Journal of Current Chemical and Pharmaceutical Sciences

Editorial | Vol 11 Iss 2

Sulphate Chemical Reaction in Making of Soap and Detergents

Nur Kartinee Kassim*

Science Faculty of University Putra Malaysia, 43400 Serdang, Malaysia.

Corresponding Author: Nur Kartinee Kassim, Science Faculty of University Putra Malaysia, 43400 Serdang, Malaysia, E-mail: kartinee@upm.edu.my

Description

Wetting of the surface and, in the case of textiles, penetration of the fibre structure by wash liquor containing the detergent. Detergents (and other surface-active agents) increase the spreading and wetting ability of water by reducing its surface tension— that is, the affinity its molecules have for each other in preference to the molecules of the material to be washed.Absorption of a layer of the soap or detergent at the interfaces between the water and the surface to be washed and between the water and the soil. In the case of ionic surface-active agents (explained below), the layer formed is ionic (electrically polar) in nature. Dispersion of soil from the fibre or other material into the wash water. This step is facilitated by mechanical agitation and high temperature; in the case of toilet soap, soil is dispersed in the foam formed by mechanical action of the hands.

Preventing the soil from being deposited again onto the surface cleaned. The soap or detergent accomplishes this by suspending the dirt in a protective colloid, sometimes with the aid of special additives. In a great many soiled surfaces the dirt is bound to the surface by a thin film of oil or grease. The cleaning of such surfaces involves the displacement of this film by the detergent solution, which is in turn washed away by rinse waters. The oil film breaks up and separates into individual droplets under the influence of the detergent solution. If detached oil droplets and dirt particles did not become suspended in the detergent solution in a stable and highly dispersed condition, they would be inclined to flocculate or coalesce into aggregates large enough to be redeposited on the cleansed surface. In the washing of fabrics and similar materials, small oil droplets or fine, deflocculated dirt particles are more easily carried through interstices in the material than are relatively large ones. The action of the detergent in maintaining the dirt in a highly dispersed condition is therefore important in preventing retention of detached dirt by the fabric.

Carboxylic acids and salts having alkyl chains longer than eight carbons exhibit unusual behavior in water due to the presence of both hydrophilic (CO2) and hydrophobic (alkyl) regions in the same molecule. Such molecules are termed amphiphilic (Gk. amphi = both) or amphipathic. Fatty acids made up of ten or more carbon atoms are nearly insoluble in water, and because of their lower density, float on the surface when mixed with water. Unlike paraffin or other alkanes, which tend to puddle on the waters surface, these fatty acids spread evenly over an extended water surface, eventually forming a monomolecular layer in which the polar carboxyl groups are hydrogen bonded at the water interface, and the hydrocarbon chains are aligned together away from the water. This behavior is illustrated in the diagram on the right. Substances that accumulate at water surfaces and change the surface properties are called surfactants. Alkali metal salts of fatty acids are more soluble in water than the acids themselves, and the amphiphilic character of these substances also make them strong surfactants. The most common examples of such compounds are soaps and detergents, four of which are shown below. Note that each of these molecules has a nonpolar hydrocarbon chain, the "tail", and a polar (often ionic) "head group". The use of such compounds as cleaning agents is facilitated by their surfactant character, which lowers the surface tension of water, allowing it to penetrate and wet a variety of materials.

The oldest amphiphilic cleaning agent known to humans is soap. Soap is manufactured by the base-catalyzed hydrolysis (saponification) of animal fat. Before sodium hydroxide was commercially available, a boiling solution of potassium carbonate leached from wood ashes was used. Soft potassium soaps were then converted to the harder sodium soaps by washing with salt solution. The importance of soap to human civilization is documented by history, but some problems associated with its use have been recognized. One of these is caused by the weak acidity (pKa ca. 4.9) of the fatty acids. Solutions of alkali metal soaps are slightly alkaline (pH 8 to 9) due to hydrolysis. If the pH of a soap solution is lowered by acidic contaminants, insoluble fatty acids precipitate and form a scum.