

Emulsifier Solutions

TARGETED APPLICATIONS. ESTABLISHED SUCCESS.





Corbion applies innovative science, enabling technology and passionate professionals to empower the food industry. We strive to understand consumers' needs and share market trends, supplying proven solutions for today and inspiration for tomorrow. We provide new, exciting and relevant technology to help customers get the most from every product. Most importantly, we build long-lasting, robust partnerships to help our customers grow their businesses.

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These pages offer an overview of Corbion products: there are many more available to fit your specific needs. Please contact your sales representative for more information.



Service benefits

Committed to innovation and service

Corbion has a long history of providing innovative solutions to the food industry, from inventing lactylates and commercializing hydrated mono-glycerides to the development of our award-winning Trancendim crystal modifiers. We work hard to understand a customer's needs to find the right solution for their application. Corbion is proud to serve the food industry through the passion of our people, the creative application of technology and an ongoing commitment to our customers' success.



High quality

Only the best raw materials are selected for use in Corbion's products. In addition, industry-leading manufacturing processes and analytical standards are employed to ensure that the products delivered to you are of the highest quality.



Research and innovation

Corbion has deep roots in emulsifier technology; we developed many key products used in the baking and processed food industries. We are committed to research and innovation. This is exemplified by our research and state-of-art level instrumentation as well as the diversity in our scientists' fields of study. We constantly strive to remain at the forefront of technology in order to provide new solutions for your un-met needs.



Product diversity

Corbion offers a diverse emulsifier portfolio utilizing a range of fat and oil sources to help us customize functionality in the end application. We offer many forms and packaging options to suit our customers' processes. Our two emulsifier manufacturing sites offer flexibility in terms of run size, Kosher and GMO status. We also have the capability to make functional blends of emulsifiers and complimentary ingredients to deliver synergistic, convenient solutions.

Quick reference guide

BFP® (Mono & Diglycerides)

Mono & diglycerides, which are very popular throughout the food industry, are the most commonly used emulsifier. They are made by reacting glycerine with specific fats, oils or fatty acids to achieve 25%-60% monoglyceride content. The primary usage of mono & diglycerides is in bakery prepared mixes; shortenings and margarines; convenience and processed foods; and frozen desserts. Normally, they are used along with a fat system, and frequently in conjunction with other emulsifiers. The BFP line of mono & diglycerides is available in multiple physical forms (liquids, plastics, flakes, beads and powders) for convenience and use in a broad range of applications.

Primary Functions

- ▶ Emulsification
- ▶ Aeration
- ▶ Starch Complexing
- ▶ Crystal Modifier (improves set time)
- ▶ Viscosity Modifier
- ▶ Wetting and Dispersion Agents
- ▶ Release Agent/Plasticizer for Confections

Alphadim® and Starplex® (Distilled Monoglycerides)

Alphadim is the product line of Corbion's mono & diglycerides that have been further processed to increase their monoglyceride content. Although they share the same basic applications as the BFP product line, this concentrated form is better-suited for direct addition (i.e. at the bowl) to provide crumb softening or aid in extrusion. The Alphadim line of distilled monoglycerides is available in many physical forms: fine powder, powder, bead, block and liquid. Powdered versions offer good dispersability into mixes and dry applications, while block and liquid forms are more suited for delivery via shortenings.

Primary Functions

- ▶ Starch Complexing
- ▶ Emulsification
- ▶ Aeration
- ▶ Crystal Modifier (improves set time)
- ▶ Structuring Agent (reduces oil migration)
- ▶ Wetting and Dispersion Agents

GMS® (Hydrates)

The GMS product line utilizes a hydration process to create a monoglyceride with a higher surface area than powdered versions. These products can be rapidly incorporated into an application with short mixing times. Hydrates are often used in cereal-based applications such as bread, pasta, rice noodles, and cakes.

Primary Functions

- ▶ Starch Complexing

Trancendim® (Saturated Diglycerides)

Trancendim is our brand family of Corbion mono & diglycerides products that have been further processed to increase the diglyceride content. It can be utilized to promote or enhance the structure of shortenings and margarines, allowing removal of trans-fat and/or reduction of saturated fat. Further, these products' unique surface interactions allow for improved slicing and release properties for baked and extruded foods.

Primary Functions

- ▶ Crystal Modifier (control fat crystal size)
- ▶ Structuring Agent (reduces oil migration)
- ▶ Lubrication & Plasticity

Emplex® and Verv® (Lactylates)

Lactylates, or lactic acid esters of fatty acids, are a unique class of surface-active agents (ionic emulsifiers) that interact with both protein and starches. In baked goods, they are effective dough strengtheners and conditioners. They also provide emulsion stability and texture modification in a variety of food products. There are five products within this category: Emplex® - sodium stearyl-2-lactylate (SSL), Verv® - calcium stearyl-2-lactylate (CSL), Stearolac® - stearyl lactic acid ester (SLA), Olacta® - oleyl lactic acid (OLA, liquid lactylate), and Patco® 3 (a mixture of SSL and CSL).

Primary Functions

- ▶ Starch Complexing
- ▶ Protein Interaction / Emulsification
- ▶ Wetting Agent

SweetPro™ (PGME)

Corbion's Propylene Glycol Mono Esters (PGME). Made specifically for baking mixes, cakes, sweet goods and snack cakes, this emulsifier system enhances aeration to create better volume and crumb structure.

Along with improved aeration, our PGME emulsifiers improve the whip-ability and foam stability in batter systems and dry mixes. It also allows you to use liquid oils in batter applications, rather than solid fat.

Primary Functions

- ▶ Aeration
- ▶ Crystal Modifier (improves set time)

Specialty Products and Blends

We have many specialty products and blends for specific applications. The following table is not all-inclusive, so please feel free to contact your Corbion Representative for specific products and applications.

Product name	Description
Cake emulsifiers	Vanlite, Dyn-A-Max, Vanall®, Surfax®, Emulsiflex, SoftTouch K, BFP® GLP, SweetPro™
Pan release agents and trough greases	Sprafilm, SpraShort, Bake-Well®
Dough conditioners (Ethoxylated monoglycerides)	Xpando®
Aeration agents (Hydrates and polysorbate blends)	Tandem®
Fat substitute	Sta-Crème®



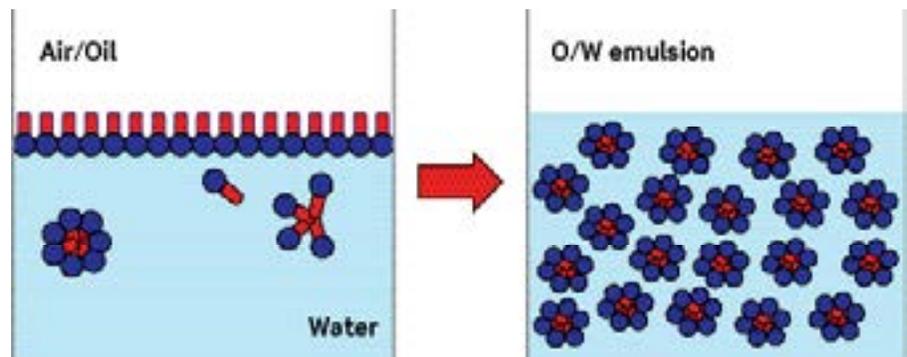
Key functionalities

What is an Emulsifier?

