



Detail of Processes Allowed Under this Standard that Produce Many of the Ingredients on the Attached Positive List

Amination of Alcohols and Fatty Acids

Reagents: Ammonia, Alkyl Amine

Catalysts: Nickel, Palladium, various known other reducing agents

Agricultural Inputs: Alcohols, Acids, Aldehydes, Ketones

Description: The process of introducing an amine into an alcohol or fatty acid.

Distillation of Essential Oils

Reagents: Water (high-pressure steam)

Catalysts: None

Agricultural Inputs: plant material (flowers, herbs, spices, etc.)

Description: The physical process to acquire essential oils from plant material.

Esterification OR Transesterification to Produce Esters

Reagents: None

Catalysts: Sulfuric/Phosphoric Acid; KCO_3 , $NaCO_3$, $NaOH$, or KOH

Agricultural Inputs: Acid and Alcohol, e.g. Fatty Alcohol, Glycerin, Ethanol, Acetic Acid

Description: The process of forming an ester bond between an acid and an alcohol, can be catalyzed by either an alkali or acid.

Etherification of Glycerin making PolyGlycerols

Reagents: None

Catalysts: Alkali ($NaOH$ or KOH)

Agricultural Inputs: Glycerin (product of fat-splitting)

Description: The process of forming ether bonds between two compounds of natural glycerin (see fat-splitting) to form polyglycerols by heating with an alkali. Polyglycerol products are indicated with a number to represent the number of glycerin molecules linked together.

Extraction

Reagents: CO_2

Catalysts: None

Agricultural Inputs: Plant material (flowers, herbs, spices, etc.)



Description: The physical process to acquire plant extracts from original plant material.

Fat-Splitting of Oils to Produce Glycerin and Fatty Acids

Reagents: Water (high-pressure steam)

Catalysts: Metal/Metal Compound Catalysts (Zinc Oxide, Nickel, Palladium, Platinum)

Agricultural Inputs: Triglyceride fats and oils; Carbohydrates, Sugars

Description: The process of splitting natural fats and oils into glycerin and fatty acids, a kind of hydrolysis.

Fermentation

Reagents: None

Catalysts: Enzymes

Agricultural Inputs: Carbohydrates, Sugars, Bacteria, Yeasts, Fungi

Description: The process of converting carbohydrates into alcohol and carbon dioxide or organic acids.

Glucosidation of Fatty Alcohol and Glucose

Reagents: None

Catalysts: Toluene Sulfonic Acid

Agricultural Inputs: Glucose and Fatty Alcohol

Description: The process of attaching glucose to an alcohol, a type of etherification (e.g. Coco Glucoside).

Hydrogenation of Oils

Reagents: Hydrogen

Catalysts: Nickel, Platinum or Palladium

Agricultural Inputs: Triglyceride fat/oil usually

Description: The process by which unsaturated bonds are reduced by the addition of hydrogen with a catalyst, specifically converting unsaturated fatty acids to saturated ones or waxes to oils.

Hydrogenolysis of Methyl Esters of an Oil to Make Fatty Alcohols

Reagents: Hydrogen from Natural Gas

Catalysts: Methanol; Nickel, Platinum, Palladium

Agricultural Inputs: Methyl or Ethyl Ester of Triglyceride fat/oil (fat/oil original ag input)



Description: The process by which hydrogen is utilized to break chemical bonds converting a fatty acid ester into the fatty alcohol and methyl or ethyl alcohol (whichever is used for the ester). This process can also be utilized directly on the fatty acid without conversion to the ester first.

Hydrolysis of Complex Proteins into Simple Amino Acids

Reagents: Water

Catalysts: Enzymes or Alkali (KOH or NaOH)

Agricultural Inputs: Proteins, Carbohydrates, Sugars

Description: The process of breaking down complex proteins into water-soluble amino acids or peptides (if partially hydrolyzed).

Oxidation with Mild Agents

Reagents: Dilute H₂O₂, O₂, Silver and Copper salts

Catalysts: Silver, Copper

Agricultural Inputs: Plant-based Alcohols, Aldehydes

Description: The process by which alcohols and aldehydes are converted to acids by oxidation.

Protein Fragment Acylation

Reagents: KOH or NaOH

Catalysts: Phosphorous Trichloride or Thionyl Chloride

Agricultural Inputs: Fatty Acid and Protein Fragment

Description: The process of attaching a fatty acid to a nitrogen-containing compound. The fatty acid is converted to a fatty acid chloride before attachment to the nitrogen of a protein fragment (e.g. glutamic acid to make Cocoyl Glutamate).

Saponification of Oils to Make Soap

Reagents: Alkali (KOH or NaOH)

Catalysts: None

Agricultural Inputs: Triglyceride fats and oils

Description: The process by which fats or oils are split into the glycerin and the free fatty acids by the addition of an alkali, a type of hydrolysis.

Sulfation of Fatty Alcohol

Reagents: Sulfate/SO₃ and NaOH



Catalysts: None

Agricultural Inputs: Fatty Alcohol

Additional Note: Sodium Lauryl Sulfate (SLS) from petrochemical sources not allowed

Description: The process of converting a fatty alcohol into the sulfate ester to produce a surfactant (e.g. sodium coco sulfate)

Sulfonation of Non-Alcohols to make Sulfonated Anionics

Reagents: SO₂, SO₃, Sulfuric Acid

Catalysts: None

Agricultural Inputs: Methyl or Ethyl Ester of Triglyceride fat/oil (fat/oil original ag input) via dehydrated plant-based alcohol

Description: The process by which an SO₃ group is attached to the carbon atom of esters.