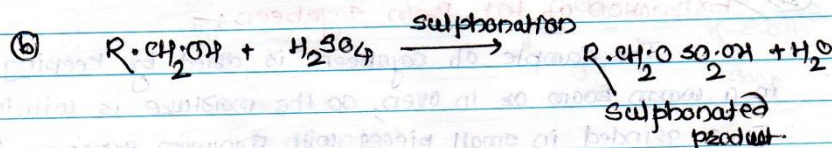
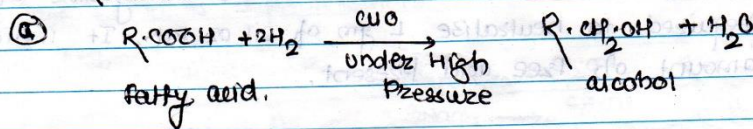
Detergents are substitutes of soap it is commonly referred as syndets or detergents it can be prepared by No. of methods; as follows.

Preparation of Detergents

① Prepⁿ of sodium alkyl sulphates:-

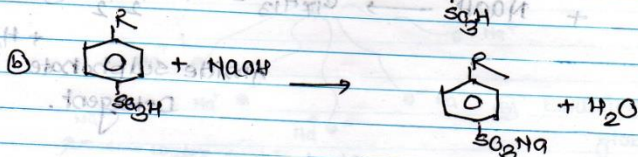
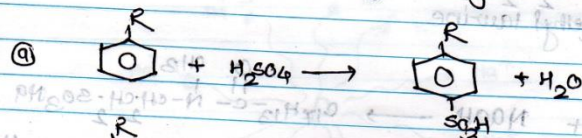
e.g. Firstly by redⁿ of fatty acid to respective alcohol. The formed alcohol sulphated by sulphonation way & lastly sulphated product hydrolysed & neutralized by a spray method we get respective detergent i.e. sodium lauryl sulphates.

Reaction -



② Alkyl benzene Sulphonate: -

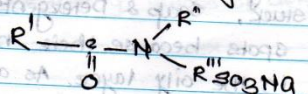
This is most imp anionic detergent. In this process alkylated benzene is treated with H_2SO_4 & lastly treated with $NaOH$ we get detergent.



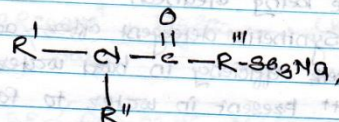
Alkyl benzene sulphonate

③ Amide sulphonates: -

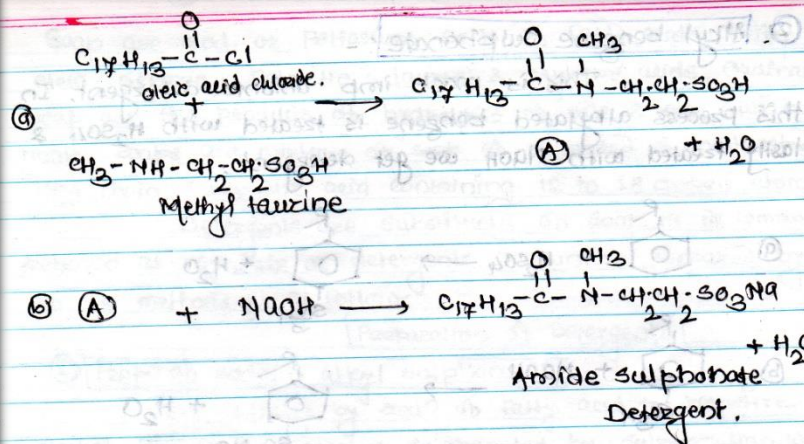
In this case two type of amide sulphonate. In first case sulphonic acid gr. is attached to the nitrogen atom of the amide group through the alkyl group.



In second case sulphonic acid gr. is attached to the alkyl group through the alkyl group.



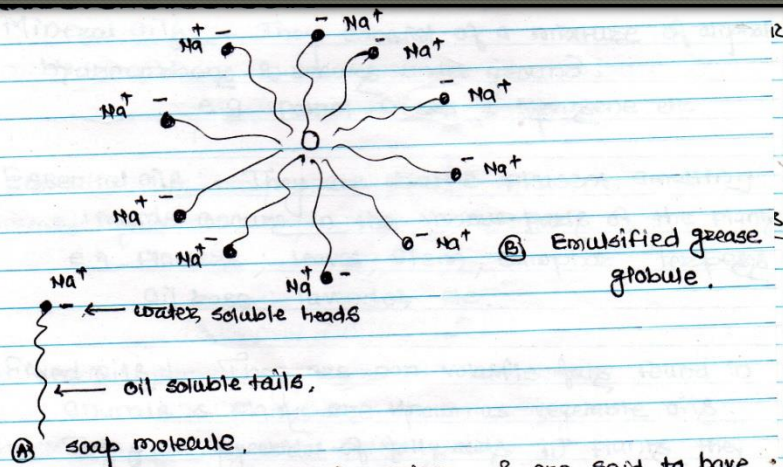
It can be prepared by reacting oleic acid with acid chloride & with Methylamine & lastly neutralization by $-NaOH$.



Cleansing Action of Detergent

The soap & Detergents used for remove the 'dirts'. Most dirt particles on skin or cloth become surrounded by a layer of an oil or fats. Water molecules alone are unable to disperse these oily spots because they are unable to penetrate the oily layer & separate them from the surface to which they are stuck. Soap & Detergents solution can separate these oily spots because their nonpolar hydrocarbon chains can dissolve in the oily layer. As a result each individual particle develops an outer polar layer of carboxylate ions. Due to repulsion between similar charges, these greasy spot become dispersed through the aq. phase & get removed from the surface being cleaned.

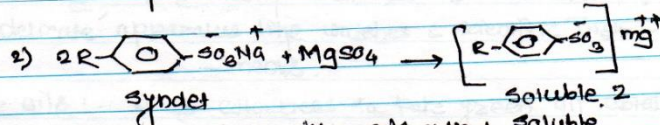
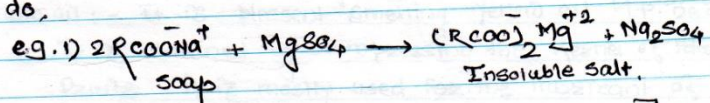
Synthetic detergent offers advantages over soap as they retain their efficiency in hard water. Soap reacts with Ca^{++} , Mg^{++} present in water to form an insoluble calcium & magnesium carboxylate while detergents reacts with these ions like Ca^{++} , Mg^{++} , Fe^{++} , Fe^{+++} to form corresponding water soluble salts of alkane sulfonates.



(A) soap molecule,
Due to the mutual repulsions, & are said to have been emulsified. The emulsified grease globules bearing dirt can be readily washed with water, shown in above figure i.e. cleansing actions of detergents.

→ Syndents versus soap! -

The syndets are superior to soaps because they do not form insoluble salts with Ca^{++} , Mg^{++} , Fe^{+3} ions as soap do.



Hence detergents can be used in either soft or hard water, while ordinary soap are precipitated in hard water & go waste.