In essence, emulsifiers are surface-active agents that aid in the interaction of two or more immiscible phases (i.e. water, oil, air) thus promoting the formation and/or stabilization of emulsions and foams. Emulsifiers are amphiphiles. They contain both a hydrophilic part, which favors interaction with water, and a hydrophobic part, which favors interactions with lipids and/or air. Emulsifiers are represented by a large class of substances that include soaps and detergents and are utilized in a variety of food and non-food applications. As such, the term emulsifier is somewhat a misnomer. Emulsifiers provide a range of functions in addition to emulsification, including:

- ▶ Starch Complexing
- ▶ Protein interaction
- ▶ Aeration
- ▶ Crystal Modification
- ▶ Lubrication & Processing Aids

Corbion has dedicated scientists who can assist customers in understanding the science and applications of emulsifiers.



Emulsifiers: Managing the interface

Emulsifiers are one tool used to meet today's challenge of maintaining processed foods' quality, safety and integrity. "Emulsifier" is a broad term to identify surface-active agents that change the surface properties of the materials they come in contact with. Other names for emulsifiers include "surface-active agents," "surfactants" and "stabilizers."

Processed foods are complex systems containing interfaces among ingredients such as fats, protein, starches, water and air. Emulsifiers provide the means to manage these interfaces, interactions, and transitions allowing the preservation of texture, flavor, etc.

For example, emulsifiers can work to:

- ▶ Inhibit staling by delaying the retrogradation of starch in breads and related grain-containing products
- ▶ Improve machinability by reinforcing the gluten matrix in bread dough
- ▶ Shorten the texture by improving the distribution of fat in a cake batter
- ▶ Allow incorporation of air by desorbing the milk protein from the interface in an ice cream
- ▶ Maintain gloss, snap, and flavor by delaying crystal transition of the cocoa butter fat in chocolates
- ▶ Reduce fat content by modifying the viscosity and yield value of chocolate to aid in processing
- ▶ Increase shelf life by delaying the separation of oil (creaming) in salad dressings

Emulsification

Many processed foods such as margarines, non-dairy creamers, beverages and cake batters are emulsions where one phase is dispersed in another. For example, a non-dairy creamer is an emulsion where a fat or oil is dispersed throughout an aqueous protein phase.

During the process, mechanical shear is facilitated by impellers or by homogenization and provides energy to disperse the fat phase. Emulsifiers can initially aid in the formation of the emulsion by reducing the surface tension for a given amount of energy, allowing a greater interfacial surface (smaller droplet size).

In certain cases, emulsifiers can also provide stabilization of the emulsion by various mechanisms such as particulate and electrostatic stabilization. These mechanisms are determined by the molecular structure and ionic nature of the emulsifier. In addition, due to the interfacial properties, emulsifiers can serve as wetting agents both in the process (dispersing other

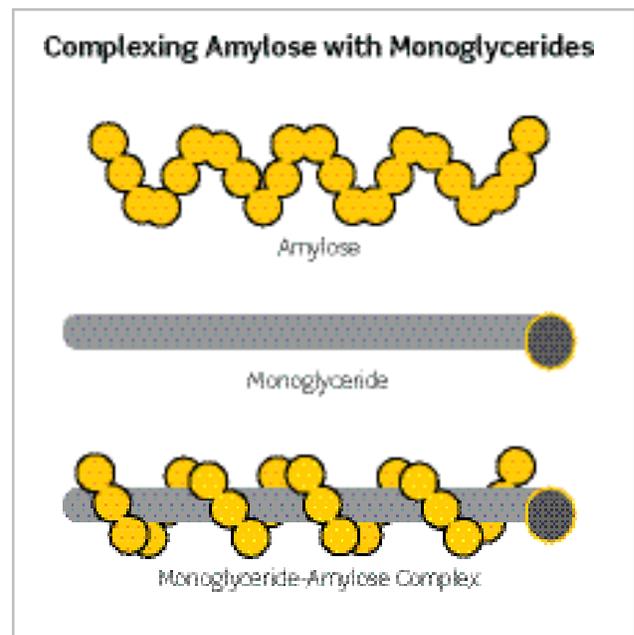
components) and in the final product as a way to improve mouth feel and flavor release.

One example is using liquid emulsifiers like Atmos® 300 to incorporate fat-soluble flavors and colors into water-based beverages such as sports drinks.

Starch complexing

Certain emulsifiers can interact with starch (amylose) to form water-insoluble complexes which serve to aid in the processing of starch-based products such as pasta, potatoes and extruded products. In baked goods, such complexes serve to delay the retrogradation (recrystallization) of the starch, commonly associated with the mechanisms of staling. Emulsifiers such as distilled monoglycerides and lactylates can provide shelf life extension and are often referred to as crumb softeners.

Distilled monoglycerides, such as Alphadim® 90 SBK, based on fully hydrogenated fats are especially suitable as starch complexing agents as they are easily entrapped by the helical configuration of amylose to form a complex that is insoluble in water.



Protein interaction

Emulsifiers are able to interact with proteins in a variety of foods. Protein interactions can affect volume in baked goods as well as mouth feel in sauces and gravies, and can stabilize dairy and non-dairy systems.

Certain emulsifiers have the ability to interact with the protein of yeast-raised baked goods. They reinforce the gluten structure and improve the dough's viscoelastic properties. Such interactions provide greater gas retention and better tolerance to proof and mechanical shock that may be experienced on today's modern high-speed lines. Emulsifiers such as lactylates (e.g. Emplex[®] SSL, Verv[®] CSL) and DATEM reinforce the gluten structure via sulfide bonding. Others, such as ethoxylated monoglycerides and polysorbates, reinforce the gluten network via hydrogen bonding.

In addition to our single emulsifiers, Corbion also offers several emulsifier blends like Xpando[®] to optimize baking success.

For sauces, gravies and non-dairy creamers, the emulsifiers interact with proteins to improve mouth feel and increase stability. Ionic emulsifiers such as Emplex (SSL) are typically used in these applications.

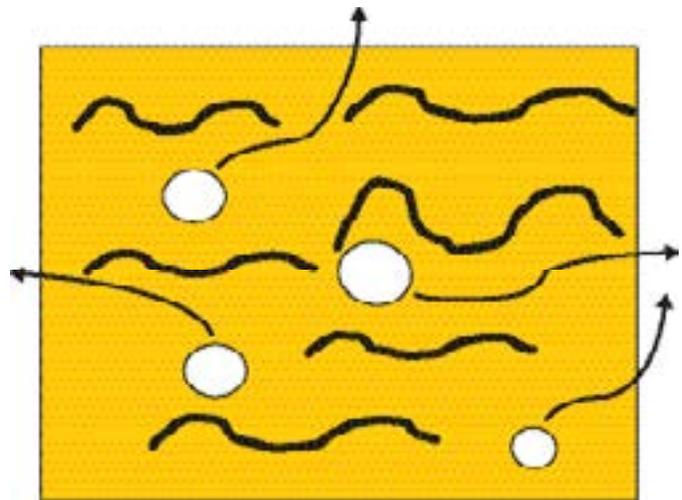
Given the complex nature of protein interactions within a specific food system, Corbion has the ability to customize the best solution for your application.

