

## CHAPTER 5: CHEMICALS FOR CONSUMERS

### **Soaps**

(Sodium or potassium salts of long-chain fatty acids)

#### Preparation of Soap

1. Saponification: heating oil with concentrated NaOH or KOH
2. Precipitation: adding NaCl (lower the solubility of soap in water)

#### Properties of Soap:

1. Feels slippery
2. Forms lather when shaken with water

#### Reduced effectiveness of Soap:

1. Hard water (react with  $Mg^{2+}$  or  $Ca^{2+}$  to produce soap scum)
2. Acidic water (react with  $H^+$  to produce fatty acids)

### **Detergents**

(Cleaning agent made from synthetic resources that is not a soap)

#### Preparation of *Sodium Alkyl Sulphate* Detergent:

1. Sulphonation: Alcohol +  $H_2SO_4 \rightarrow$  Alkyl sulphonic acid +  $H_2O$
2. Neutralisation: Alkyl sulphonic acid + NaOH  $\rightarrow$  Sodium alkyl sulphate +  $H_2O$

#### Preparation of *Sodium Alkylbenzene Sulphonate* Detergent:

1. Alkylation: Alkene + Benzene  $\rightarrow$  Alkylbenzene
2. Sulphonation: Alkylbenzene +  $H_2SO_4 \rightarrow$  Alkylbenzene sulphonic acid +  $H_2O$
3. Neutralisation: A.S.A. + NaOH  $\rightarrow$  Sodium alkylbenzene sulphonate +  $H_2O$

#### Types of Detergents:

1. Anionic: Dishwashers, *sodium alkyl sulphate*, *sodium alkylbenzene sulphonate*
2. Cationic: Hair conditioner
3. Non-ionic: Car washing detergent

#### Additives in Detergents:

- |                        |                                      |                             |
|------------------------|--------------------------------------|-----------------------------|
| 1. Biological enzymes: | Amylase, protease, cellulase, lipase |                             |
| 2. Whitening agent:    | Sodium perborate                     | [per $\rightarrow$ 白]       |
| 3. Optical whitener:   | Fluorescent dyes                     |                             |
| 4. Builder:            | Sodium tripolyphosphate              | [poly $\rightarrow$ build]  |
| 5. Suspension agent:   | Carboxymethylcellulose               | [CMC $\rightarrow$ 悬, 嗯, 悬] |
| 6. Filler:             | $NaSO_4$ , $Na_2SiO_3$               | [Na $\rightarrow$ 容“纳”]     |
| 7. Foam control agent: | Silicones                            | [cone-trol]                 |
| 8. Fragrance           |                                      |                             |

## **Soaps and Detergents**

Ionisation in water:

1.  $\text{RCOO}^-\text{Na}^+ \rightarrow \text{RCOO}^- + \text{Na}^+$  (Soaps)
2.  $\text{ROSO}_3^-\text{Na}^+ \rightarrow \text{ROSO}_3^- + \text{Na}^+$  (*Sodium alkyl sulphate*)
3.  $\text{RSO}_3^-\text{Na}^+ \rightarrow \text{RSO}_3^- + \text{Na}^+$  (*Sodium alkylbenzene sulphonate*)
4. R(hydrocarbon chain) is hydrophobic – soluble in oils
5.  $\text{COO}^-$ ,  $\text{OSO}_3^-$ , &  $\text{SO}_3^-$  are hydrophilic – soluble in water

Biodegradability of Soaps and Detergents:

1. Soaps are biodegradable and do not cause any pollution
2. Detergents can be biodegradable (above given two) or non-biodegradable
3. Non-biodegradable detergents form thick foams that kill aquatic lives

Cleansing Action of Soaps and Detergents

1. Reduce surface tension of water to wet surface thoroughly.
2. Hydrophobic parts of the anions are soluble in grease; hydrophilic parts in water.
3. Scrubbing or mechanical agitation will pull the grease away into smaller droplets.
4. Emulsion is formed due to repulsion of suspending droplets.
5. Can be rinsed since the droplets do not coagulate or redeposit on the surface.

## **Food Additives**

(Natural or synthetic substance added to food to prevent spoilage, improve appearance, taste or texture)

Food Additives:

1. Preservatives: Salt, sugar, vinegar,  $\text{NaNO}_2$ ,  $\text{NaNO}_3$ ,  $\text{SO}_2$ ,  $\text{C}_6\text{H}_5\text{COOH}/\text{Na}$
2. Antioxidants: *BHA*, *BHT*, sodium citrate, Vit C (carcinogen), Vit E (free radicals)
3. Flavourings: *MSG*, aspartame, synthetic essences (esters)
4. Stabilisers: Acacia gum, lecithin, mono-/di-glycerides
5. Thickeners: Acacia gum, modified starch, gelatine, pectin, xanthan gum
6. Dyes: *Azo* (tartrazine) and *triphenyl* compounds (brilliant blue FCF)

Advantages of Artificial Food Dyes:

1. Cheaper
2. More uniform and have brighter colours

Advantages of Food Additives:

1. Stay fresh longer, look nice, taste better
2. Make seasonal crops and fruits available throughout the year

Disadvantages of Food Additives:

1. Cancer, asthma, allergies, hyperactivity
2. Less nutritious

## **Medicines**

(Substance to prevent or cure a disease or to relieve pain)

### Traditional Medicines:

1. Aloe vera (skin wounds), sea cucumber (heart hole), centipede (lockjaw), ants (Hepa B)
2. Alkaloid is toxic to the liver
3. Side effects

### Modern Medicines:

#### 1. Analgesics

- i. **Medicine to relieve pain without causing numbness or affecting consciousness**
- ii. Aspirin (acid) – Arthritic/dental pain. SE: Ulcers, brain/liver damage
- iii. Paracetamol – Mild to moderate pain. SE: Liver/skin damage
- iv. Codeine – Headache. SE: Addiction and nausea

#### 2. Antibiotics

- i. **Medicine to kill or slow down the growth of bacteria**
- ii. Penicillin – Cure tuberculosis/pneumonia
- iii. Streptomycin – Cure tuberculosis/pneumonia/whooping cough
- iv. Side effects – Headache, allergic reaction, diarrhoea

#### 3. Psychotherapeutic Medicines

- i. **Medicine to alter abnormal thinking, feelings, or behaviours**
- ii. Stimulant – Reduce fatigue, elevate mood
- iii. Antidepressant – Reduce tension and anxiety
- iv. Antipsychotic – Treat psychiatric illnesses such as *schizophrenia*