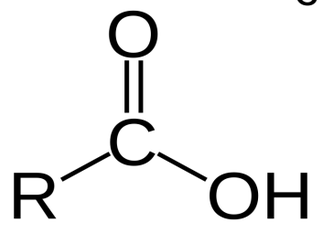
Making soap

Saponification reaction of fatty acids with alkali catalyst



In chemistry, particularly in biochemistry, a **fatty acid** is a *carboxylic acid* with a long aliphatic chain, which is either saturated or unsaturated. A **carboxylic acid** is an organic compound that contains a carboxyl group (**C(=O)OH**). The general formula of a carboxylic acid is **R–COOH**, with R referring to the rest of the (possibly quite large) molecule. For example, $C_{17}H_{35}CO_2H$ (tallow).

R-COOH (fatty acid) + alkali catalyst (lye)

↓

$R\text{-}COO^-$ (fatty acid **soap**) M^+ and H_2O (water)

R-COOH (fatty acid) + (water and alkali catalyst)

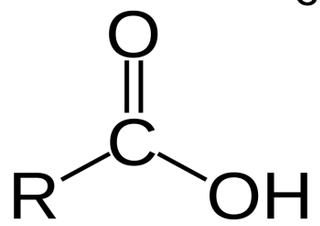
↓

$R\text{-}COO^-$ (fatty acid **soap**) M^+ and H_2O (water)

Potassium Hydroxide is a type of lye used to make liquid soap. It is also known as potash, lye or KOH.
This is what induces *saponification* of the fats and oils to create liquid soap.

Making soap (on demand)

Saponification reaction of fatty acids with alkali catalyst



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R-COOH (fatty acid) + KOH (potassium hydroxide)

↓

R-COO^- (fatty acid **soap**) **K^+** and H_2O (water)

R-COOH (fatty acid) + **Purple** (water and KOH)

↓

R-COO^- (fatty acid **soap**) **K^+** and H_2O (water)

Saponification is an exothermic chemical reaction that occurs when fatty acids come into contact with lye. In this reaction, the triglyceride units of fats react with potassium hydroxide and are converted to soap.

Saponification value number represents the number of milligrams of potassium hydroxide required to saponify 1g of fat under the conditions specified. It is a measure of the average molecular weight (or chain length) of all the fatty acids present.

As most of the mass of a fat/tri-ester is in the 3 fatty acids, the saponification value allows for comparison of the average fatty acid chain length. The long chain fatty acids found in fats have a low saponification value because they have a relatively fewer number of carboxylic functional groups per unit mass of the fat as compared to short chain fatty acids. If more moles of base are required to saponify N grams of fat then there are more moles of the fat and the chain lengths are relatively small, given the following relation:

Number of moles = mass of oil / average molecular mass

The calculated molar mass is not applicable to fats and oils containing high amounts of unsaponifiable material, free fatty acids (>0.1%), or mono- and diacylglycerols (>0.1%).

Our proprietary combination of high alkalinity (pH) and electrolysis, optimizes the Saponification value at the point of contact, resulting in a reaction where M+ (KOH) is consumed in the process and neutral (BOD) / (COD) in any water.