Aeration and stabilization

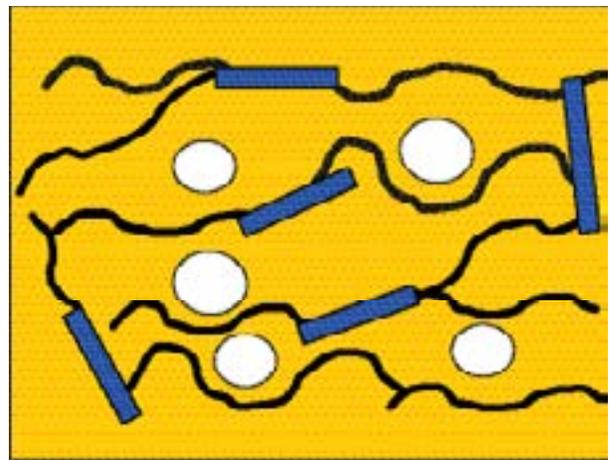
Aerated foods (cake batters, imitation creams, etc.) are more complex emulsions since they are oil-in-water (aqueous protein phase) emulsions that also incorporate and require stabilization of air cells. Emulsifiers are typically employed to strengthen the air cell network.

In general, emulsifiers are critical for producing the desired crumb structure and volume for cakes. A section of the industry prefers using liquid oils. This presents its own challenges. In layer or high-ratio cakes that use liquid oil rather than a structured shortening, a combination of emulsifiers can aid in aeration by encapsulating the liquid oil and preventing defoaming. This enables the cake batter to become aerated during the mixing process.

Alpha-tending emulsifiers hold the monoglycerides in the preferred mesophase (alpha gel) that provide structure to the air cells. This allows entrapment of air until the baking process sets the foam structure. Vanlite is an excellent example of an alpha-tending emulsifier system.



Air cells (circles) degassing through protein network



Air cells (circles) retained in reinforced (blue rectangles) protein network

Ice cream is an example where an emulsifier is needed to destabilize an existing emulsion to allow for air incorporation. Proteins can be extremely strong emulsifiers and prevent aeration. Adding emulsifiers, such as Alphadim[®] 570 or BFP[®] 75K, partially displaces the proteins at the interface and allows for creation of stable foams.

Crystal Modification

Fat can exist in more than one polymorph (crystalline form). The number of polymorphs depends on the type of fat. For example, palm oil has three polymorphs (alpha, beta prime and beta) whereas cocoa butter can exist in many more. Certain polymorphs are more stable or desired than others. The desired polymorph is dependent on the application. Process conditions and emulsifiers can be used to promote and retain the desired crystal form.

Emulsifiers can enhance the appearance and texture of chocolates and coatings by maintaining gloss and snap. During storage and transportation, the fat crystals can undergo polymorphic transitions, resulting in a fat bloom (mottling) on the surface or producing a dull appearance. These transitions can negatively impact the organoleptic properties associated with flavor and texture. Certain emulsifiers, such as lactic acid esters (BFP® GLP), sorbitan esters and polysorbates, can delay or retard such transitions and increase the shelf life.

Other emulsifiers such as distilled monoglycerides (Alphadim® 90 SBK) and mono & diglycerides can modify the set point of confectionery products. Modifying the set point can, in turn, increase production throughput and improve tolerance to adverse storage conditions.

Confections such as chews, caramels, etc., contain emulsifiers such as mono & diglycerides (BFP® 550) to maintain their plasticity or chewing properties during storage.

Oil Structuring

Traditionally, processors have relied on solids fats to provide structure in food systems. Trans-fat shortenings delivered the desired crumb structure to baked goods and creaminess to table margarines. With the advent of new dietary guidelines, many processors have moved away from *trans*-containing shortening, and toward incorporating more nutritionally desirable liquid oils in their applications. These reformulations created challenges in maintaining the necessary structuring for these systems. For example, when switching to a mostly liquid oil system, a fried donut has a greasier surface and puff pastry loses its characteristic light, airy structure.

Trancendim®, a line of customized diglycerides, can provide

the required structure to liquid oil while keeping saturated fat content low and eliminating *trans* fat. These emulsifiers have excellent crystallization properties that lead to a network of small, beta-prime crystals that entrap the liquid portion of the shortening system. The result is a shortening comparable to the traditional *trans*-containing versions, with improved nutritional value and the same desired eating qualities.

Outside of shortening applications, Trancendim can reduce oil and moisture migration between two or more layers in a food system. Nut butters, which typically contain about 50% liquid oil, can separate over time. The addition of Trancendim will delay this separation and lead to a more desirable product.

Lubrication & Processing Aids

Mono & diglycerides, as well as distilled monoglycerides, are used in extruded products such as pasta, pet food and breakfast cereals as lubricants and processing aids. These emulsifiers provide product release from packaging or equipment. They also work in systems such as caramels, fruit leathers, or gum as a plasticizer to improve chewing quality and prevent stickiness.

The Trancendim product line is an excellent processing aid in situations ranging from high-speed bread slicing operations to preventing stacks of tortillas from sticking to one another.



Choosing an emulsifier

Emulsifiers are very versatile food ingredients. Some of the more common uses are found in the following pages.

There are many factors that go into selecting the correct emulsifier for your application. These factors could include desired functionality, interaction with other ingredients, processing equipment, regulatory guidelines, and more. Please contact Corbion to assist you in selecting the correct emulsifier solution for your application.

Incorporating Corbion's emulsifiers into your process and products

Corbion emulsifiers are available in many different physical forms and packaging options. The application dictates the type and form of the emulsifier. For example, flaked emulsifiers are most-easily melted into liquid systems, while beaded or powdered emulsifiers are often added to dry blends. Plastic or shortening-type emulsifiers are more commonly used in applications that cream together ingredients. Bulk, molten emulsifiers are available for larger manufacturers.

Lactylates

In general, lactylates can be incorporated directly into food systems. Lactylates are water-dispersible and functional at room temperature.

Example Products:

- ▶ Emplex®
- ▶ Verv®
- ▶ Patco® 3
- ▶ Olacta®
- ▶ Stearolac®

Distilled monoglycerides, mono & diglycerides, hydrates

The melt point and particle size of these emulsifiers dictate how they are incorporated into the food system. For even distribution and best performance, the emulsifier should be melted into the fat phase.

The melting point or degree of saturation will greatly affect the behavior of the emulsifier in water. Our hydrated emulsifiers and hydrated emulsifier blends are designed to accentuate the functionality of beaded emulsifiers in a readily dispersible paste. They can be added to the food system without pre-conditioning steps.

Instructions on how to incorporate the emulsifiers and potential pitfalls can be found in the appendix of this brochure.

Example Products:

- ▶ Alphadim® 90 SBK
- ▶ Alphadim® 90 MAK
- ▶ BFP® 550
- ▶ Trancendim® 180
- ▶ GMS® 520

Shortenings, margarines, and other lipid-based systems

For these systems, emulsifiers should be incorporated into the fat phase above their melting point.

Dry blends

Several of our powdered products are designed for direct addition into dry blends. We also have a line of plastic emulsifiers that can be creamed or plated onto a dry blend.

Choosing a Crumb Softener

The modern-day bread market requires that manufacturers control and/or delay crumb staling, which is typically a result of gelatinized starch retrograding. Emulsifiers can be used to delay this staling.

Corbion offers a wide range of crumb softeners with different application characteristics. The following section provides insights on how to choose the best crumb softener, depending upon process conditions and desired outcome.

Crumb softeners are offered at varying IVs, physical condition and particle sizes. The type of dough system, ingredient transport, environmental conditions, etc., should all be considered when choosing the appropriate emulsifier.

Crumb softeners are formulated and processed to maintain stability against lumping during transportation, storage and metering into the application and to allow excellent dispersability of the monoglycerides throughout the dough during mixing.

