OLEOCHEMICALS
GLOSSARY

The following is a glossary of terms used in the oleochemicals industry. It is by no means all-inclusive, nor is it meant to be.

Alkryd Resin : The reaction product of polyols, diacids, acids and anhydrides used primarily in the surface coating industry in which fatty acids, oils and glycerine are used to impart properties, e.g. chemical resistance, hardness, drying speed and flexibility.

Amines : Amines are produced from fatty acids for use as surface-active compounds. The primary and secondary amines can be converted to tertiary amines, quats and amine oxides, all of which have valuable surface-active properties. Based on their cationic nature and ability to be strongly absorbed on many surfaces, they have many industrial and cosmetic applications.

Castor Oil : Oil from *Ricinus communis* produced mainly in India, Brazil and China. Castor oil differs from all other common oils in being rich (~90%) in the hydroxyl acid, ricinoleic. Castor oil is a source of several important oleochemicals including Turkey-red oil, 12-hydroxystearic acid, dehydrated castor oil, heptanal, 10-undeconoic acid, 2-octanol and sebacic acid.

Dibasic Acids : Refers to acids with two carboxyl groups, of which the most common have the general structure HOOC(CH2)nCOOH. They include (value of n in parenthesis): oxalic* (0), malonic* (1), succinic* (2), glutaric* (3), adipic* (4), suberic* (6), azelaic (7), sebacic (8), dodecanedioic* (10) and brassylic* (11). Systematic names such as nonanedioic acid indicate the presence of two carboxyl groups and the total number of carbon atoms in each molecule (in this case nine). Some of these are used in the production of polyesters and poly-amides. (*Azelaic, brassylic and sebacic are the only commercial dibasic acids from natural sources).

Emulsifiers : Additives that allow oils to be mixed with water and water to be mixed with oils. They alter the surface properties of materials they contact because of their amphiphilic nature. That is to say, they have chemical affinity to both lipid and aqueous phases. Because of this property, the molecules become oriented along the surfaces or interfaces of these normally immiscible substances.

Epoxidation : The reaction by which unsaturated acids are converted to epoxy acids. This is a *cis* addition of oxygen to the double bond, usually affected by a peroxy acid such as peroxyformic or peroxyacetic. The reaction is carried out on an industrial scale to produce epoxidised soybean oil, epoxidised linseed oil, etc. These are used primarily as plasticisers-stabilisers for polyvinylchloride (PVC).

Erucic Acid : Erucic acid (13-22:1), whose systematic name is 13-docosenoic acid, is derived primarily from high-erucic rapeseed, mustard and Crambe seed oils. Erucic acid is used as an intermediate to make derivatives such as erucamides, amines and behenamide. End applications include lubricants, heat transfer fluids, surfactants, slip agents, emollients, cosmetics and coatings.

Esterification : The reaction by which esters are formed from alcohols and acids, usually in the presence of an acidic catalyst, or with the more reactive acid anhydrides or chlorides for which no catalyst is required. Esters can also be changed to other ester by alcoholysis, acidolysis and interesterification.

Ethylene : A petrochemical feedstock for production of detergent-range alcohols and for the production of ethylene oxide, which is used in the manufacture of many surfactants.

FFB : The acronym for Fresh Fruit Bunch, FFB, refers to the bunch harvested from the oil palm. Each bunch weighs 5-50 kg (about 11-110 lbs) and may contain 1,500 or more individual fruits.

FAME : Fatty Acid Methyl Esters (FAME), sometimes referred to as Vegetable Oil Methyl Esters (VOME), are used as transportation biofuels in varying proportions with diesel and as feed for the production of natural fatty alcohols. They are obtained by esterification of the oils with an alcohol (methanol).

Fat : A chemical unit resulting from the chemical combination or esterification of one unit of glycerine with three units of fatty acids. The special ester thus formed is a "triglyceride". A natural fat is a mixture of different triglycerides and may contain small quantities of mono- and diglycerides and fatty acids along with small amounts of other oil-soluble constituents. When referring to a fat, under normal ambient temperatures, the product would be in semi-solid form.

Fatty Acids : Alkanoic and alkenoic acids are saturated or unsaturated organic acids generally having an unbranched chain of an even number of carbon atoms. They are major components of most lipids and are primarily obtained directly from animal or vegetable sources. Primary markets for fatty acids include greases and lubricants, rubber, soaps and detergents, plastics, cosmetics and toiletries, foods and emulsifiers, paper chemicals, and paints and coatings.

Fatty Alcohols : Medium- and long-chain alcohols related to the fatty acids that occur naturally in lauric oils and wax esters are produced commercially by the catalytic reduction of the acids or their methyl esters. Fatty alcohols (C12 and up) are vital components of surfactants used in personal care products. When reacted with ethylene oxide, fatty alcohols give polyoxyethylene derivatives, and both may also be used as sulfates. Hydrogenoloysis of methyl ester, free acid or wax ester all yield fatty alcohols from lauric oils, tallow or palm stearin.

