



**Ministry of
Higher
Education and
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AL Mustaqbal university college
Chemical Engineering Department**

Petroleum Chemistry Laboratory

**Experimental No.4
Alkaline hydrolysis of fat**

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The purpose of the experiment:

Preparation of Soap – Basic Hydrolysis of Fats

Introduction And Theory

Soap is produced by the saponification (hydrolysis) of a triglyceride (fat or oil). (See Figure 1.) In this process the triglyceride is reacted with a strong base such as sodium or potassium hydroxide to produce glycerol and fatty acid salts. The salt of the fatty acid is called a soap.

Fatty acids are straight-chain monocarboxylic acids. The most common fatty acids range in size from 10-20 carbons and most often have an even number of carbon atoms including the carboxyl group carbon. The carbon-carbon bonds in saturated fatty acids are all single bonds, while unsaturated fatty acids have one or more carbon-carbon double bonds in their chains. One example of a saturated fatty acid is palmitic acid, $\text{CH}_3\text{---}(\text{CH}_2)_{14}\text{---CO}_2\text{H}$.

Fatty acids are seldom found as free molecules in nature but are most often a part of a larger molecule called a triglyceride. Triglycerides consist of a three-membered carbon chain (glycerol backbone) with a fatty acid bonded to each of the three carbon atoms in the glycerol backbone. The bond between the fatty acid and the glycerol backbone is referred to as an ester linkage. In the saponification process, the ester linkage is broken to form glycerol and soap.

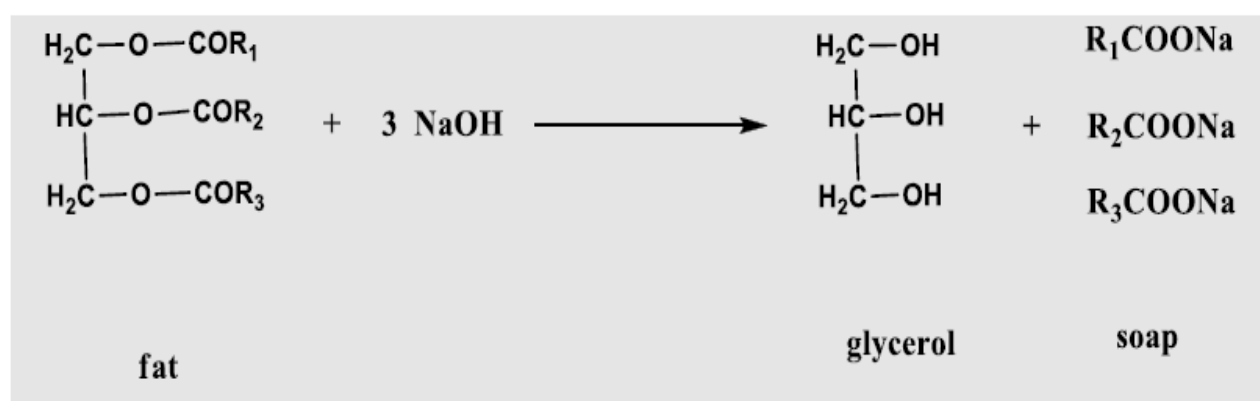


Figure 1: Saponification of a triglyceride

The saponification process is a hydrolysis reaction, which is the reversal of the esterification reaction. In this experiment, we will use a saturated fat made from hydrogenated olive oil (glycerol tristearate) to prepare a soap, which will be primarily sodium stearate.

Any animal or vegetable fat or oil can be used to conduct this experiment, but oils contain a greater percentage of unsaturated carboxylic acids compared to fats. The resulting soap is better if a solid fat is used, such as (lard). Cocoa oil, margarine, commercial cooking fat, etc.)

Theoretical part:

- Instruments and Chemicals

- Vegetable fat,
- methyl alcohol,
- sodium hydroxide
- sodium chloride Round flask,
- escalation condenser,
- spoon,
- scratching funnel

- Procedure

- 1) Mix (3 g) of fat with (50 ml) of methanol and (3 g) of sodium hydroxide in a round flask. Capacity (100ml)
- 2) Install a escalation condenser on the beaker and heat it on a water bath for (30 minutes)
- 3) Get rid of methyl alcohol by simple distillation
- 4) Dissolve the remaining precipitate in (50 ml) of water (in the industrial field an aqueous-base solution is used, but an alcohol-base solution gives a faster decomposition)
- 5) The soap is separated by adding (5 g) of sodium chloride in what is called the salting process (an example of the ion effect subscriber on dissolving)
- 6) Filter the curds with a Hirsch funnel and dry the soap between layers of filter paper.

Discussion :

- 1- What is the purpose of the experiment,
- 2- What are the types samples of fat can be used in this experiment ?
- 3- What sample can used to resulting better soap ? give the examples?