How to choose

Select desired degree of hardness	
Degree of unsaturation (iodine value, IV)	High levels of unsaturation increases dispersability
	Typical range: 0-40 IV
	Low IV (below 20) commonly used in hotter climates
Melting point	Higher melt point = lower IV
	Higher melt point = less likely to lump during storage under adverse conditions
Select form of emulsifier	
Fine powder	Manual or automatic metering at bowl
	Requires given amount of time to hydrate and disperse
	Typically used in sponge-and-dough applications
Hydrate	Aqueous dispersion of monoglyceride crystalline platelets in the form of a slurry or paste
	A surface area approximately a hundred times greater than powdered form
	Highly dispersible and effective in no-time dough, short-time processing
	Will require drum pump for metering

How to choose an emulsifier

Performance relating to dispersability

- ▶ GMS® 520 > GMS® 540 > Starplex® 590F > Starplex® 590 > Starplex® 590 HS

Powder stability against caking, melting or lumping

- ▶ Starplex® 590 HS > Starplex® 590 > Starplex® 590F

Ease of use (ease of metering)

Traditionally, powders were more desirable since they are free-flowing and easily metered either manually or pneumatically. With the advent of drum pumps, paste-like hydrates can also be metered into high-speed lines.

- ▶ Powders: Starplex® 590F > Starplex® 590
- ▶ Pastes: GMS® 520 > GMS® 540
- ▶ Automatic Metering Systems: Starplex® 590 HS

BFP® 550

Mono & diglycerides in paste form. At temperatures of 70-75°F, becomes very plastic and moves efficiently through a ram pump. IV (wijs) 50-57; 52% min. monoglyceride content.

Starplex® 590F

Smallest particle size in a distilled monoglyceride. Use when dispersion is difficult due to short mixing times. Suitable for powder blends. IV (wijs) 15-25; 90% min. monoglyceride content.

GMS® 520

Hydrated mono & diglycerides in paste form that can be easily pumped. Easy to disperse, can be used in any dough system. Ideal for no-time doughs. 21% min. monoglyceride content.

Starplex® 590

Distilled monoglyceride in dispersible powder form. Needs time to hydrate to be fully functional in a sponge or other fermented dough system. IV (wijs) 15-25; 90% min. monoglyceride content.

GMS® 540

Hydrated mono & diglycerides in paste form that can be pumped. Easy to disperse, can be used in any dough system. Ideal for no-time doughs. 38.5% min. monoglyceride content.





Emulsifier applications

Bakery

Category	Function	Product	Usage rate	Comments
Breads and Rolls	Dough conditioner	BFP® 550	0.25%-1.0% flour basis	Anti-staling, crumb softener; Should be added to the fat prior to mixing with other ingredients
	Shelf life extension	Starplex® 590 Starplex® 590F	as required	Anti-staling, crumb softener; Fine beads applicable for dry mix applications; Different forms are available for various feed systems
		GMS® 520 GMS® 540	0.5%-1.25% flour basis	Hydrated softeners for yeast-raised breads and rolls
	Dough strengthener	Emplex®	0.25%-0.5% flour basis*	Dough conditioner, strengthener
		Xpando® 570	0.25%-0.75% flour basis	Provides improved dough strength and finished crumb softness.

Bakery

Category	Function	Product	Usage rate	Comments
American-style Biscuits, Cookies, and Crackers	Dough development	BFP® 550 BFP® 65 PLM Non GMO	0.5%-2.0% flour basis	Ease of processing
	Fat reduction, controls spread	Emplex®	0.5% flour basis*	Fat reduction, increased spread (cookies)
	Crumb softening	Olacta®	0.5%-1.0%	Improves texture after microwaving
Batters (For this category, consider soft emulsifiers first since processing is at ambient temperatures.)	Emulsion stability	BFP® 550 BFP® 65 PLM Non GMO	1.0%-3.0% flour basis	Batter emulsion and aeration stability
		Starplex® 590	0.5%-1.0% flour basis	Fat dispersion
	Emulsification	Emplex®	0.25%-0.5% flour basis*	Emulsion stability
	Crumb softening	Olacta®	as needed	Modifies crumb texture and extends shelf life
Cake Mixes	Batter aeration, cell structure, anti-staling	BFP® 550 BFP® 65 PLM Non GMO	4.0%-5.0% fat basis	Helps aerate and stabilize the batter; Combine with the fat phase first
		Emplex®	0.25%-0.50% flour basis	Stabilize emulsion, texture improvement with tighter cell structure
		Starplex® 590F	0.5%-2.0% flour basis	Improves crumb grain and softness, extends shelf life; Reduces peaking in layer cakes/sheet cakes
		SweetPro™ V100 SweetPro™ P100	Variable	Delivers aeration, structure, and tolerance to cake systems
	Shelf life extension	Olacta®	0.25%-2.0% flour basis	Modifies crumb texture, extends shelf life and gives moistness
Cakes	Batter aeration and cell structure in shortening-based systems	Surfax®	1.0%-4.0% flour basis	Increases volume and improves grain; Extends shelf life; Reduces egg/shortening levels 10-30%; Prevents cracking of rolled cakes (only Emulsiflex)
		Emulsi Flex 500	1.0%-4.0% flour basis	
		Soft Touch K	1.0%-4.0% flour basis	
		SweetPro™ V100 SweetPro™ P100	Variable	Delivers aeration, structure, and tolerance to cake systems
	Oil substitution in batters; Improves volume and grain	Vanlite®	2.0%-4.0% flour basis	Allows for the use of oil in place of emulsified shortening without volume loss
	Shelf life extension	Olacta®	0.25%-2.0% flour basis	Increases crumb softness, extends shelf life; Reduces peaking on layer cakes

This is not an all-inclusive list of our emulsifiers, and should serve as a starting place. If you have questions regarding any of these categories, please contact us at 800.669.4092.

Emulsifier applications

Bakery

Category	Function	Product	Usage rate	Comments
Fillings	Aeration, fat dispersion	Sta-Crème®	as required	May be used to produce a zero grams <i>trans</i> fat and low fat aerated filling for snack cakes, donuts etc.; Provides heat tolerance
		BFP® GLP Kosher	as required	Produces a stable aerated foam
		Vanlite	0.5%-2.0% formula wt	Aeration and enhanced mouthfeel (hydrate)
		Emplex®	0.1%-0.2% formula wt*	Stabilizes emulsion and improves texture and appearance
Icings	Aeration, fat dispersion, stability	BFP® 550 BFP® 65 PLM Non GMO	2.0%-6.0% based on shortening	Improves mouth feel and prevents weeping
		Soft Touch K Tandem® 530	Variable	improves aeration and achieves lower specific gravities in cake icings
Tortillas and Flatbreads	Shelf life extension, flexibility, ease of wrapping	BFP® 550 BFP® 65 PLM Non GMO Starplex® 590 Starplex® 590F	0.5%-1.0% flour basis	Different physical forms available to provide processing flexibility; Ensure adequate dispersion into the application for best results; Gives better mouthfeel and softness
	Anti-stick, release	Trancendim® 110 Trancendim® 180	1.0%-2.0% flour basis	Add into the dough in powder form
Shortenings	Structuring	Trancendim® 130 Trancendim® 180	5.0%-20%	May be used to produce a zero grams <i>trans</i> fat shortening with reductions in saturated fat

