soap chemistry

handmade soap

Handmade soap is a neutral by-product derived from a complex chemical reaction called saponification. Basically, an acid (fats and oils) and an alkali react to produce soap and glycerin. Fats and oils are made up of triglycerides; a three molecular chain of fatty acids joined to a single-molecular glycerol 'spine' that looks like a capital E. Although the triglyceride molecules are tightly bonded to the glycerol molecule small amounts become detached and are called free fatty acids. When the alkali solution is mixed with the fats and oils the free fatty acids kick-start the first stage of the saponification process producing small amounts of soap. This emulsifying reaction of the soap continues until all available fatty acids have reacted with the available alkali, then saponification is complete.

Whether solid or liquid all real soaps are made through the reaction of an alkali with fatty acids. Fatty acids and sodium hydroxide or caustic soda (NaOH) produce bar soaps through the crystallisation of sodium, and potassium hydroxide or caustic potash (KOH) is the base used for all liquid soaps. Although soap is made with an alkali the final product should not contain it, as it should be completely neutralised after the curing period in the case of 'cold process' bar soap, and after cooking in the case of 'hot process' soaps.

how soap cleans

Soap is unusual and contrary in nature acting like a two-headed snake. At one end is a potassium or sodium oil-hating, water-loving head and at the other end there is a fatty acid chain of oil-loving, water-hating head. Because the oily head hates water and the alkali head loves water, when soap is mixed with water this love/hate relationship causes soap to lather.

There is no room for error in making the basic soap emulsion. It is important that the correct proportions of acid and alkali are used to obtain pure soap, as too much alkali will render the final bars unsafe for use on the skin and too much oil and fats will render the soap too greasy, soft or squishy.

I have done all the mathematical calculations for the recipes included in this book and so all you have to do is follow the recipes and instructions outlined to make high quality soaps even with your first attempt.

Although it is not necessary to have a degree in chemistry to understand and make soap at home, it is useful to know the basics to be able to manipulate the characteristics of the oils and fats, use the saponification values to craft your own unique creations and also to recognise what is going on in your soap pot during the soap making process.