

Lab N °04: Preparation of Soap

Objectives

Conducting a laboratory synthesis of a soap
 Highlighting some properties of aqueous soap solutions.

Introduction

Soaps are carboxylate salts characterized by very long hydrocarbon chains. They are typically derived from the alkaline hydrolysis of fats or oils, a process known as saponification, which has been practiced for centuries. Historically, soaps were crafted from animal fats and lye (NaOH), with lye traditionally obtained by leaching water through wood ashes. An illustration of a saponification reaction is provided below.

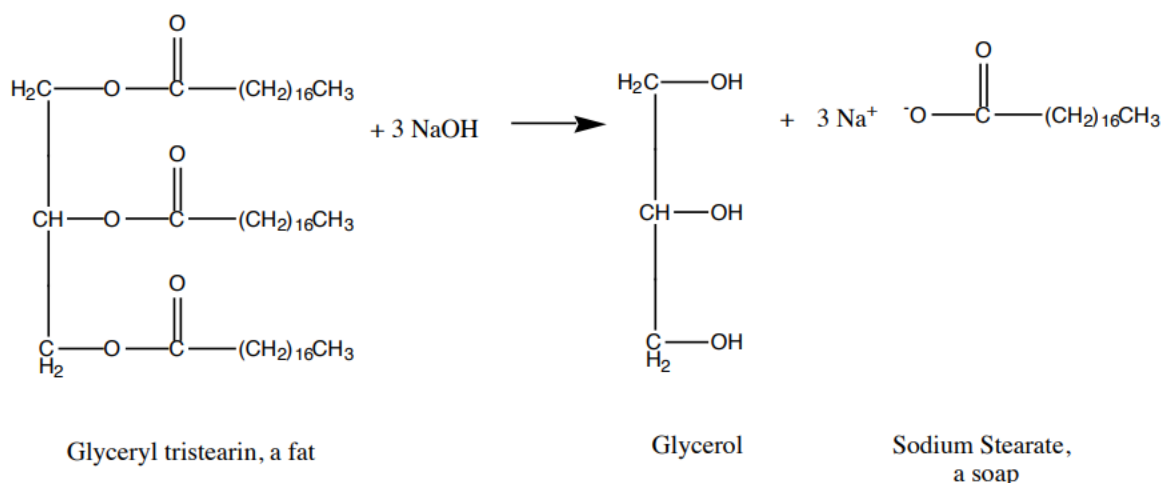


Figure 1. Reaction of Saponification

Materials & Equipment

Materials	Equipments	
Distilled Water	25 mL test tube	pH paper
Vegetable oil	50 mL test tube.	Electronic Balance
Sodium hydroxide (NaOH). 95% ethanol.	3 250 mL beakers. Reflux heating device.	Watch Glass
Saturated sodium chloride solution NaCl.	Glass stirrer Large crystallizing dish.	Buckner Funnel Pumice stone. Filter papers

Safety and precautions

- Wear your safety goggles. This is especially important in this experiment, since NaOH can cause permanent eye damage.

Procedure

1. In a 250 mL flask, carefully introduce:
 - 20 mL of 8 mol/L sodium hydroxide solution.
 - 20 mL of 95% ethanol.
2. Stir to dissolve the sodium hydroxide.
3. Add 10 mL of vegetable oil.
4. Add a few grains of pumice stone.
5. Heat for 30 minutes without exceeding 90°C.
6. At the end of heating, pour the contents of the flask into a beaker containing a saturated solution of sodium chloride. **Note:** NaCl solubility in water 36g/L (25°)
7. A yellowish solid layer, the precipitated soap, forms and floats on the surface of the saltwater.
8. Filter using a large-diameter Büchner funnel. Wash the soap with ice-cold water in the Büchner funnel. Measure the pH of the filtrate.
9. Let the soap dry (shape it by placing it in a mold).

Foaming properties of soap

1. Cut a small piece of the obtained soap and introduce it into a test tube.
2. Add 2 to 3 mL of distilled water and shake.

Note It is not recommended to use the obtained soap for hand washing; indeed, it still contains a lot of sodium hydroxide and is therefore caustic.

Questions

1. What is saponification?
2. Write the equation for the saponification reaction and name all reagents and products.
3. Provide the reaction mechanism.
4. To which class of chemical compounds do fatty substances belong?
5. What substance can be used instead of sodium hydroxide (lye)?
6. Why was ethanol added to the reaction mixture of fat and base?
7. Explain how soaps emulsify oils and fats
8. Calculate the reaction yield.