Confectionery

Category	Function	Product	Usage rate	Comments
Caramel	Fat dispersion in caramel	BFP® 550 BFP® 65 PLM Non GMO Starplex® 590	0.5%	Controls fat dispersion in caramel, should be added to fat prior to other ingredients
Licorice and Gummy Candy	Lubricity	BFP® 75K BFP® 75 PLM Non GMO	0.5%	Improves lubricity by reducing stickiness, improves flavor release
Taffy	Softening/ reduces bite stickiness	BFP® 74K BFP® 75K BFP® 75 PLM Non GMO	0.5%	Reduces stickiness, improves lubricity and enhances bite and mouth feel
Compound Coatings	Improves gloss retention	BFP® GLP Kosher	0.2%-0.5% formula wt	Enhances gloss retention in compound coatings
	Fat crystallization	Alphadim® 90 SBK	as required	Speeds fat crystallization and improves set point and stability of palm kernel fractions

Confectionery

Category	Function	Product	Usage rate	Comments
Confectionery Fillings	Reducing oil migration	Trancendim® 180	as required	Structures fat phase, reduces texture loss (eutectic formation)
Chewing Gum	Softening, anti-stick	BFP® 74K BFP® 75K BFP® 75 PLM Non GMO	0.5%-1.0% formula wt	Provides lubricity, anti-sticking, emulsification of gum base
Syrups	Stability	BFP® 75K BFP® 75 PLM Non GMO	0.5% basis formula wt	Improves emulsification stability, improves mouthfeel

Beverages

Category	Function	Product	Usage rate	Comments
Cream Liqueurs	Emulsification, stability	Emplex®	0.5% max formula wt*	Stabilizes alcoholic dairy emulsions
Protein Drinks/ Shakes	Provides body	Alphadim® 90 PBK Alphadim® 90 SBK	0.5%-2.0% formula wt	Helps with emulsification and provides body
	Emulsion stability	BFP® L-100	0.5%-1.0% formula wt	Helps stabilize emulsion
	Stable dispersability	Starplex® 590	0.5%-1.0% formula wt	Creates stable dispersion
Sport Drinks/ Nutritional Supplements	Clouding agent, flavor dispersion, vitamin solubilizer	Atmos® 300 K	0.3%-1.0% formula wt	Acts as a clouding agent and helps disperse oil-soluble flavors and colors into the aqueous phase
		BFP® 30	as required	Solubilizes vitamin oil and color dispersion
	Flavor stability	BFP® 550 BFP® 65 PLM Non GMO	as required	Improves flavor stability
	Flavor stability, vitamin oil solubilizer	BFP® L-100	as required	Improves flavor stability, color dispersion, solubilizes vitamin oil

Dairy/Non-Dairy

Category	Function	Product	Usage rate	Comments
Coffee Whiteners, Solid & Liquid	Emulsification, dispersion aid, improved whitening	Alphadim® 90 PBK Non GMO Alphadim® 90 SBK	0.1%-1.0% formula wt	Helps create emulsion and aids fat dispersion
	Emulsification, dispersion aid, stability	BFP® 550 BFP® L-100 BFP® 75K	0.2%-2.0% formula wt	Helps create emulsion and aids fat dispersion

Emulsifier applications

Dairy/Non-Dairy

Category	Function	Product	Usage rate	Comments
Coffee Whiteners, Solid & Liquid	Protein interaction, mouth feel	Emplex®	0.1%-0.3% formula wt*	NON-DAIRY ONLY: Improves whitening, mouth feel and storage ability through protein interactions, use in combination with BFP 75K
	Dispersion	Atmos® 300K	0.4% dry wt	Helps dispersion without oiling off
Ice Cream/ Ice Milk/Soft Serve/Frozen Desserts	Stability, improved dispersion	Alphadim® 570 Alphadim® 90 SBK	as required	Improves dispersion and stability to freezing and thawing
	Imparts dryness, overrun	Starplex® 590 BFP® 75K	0.1%-1.0% formula wt	Imparts dryness and overrun
Ice Cream/ Ice Milk/Soft Serve/Frozen Desserts	Increases overrun	Monofreeze 80	0.5% max frozen dessert wt	Used for novelty processes to aid in reducing tailing
Imitation Sour Cream and Dip	Texture, capacity for water	Alphadim® 570	0.5%-1.0% formula wt	Improves texture and capacity of water
	Stability, mouth feel	BFP® 550	0.5%-1.0% formula wt	Improves mouth feel and increases stability
		BFP® 65 PLM Non GMO		Zero grams <i>trans</i> option that improves mouth feel and increases stability
	Improving body	BFP® 75K BFP® 75 PLM Non GMO	0.5%-1.0% formula wt	Zero grams <i>trans</i> option that helps create emulsion and increases stability while providing body
Freeze-thaw stability	Sta-Crème®	30%-45% formula wt	Imparts freeze-thaw stability, fat reduction	
Whipped Toppings, Liquid and Powdered	Stability, mouth feel	Alphadim® 570	0.5%-1.0% formula wt	Provides good aeration, texture, overrun, and stability with improved mouth feel
	Provides body	Alphadim® 90 PBK Alphadim® 90 SBK BFP® 65 PLM Non GMO	0.5%-1.0% formula wt	Provides body, texture, overrun
	Aeration	BFP® GLP Kosher	0.5%-1.0% formula wt	Very good aerator
	Stability	Emplex®	0.2% max formula wt*	Provides emulsion stability and powder wetting
	Emulsification	BFP® 550 BFP® 65 PLM Non GMO	0.5%-2.0% formula wt	Helps create emulsion while improving texture, mouth feel

Dairy/Non-Dairy

Category	Function	Product	Usage rate	Comments
Puddings and Snack Dips	Stability, texture	Emplex®	0.2% max formula wt*	Stabilizes emulsion, improves texture and appearance
	Improved dispersion	Alphadim® 570	0.25%-0.75% formula wt	Helps create emulsion, improves dispersion, stability and texture

Processed Foods

Category	Function	Product	Usage rate	Comments
Extruded/ Flaked Cereals and Grains	Anti-sticking and clumping; Reduces stickiness	Alphadim® 90 SBK	as required	Reduces sticking during processing; Process aid
		Starplex® 590	0.5%-1.0% flour wt	
	Crispness	Starplex® 590F	as required	Improves crispness; Process aid
Imitation Cheeses	Improved mouth feel, reduced syneresis	Alphadim® 90 SBK Starplex® 590F Starplex® 590	0.5%-3.0% formula wt	Improves mouthfeel; Reduces syneresis
	Emulsion stability	Emplex®	0.1%-0.2% formula wt*	Stabilizes emulsion while giving body and smooth texture
	Structuring, reduce saturated fat	Trancendim® 180	3.0%-7.0% fat basis	Good meltdown properties, long texture
Pet Foods	Extrusion aid	BFP® 550 BFP® 65 PLM Non GMO	2.0%-4.0% formula wt	Aids extrusion, retards firming
	Preventing fat separation, maintaining moisture and softness	BFP® 75K BFP® 75 PLM Non GMO	2.0%-4.0% formula wt	Aids extrusion; Prevents fat separation
	Stability	Emplex®	0.3% formula wt	Retards firming and increases stability
	Maintaining moisture, softness	Alphadim® 90 PBK Alphadim® 90 SBK	as required	Helps maintain moisture and softness; Aids extrusion