Glycerol or Glycerine : Glycerol is an important structural compound of fats and oils. A complete splitting by hydrolysis of fats or oils results in glycerol and free fatty acids. Glycerol is used as a humectant, a food ingredient, in pharmaceutical products and in explosives.

Hydrolysis : The initial process used to obtain fatty acids from fats and oils is hydrolysis, resulting in mixed fatty acids and dilute glycerine. Purification of the mixed fatty acids is accomplished by distillation or by separation into individual fatty acids of different chain lengths by fractional distillation.

Interesterification : A term given to the production of esters by interaction of two esters in the presence of an alkaline or enzymatic catalyst.

Lauric Fats and Oils : The largest volume lauric fats and oils are coconut and palm kernel, which are vital to the manufacture of surfactants among other applications. Lauric oils typically contain 40-50% lauric acid (C12) in combination with lesser amounts of other relatively low-molecular-weight fatty acids.

Lipid : The general term used to describe fats, oils and waxes, together with more complex molecules.

Markets : Markets for oleochemicals continue to evolve, with niche markets developing continually. Nonetheless, the main end-use markets include building auxiliaries, candles, cleaning agents, cosmetics, detergents, fire extinguishing agents, flotation agents, food emulsifiers, insecticides, pharmaceuticals, plastics, rubber, soaps and detergents, textiles and tyres.

Oleic Acid : This monounsaturated acid is the most widely distributed of all fatty acids, found in practically every vegetable oil and animal fat. Rich sources are olive and peanut oils and palm olein. Oleic acid contains 18 carbon atoms and one double bond in the *cis* configuration. The classic route for making oleic acid and pressed-type stearic acids is to separate mixed fatty acids by crystallisation from either an organic solvent or a surfactant/water solution.

Oleochemicals : Oleochemicals are chemicals derived from biological fats or oils and are analogous to petrochemicals, which are chemicals derived from biological fats or oils and are analogous to petrochemicals, which are chemicals derived from petroleum. The hydrolysis of the triglycerides composing oils and fats produces fatty acids and glycerol. If oils or fats are made to react with an alcohol instead of with water, the process is alcoholysis and the products are fatty acid esters and glycerol. Other important oleochemicals include fatty alcohols, methyl or other esters, amides and amines, dimer acids and dibasic acids.

Palm Olein : Palm oil is separated into palm stearin (30-35% of the original oil) and palm olein (65-70%). The latter finds a ready market as a high-quality, highly stable frying oil. With improved filtration procedures the yield of olein has been raised to 71-78%.

Palm Stearin : As mentioned above, palm oil is separated into palm stearin and palm olein. The olein is the more valuable product, but the stearin can be used as a hard fat in margarine stock or as an alternative to tallow in the oleochemical industry where it serves as a source of stearic, palmitic and oleic glycerides.

Processes : Basic oleochemicals are producted primarily through splitting, distillation, fractionation, separation, hydrogenation, methylation and hydrophilisation. Derivatives of basic oleochemicals are produced mainly through amidation, chlorination, dimerisation, epoxidation, ethoxylation, quarternisation, sulfation, sulfonation, transesterification and saponification.

Raw Materials : The primary raw materials of the oleochemicals industry are tall oil, tallow, coconut oil, palm oil, palm kernel oil, soybean oil, sunflower oil and canola oil.

Ricinoleic Acid : Ricinoleic acid, whose systematic name is 12-hydroxyleic acid, is found in high degree in castor oil. The oil, ricinoleic acid, or its derivatives, are important to the cosmetics and lubricants industries.

Soapstock : In the chemical refining of crude oils, free fatty acids are removed by neutralisation with alkali and settle to the bottom as alkali soaps, known as soapstock.

Surfactants : Surfactants, or surface active agents, are substances that, when dissolved in water, give a product the ability to remove dirt from surfaces such as the human skin, textiles, and other solids. Each surfactant molecule has a hydrophilic (water-loving) head that is attracted to water molecules and a hydrophobic (water-hating) tail that repels water and simultaneously attaches itself to oil and grease in dirt. These opposing forces loosen the dirt and suspend it in the water. Surfactants derived from fats and oils are by far the largest oleochemical market at present. Virtually all types of fats, oils and fatty acids are used in this area.

Tall Oil Fatty Acids (TOFA) : An important industrial feedstock that is a by-product of the wood pulp industry. The term "tall oil" is derived from the Swedish word for "pine oil", or *tallolja*. Production occurs mainly in North America and Scandinavia. TOFA are obtained from crude tall oil via fractional distillation and yield between 25-35% fatty acids (oleic and linoleic).

Tallow : Beef fat is the primary source of tallow, whereas hog and poultry fats are the sources for greases. The ample availability of beef tallow in the last 50 years has made it the feedstock of choice for the fatty acid industry, both in the United States and Europe. Animal fat is divided into classes depending on the solidification temperature, or titre point. If the titre is above 40°C, it is classified as tallow. If below 40°C, it is considered a grease. Tallow contains mainly saturated (60%, 16:0 and 18:0) and monounsaturated fatty acids (40%, mainly 18:1 with some 16:1).

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