**Experiment name:** Soap

**Classification:** Esterification reactions

**Reaction scheme:**



**Experimental procedure and purification technique:**

Soaps are sodium or potassium salts of long chain fatty acids and obtained from the saponification (hydrolysis) of a triglyceride (fat or oil). 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 fatty acid is called soap. R groups might be identical or different, but frequently they are commonly found in the form of C15H31COOH (palmitic acid), C17H35COOH (stearic acid) in solid animal fats and as C17H33COOH (oleic acid) in liquid vegetable oils.

1st method:

In order to perform the saponification reaction, utilize vegetable oil (200 g) and NaOH (100 ml, 5 N). To this aim, heat the mixture of NaOH (10 ml, 5 N) and water (100 ml) in a 1 L beaker, and add the vegetable oil into the solution. After 1 hour, add NaOH (75 ml, 5 N) and stir the mixture vigorously. After 20 minutes, introduce another partition of NaOH solution (20 ml, 5 N) and water (20 ml) then heat until slightly boiling for about 30 minutes. Following this step, add the remaining NaOH solution and if needed add the necessary amount of water in order to compensate the evaporated water. Allow to stir for an extra 15 minutes and add water (20 ml). Continue to boil the solution until a homogeneous paste is gathered (approximately 20 to 30 minutes). Afterward, add hot water (400-500 ml) while vigorously stirring the beaker content and observe the formation of a thick and transparent paste. In the last step, add NaCl (20 g) at the boiling temperature of the solution. Allow the beaker content to cool and stand for overnight. Let the solution to dry for a long period. In order to purify the soap, dissolve the mixture in hot water and saturate with NaCl and allow to solidify.

2nd method:

In order to perform the saponification reaction, utilize vegetable oil or animal fat (10 g) and NaOH (dissolve 5 g NaOH in 40 ml of water: ethanol (1:1) solution). Place these two ingredients into a 250 ml beaker and heat in a hot water bath for about 45 minutes. Prepare another NaOH solution (40 ml, water: ethanol (1:1)) and add in small portions with stirring. Dissolve NaCl (50 g) in water (150 ml), if necessary heat the mixture in order to completely dissolve NaCl. Afterward, cool the mixture to the room temperature. Pour the soap mixture into the brine. Cool the mixture in an ice bath while stirring it for 15 minutes. Filter the separated soap from the pump. Wash the solid product two times with cold water and dry it by suction filtration. Allow to stand overnight.

Reference source (1): “Vogel’s Textbook of Practical Organic Chemistry (5th edition)”: -

Reference source (2): “Denel Organik Kimya (6th edition)”: 643.