Emulsifier applications

Processed Foods

Category	Function	Product	Usage rate	Comments
Margarines and Spreads	Margarine emulsification	BFP® 550 BFP® 75K	0.4%-0.6% formula wt	Facilitates margarine emulsification, increases stability
		BFP® 65 PLM Non GMO		Zero grams trans, non-GMO option
	Improves sheeting and release	Alphadim® 90 MAK	0.5%-1.0% formula wt	Facilitates margarine and low fat spread emulsification, improves process tolerance
	Plasticity	Alphadim® 90 PBK Alphadim® 90 SBK	0.5% formula wt	Improves mouth feel
Shortening	Shortening emulsifier	BFP® 550	2.5-10% formula wt	Emulsifier for high ratio cake and icing shortenings
	Zero grams <i>trans</i> shortening emulsifier	BFP® 65 PLM Non GMO	2.5-10% formula wt	Emulsifier for high ratio cake and icing shortenings
Low Fat Foods	Fat sparing effect	BFP® 62 TF Sta-Crème®	as required	Provides fat functionality (mouthfeel, crystal structure, etc) in systems with reduced fat
		Emplex®	0.2% formula wt*	
Pasta/Noodles	Starch complexing	Alphadim® 90 SBK	0.5%-1.0% dry wt	Improves freeze-thaw stability; Prevents sticking; Gives resistance to overcooking and adds stability and firmness
		Alphadim® 90 PBK	0.5%-1.75% dry wt	
		Starplex® 590	0.5%-1.0% dry wt	
		GMS® 520	2.0%-4.0% dry wt	
Peanut Butter	Inhibits oil separation, improves texture; Reduces stickiness	BFP® 74K BFP® 75K BFP® 75 PLM Non GMO	1.75%-2.5% formula wt	Inhibits oil separation; Reduces stickiness; Improves stability; Increases flavor retention
		Alphadim® 90 PBK Alphadim® 90 SBK	1.0%-2.5% formula wt	
	Fat crystal modification	Trancendim® 130 Trancendim® 180	as required	Modifies fat crystals and improves stability

Processed Foods

Category	Function	Product	Usage rate	Comments
Processed Potatoes	Ease of hydration	Emplex®	0.25% solids basis*	Improves ease of hydration, palatability, and texture; Reduces stickiness
	Improved water holding; Prevents sticking	Alphadim® 90 PBK Alphadim® 90 SBK	0.3%-0.8% formula wt	Improves water holding, palatability, and steam stability; Improves texture and prevents sticking
	Improves sheeting and release	Verv®	0.3%-0.5% formula wt*	Reduces sticking and improves tolerance
	Improves sheeting	BFP® 550 BFP® 65 PLM Non GMO	0.5%-1.0% solids basis	Improves sheeting and texture in doughs
Sauces and Gravies	Increased stability	BFP® 550 BFP® 65 PLM Non GMO	0.5%-2.0% formula wt	Increases stability and shelf life while improving mouthfeel
	Improved texture	Emplex®	0.1%-0.25% formula wt*	Improves emulsion stability and increases shelf life while reducing skinning
	Viscosity control	Tandem® 552	0.25%-1.0% formula wt	Facilitates oil emulsification and controls viscosity
	Reduces skinning	Starplex® 590	0.2%-0.5% formula wt	Improves freeze-thaw stability, reduces skinning, increases stability and facilitates emulsification

Product categories

Mono & Diglycerides

Product name	Ingredient description	Mono	IV	MP*	Form
Atmos® 300K	Mono & diglycerides and propylene glycol	46% min	64-70	N/A	Liquid
Atmul® 695K	Mono & diglycerides	52% min	73-79	N/A	Semi-liquid
BFP® L-100	Mono & diglycerides	52% min	92-105	83°F	Semi-solid/ Liquid
BFP® 30K	Mono & diglycerides and propylene glycol	40% min	85-90	N/A	Liquid
BFP® 62 TF	Mono & diglycerides	20% min	56-63	121°F	Plastic
BFP® 550	Mono & diglycerides	52% min	50-57	120°F	Plastic
BFP® 65 PLM Non GMO	Mono & diglycerides and citric acid	52% min	40-50	126°F	Plastic
BFP® 74K	Mono & diglycerides	42% min	3 max.	144°F	Flakes or Beads
BFP® 75K	Mono & diglycerides	52% min	3 max.	146°F	Flakes or Beads
BFP® 75 PLM Non GMO	Mono & diglycerides	52% min	3 max	142°F	Flakes
BFP® GLP Kosher	Glyceryl lacto esters of fatty acids	N/A	5 max.	122°F	Flakes

Distilled Monoglycerides

Product name	Ingredient description	Mono	IV	MP*	Form
Alphadim® 90 MAK	Monoglycerides with mixed tocopherols and ascorbic acid	90% min	95-115	108°F	Soft Paste
Starplex® 590F	Monoglycerides with ascorbic acid and citric acid	90% min	15-25	163°F	Powder
Starplex® 590	Monoglycerides with ascorbic acid and citric acid	90% min	15-25	163°F	Beads
Starplex® 590 HS	Monoglycerides with ascorbic acid and citric acid	90% Min	10-20	-	Beads
Alphadim® 90 RPO	Monoglycerides, tocopherols and ascorbic acid	90% min	63-67	140°F	Plastic
Alphadim® 570	Monoglycerides and fully hydrogenated soybean oil with citric acid and ascorbic acid	72% min	15-28	154°F	Beads
Alphadim® 90 SBK	Monoglycerides	90% min	3 max	162°F	Beads
Alphadim® 90 SBK FG	Monoglycerides	90% min	3 max	162°F	Powder
Alphadim® 90 PBK	Monoglycerides	90% min	5 max	162°F	Fine Beads
Alphadim® 90 NLK	Monoglycerides with ascorbic acid	90% min	68-105	113°F	Paste
Alphadim® 590 V	Monoglycerides, tocopherols and ascorbic acid	90% min	52-56		Plastic

Product categories

Specialty Diglycerides

Product name	Ingredient description	Mono	IV	MP*	Form
Trancendim® 110	Mono & diglycerides	4.0%-10%	3 max	143°F	Powder
Trancendim® 130 Non-GMO	Mono & diglycerides	3.0%-8.0%	3 max	132°F	Powder
Trancendim® 180	Mono & diglycerides	3.0%-8.0%	3 max	143°F	Powder

Mono Blends

Product name	Ingredient description	Mono	IV	MP*	Form
Tandem® 552K	Mono & diglycerides, polysorbate 60, water, and 2% or less of each of the following: antioxidants (propyl gallate, citric acid)	27%-30%	39-43	N/A	Liquid
Tandem® 530	Mono & diglycerides, polysorbate 60, and 2% or less of each of the following: antioxidants (citric acid, BHT)	31% min	27-33	128°F	Plastic

Ethoxylated Monoglycerides

Product name	Ingredient description	Mono	IV	MP*	Form
EMG 20 K	Ethoxylated mono & diglycerides	N/A	<5	95°F	Plastic
Xpando® 570	Ethoxylated mono & diglycerides and mono & diglycerides, mixed tocopherols, and citric acid	18%-22%	6-15	N/A	Plastic
Xpando® Powder	Ethoxylated mono & diglycerides, mono & diglycerides	30%-35%	3 max	131°F	Beads

Propylene Glycol Mono Esters (PGME)

Product name	Ingredient description	Mono	IV	MP*	Form
SweetPro™ S100	Propylene Glycol Mono- and Diesters of Fats and Fatty Acids	8%	5 Max	122°F	Liquid
SweetPro™ V100	Propylene Glycol Mono- and Diesters of Fats and Fatty Acids	20.0%-28.0%	56 Max	103°F	Plastic
SweetPro™ P100	Propylene Glycol Mono- and Diesters of Fats and Fatty Acids	N/A	2 Max	N/A	Powder

Product categories

Lactylates

Product name	Ingredient description	AV	EV	MP*	Form
Emplex®	Sodium stearoyl lactylate (SSL)	60-80	150-190	120°F	Powder
Verv®	Calcium stearoyl lactylate (CSL)	50-86	125-164	122°F	Powder
Patco® 3	Sodium stearoyl lactylate, calcium stearoyl lactylate (SSL & CSL)	55-83	137-177	119°F	Powder
Olacta®	Oleyl lactic oleate and tocopherols (OLA)	75-85	N/A	N/A	Liquid

Non-GMO Emulsifiers

Product name	Ingredient description	Mono	IV	MP*	Form
Alphadim® 90 PBK Non GMO	Monoglycerides	93% min	2.0	162°F	Beads
Atmos 300 Non GMO	Mono- and Diglycerides, Propylene Glycol, Propyl Gallate, Citric Acid	45% min	64-70	N/A	Fluid
Atmul® 695 Non GMO	Mono- and Diglycerides, Propyl Gallate (Antioxidant), Citric Acid.	52% min	73-79	N/A	Liquid
BFP® 65 PLM Non GMO	Mono & diglycerides and citric acid	52% min	40-50	126°F	Plastic
BFP® 75 PLM Non GMO	Mono & diglycerides	52% min	3 max	142°F	Flakes
Emplex® Non GMO	Sodium stearoyl lactylate (SSL)	N/A	N/A	120°F	Powder
Tandem® 552K Non GMO	Mono- and Diglycerides, Polysorbate 60, Water and 2% or Less of Each of the Following: Citric Acid, Propyl Gallate (Antioxidant).	27% min	39-43	N/A	Liquid
Trancendim® 130 Non-GMO	Mono & diglycerides	8.0% max	3 max	132°F	Powder

Lubricants and Release Agents

Product name	Ingredient description	Mono	IV	MP*	Form
SpraFilm 2.0	Soybean Oil, Petrolatum, Sunflower Lecithin, Mono- and Diglycerides, BHT	N/A	N/A	N/A	Liquid
SpraShort® 2.0	Soybean Oil, Yellow Corn Flour, Palm Shortening, Mono- and Diglycerides Soy Lecithin, BHT	N/A	N/A	N/A	Semi-solid
Bake-Well® Trough Grease 500	Soybean Oil, Hydrogenated Soybean Oil, Tocopherols	N/A	115-125	N/A	Soft Plastic

*Regulated 21 CFR

Hydrated Emulsifiers

Product name	Ingredient description	Mono	IV	MP*	Form
GMS® 520	Water, monoglycerides, and 2% or less of each of the following: preservatives (propionic acid and phosphoric acid)	N/A	21% min	N/A	Paste
GMS® 540	Water, monoglycerides, and 2% or less of each of the following: preservatives (propionic acid and phosphoric acid)	N/A	38.5% min	N/A	Paste
Sta-Crème®	Water, mono & diglycerides, modified corn starch, and 2% or less of each of the following: DATEM, citric acid, potassium sorbate (preservative), tricalcium phosphate, sodium stearyl lactylate (SSL), xanthan gum	N/A	N/A	N/A	Paste

Hydrated Cake Emulsifiers

Product name	Ingredient description	Mono	IV	MP	Form
Vanlite Cake Emulsifier	Water, propylene glycol monostearate, monoglycerides, lactic esters of fatty acid with potassium sorbate	8% min	1.0	N/A	Plastic
Soft Touch K	Water, Monoglycerides, Polysorbate 60, Sodium Stearyl Lactylate (SSL) Phosphoric Acid, Sodium Propionate	11% min	18-22	N/A	Plastic

Beaded Fats

Product name	Ingredient description	Mono	IV	MP*	Form
Tab Tex	Hydrogenated cottonseed oil	N/A	5 max	135°F	Powders

Regulatory information

The information and recommendations contained in this booklet are, to the best of our knowledge, reliable. Corbion is pleased to give guidance where applicable but strongly recommends that all use of any food ingredient is vetted by the user's appropriate regulatory department to determine the legal status for the intended use of the product. All Corbion's food emulsifiers, except those of animal origin, are Kosher and certified by the Orthodox Union.

Emulsifiers fall under the Code of Federal Regulations; Title 21- Food and Drugs for the US market. Find the Code of Federal Regulations: <http://www.ecfr.gov/>

Please note that:

- ▶ SSL use is limited under 21 CFR 172.846
- ▶ CSL use is limited under 21 CFR 172.844
- ▶ PGME use is limited under 21 CFR 172.856 GMP

The European Commission has a system of E numbers for food additives. This link provides a guide to usage of these additives on the European Commission website: http://ec.europa.eu/food/food/FAEF/additives/lists_authorized_fa_en.htm

Glossary

Alpha Gel and Mesophases

Emulsifiers and water create different structures depending on temperature, concentration and the presence of co-emulsifiers. These structures are called liquid crystal (LC) mesophases and have properties of both liquids (fluid) and solids (short-distance networking). Several of them can be difficult to work with because they are too viscous, or not as functional. One of the preferred LC mesophase for aeration is the alpha gel state, which has layers of water trapped between oriented layers of emulsifiers.

Alpha-tending emulsifiers and alpha gel states provide stability to the boundary between oil/water/air phases. They can aid in incorporation of air (aeration) in foam-type systems such as cake batters and whipped toppings. Vanlite, SweetPro™, and Surfax® are three examples of alpha-tending emulsifiers produced by Corbion.

Our hydrated emulsifiers and hydrated emulsifier blends are designed with the functionality of beaded emulsifiers in a readily dispersible paste. They can be added to the food system without pre-conditioning steps.

Antioxidants and Preservatives

They inhibit oxidation which results in rancidity. One or more of the following may be used: Mixed Tocopherols, Citric Acid, Ascorbic Acid, TBHQ, BHT, BHA, propyl gallate.

Eutectic Formation

Eutectic Formation represents the blending of two or more incompatible fats (e.g., palm kernel and palm oils or cocoa butter and soybean oil) resulting in a significant lowering of the melt point versus the melt points of the parent materials. This incompatibility could lead to the blend not setting up in the desired time frame. Alternatively, the texture could deteriorate over time.

Ionic

Molecules having a positive or negative charge form ionic pairs. Ionic emulsifiers are more water-dispersible than emulsifiers that are non-ionic. An example of an ionic emulsifier is Emplex®. This emulsifier disperses readily in room temperature water and its ionic nature facilitates interactions with protein.

Non-Ionic

These are molecules that do not have positive or negative charge. Non-ionic emulsifiers do not readily disperse in water and are quite soluble in fat or oil. Starplex® 590, a non-ionic emulsifier, interacts with starch to provide the desired crumb structure in baked goods. Another non-ionic emulsifier is BFP® 65, which facilitates formation of emulsions.

Polymorphism

Polymorphism describes a material that can exist in several solid states. The term usually applies to materials with several crystalline structures. Functionality can depend on the correct crystal state being maintained. Lipids could have one or more of the following polymorphs: alpha (α), beta prime (β') and beta (β). Cocoa butter is unique in having several other polymorphs.

Processing conditions and the emulsifier dictate which polymorph is created. In many cases, the emulsifier is needed to maintain the desired crystal structure in the food system.

The **alpha crystal state** generally melts at a lower temperature than beta or beta prime. In some cases, this polymorph does not lead to the desired texture. Generally, with good run conditions, this state will not impact your application as it tends to be very short lived.

In general, **beta prime** is the preferred crystalline state. Typically, it provides smooth, non-grainy texture and creams well in bakery applications. Corbion's Trancendim® can be used to promote a beta-prime structure in a shortening system.

The **beta crystal state** is commonly found in confectionery applications to provide shine and gloss. This state also provides flaky layers for biscuits. Some of our emulsifiers, like Alphadim® 90 SBK, can induce a beta crystal state in a fat system.

Propylene Glycol

Propylene Glycol is an approved GRAS food ingredient. This raw material is used to allow for certain emulsifiers to remain liquid at room temperature, which in turn allows the emulsifier to be pumped into the manufacturing systems.

Typical chemical and physical tests

The following tests are used in the fats and oils industry to ensure product quality. Corbion works with its suppliers to ensure that our raw materials meet our strict quality standards. The tests performed on an emulsifier are dictated by its chemical composition.

Acid Value (AV)

The result is reported in mg potassium hydroxide (KOH)/g of sample and indicates the degree of titratable acidity. In conjunction with EV, can help determine if a product has been hydrolyzed (degraded) by interactions with water.

SSL and CSL fall under FDA regulations and must conform to specific AV ranges.

Color

We test for color because emulsifiers are derived from natural sources, creating some slight variation in color from lot to lot. This is a quality test to check that the materials have not been abused from high temperature, oxidation, etc. We set our color specifications to ensure high-quality raw materials and packaged products. For glycerol-based emulsifiers, we use Lovibond Red and Yellow methods. In general, products made with soy oil will be lighter in color than those made from palm oil. For lactylates, we use a Gardner color method, which is better-suited for amber-colored products.

Because we use vegetable oils to make our emulsifiers, the products may sometimes display color changes. Depending upon the age of the soybean oil, emulsifiers may develop a slight green tint due to the variation in chlorophyll content. "Toco red", or a slight pink tint, is a result of naturally-occurring tocopherols. These tints do not carry through to the finished product and do not affect the functionality of the emulsifier.

Ester Value (EV)

The result is reported in mg potassium hydroxide (KOH)/g of sample and indicates the degree of esterification in an emulsifier. In conjunction with the AV, can help determine if a product has been hydrolyzed (degraded) by interactions with water.

SSL and CSL fall under FDA regulations and must conform to specific EV ranges.

Free Fatty Acid (% FFA)

Reported as a percentage of oleic acid. This test is similar to acid value and can indicate if a glyceride (mono, di, or triglyceride) was hydrolyzed to its constituent fatty acids and glycerine. Products with over 1% free fatty acid may develop off flavors and colors.

% Free Glycerine

% Free Glycerine is often used as process control during emulsifier manufacturing. Government regulations set an upper limit on free glycerine for mono-diglyceride emulsifiers.

Iodine Value (IV)

Iodine Value (IV) determines the overall amount of unsaturated fatty acids present in lipid-based products. This is a process control test. It also helps determine typical shelf life, stability and physical properties.

Mettler Dropping Point vs. Capillary Melt

There are several methods to determine when a product will become liquid or molten. They give slightly different readings based on preparation method. Knowing the melt point will help you decide on the correct emulsifier for your application and guide you on the best method for adding the emulsifier.

Mettler Dropping Point (MDP) is the standard for products that melt between 80-140° F.

Capillary melt point is the standard for products that melt above 140° F.

% Monoglyceride

The original test determined the level of α -monoglyceride. Newer tests methods determine total monoglyceride. Applications may call for a certain level of monoglyceride to produce desired effects.

Peroxide Value (PV)

This test is used to detect peroxides formed during fat oxidation. At time of manufacture, the PV is typically < 1.

Physical forms

Flakes

Flakes are formed by cooling a thin layer of molten emulsifier onto a cool metal surface. Flaked emulsifiers are most easily melted into food systems where the process requires rapid incorporation.

Liquid

Fluid at room temperature (e.g. Atmos® 300K).

Molten

Some bulk emulsifiers are shipped above their melt point.

Plastic Solid

This term describes the physical form of a product. Plasticity describes the deformation of a plastic or soft emulsifier when pressure is applied. Emulsifiers that melt near room temperature are too soft to form into beads or flakes but are very functional at room temperature. Products like BFP® 65 are processed into a firm paste. The paste will spread, but not melt, when work is applied without heat (i.e., mixing).

Powders vs. Beads

Beads are spray-congealed solid emulsifiers with more uniform size dispersion than powders. Average particle size is typically above 100 microns. Powders, on the other hand, fall into two main categories. They are produced either through a grinding process to form irregularly shaped pieces, or a spray congealed process to form spheres with an average particle size at or below 100 microns.

Beads are typically used in applications where the emulsifier will be melted into a liquid. Powders are often added to dry blends or directly to a product. Corbion does offer certain emulsifiers in both bead and powdered forms.

Packaging options

Corbion offers a variety of packaging options to suit the properties of the emulsifier and our customer needs. Please inquire if you have a specific need.

1-Gallon Container

Certain cake emulsifiers are offered in one gallon containers.

Bag

Our flaked products come in 50-lb. bags.

Bulk

Bulk shipments are made via tanker trucks and typically weigh 40,000 lbs. Tankers may be heated.

Drum

Steel drums (open- or closed-head) are used for emulsifiers that are either fluid at room temperature or will be melted by the customer. Fiber drums with bag liners are used for hydrates. Typical weight: 400 lbs.

Pail

We use five-gallon pails for fluid emulsifiers and emulsifier blends.

Poly-Lined Carton

We package our powders, beads, plastic solids and hydrates into lined boxes. Average product weight: 50 lbs.

Tote

Totes typically hold from 1,500 to 2,000 lbs., may be heated, and are secured to pallets.

Using distilled monoglycerides

Powdered softeners such as Starplex® 590 and Starplex® 590F, are designed, by composition and particle size, to maximize dispersability in cold water at temperatures below their melting point. This is highly desired in applications such as over-the-side of the bowl additions. However, to achieve greater functionality the distilled monoglyceride may be melted into the fat phase or the following procedure allows for pre-activation by blending with water. This highly activated state of the monoglyceride finds application in potato, cereal & grain products to reduce stickiness. Further applications include aeration, improving crumb structure and softness of industrial snack cakes and sweet goods.

Dispersion Procedure

The following procedure should be carefully followed to ensure proper functionality (typically 5 -15% w/w dispersion of emulsifier):

1. Heat water to 69°C (155°F). Turn off heat source.
2. Add the monoglyceride with stirring and minimal air incorporation. The temperature of the mix will drop to 60-66°C (140-150°F). Agitate for five minutes, or until there are no discrete particles present.
3. Cool to desired processing temperature with continuous slow agitation to maintain a homogeneous mixture.

NOTE: Monoglycerides do not disperse satisfactorily in distilled water or very hard water. If the tap water is alkaline, a viscous dispersion will result and be difficult to handle. The viscosity can be lowered by adjusting the pH of the dispersion to about 6.5 with citric acid, vinegar, or other food grade acidulants.

Corbion also offers GMS-520® and GMS-540®, which are monoglycerides where we have already optimized the ratio of water and emulsifier for functionality. This avoids the need to go through the above dispersion procedure. These products are often used in bakery applications where they are used for starch complexing, useful for improving softness.

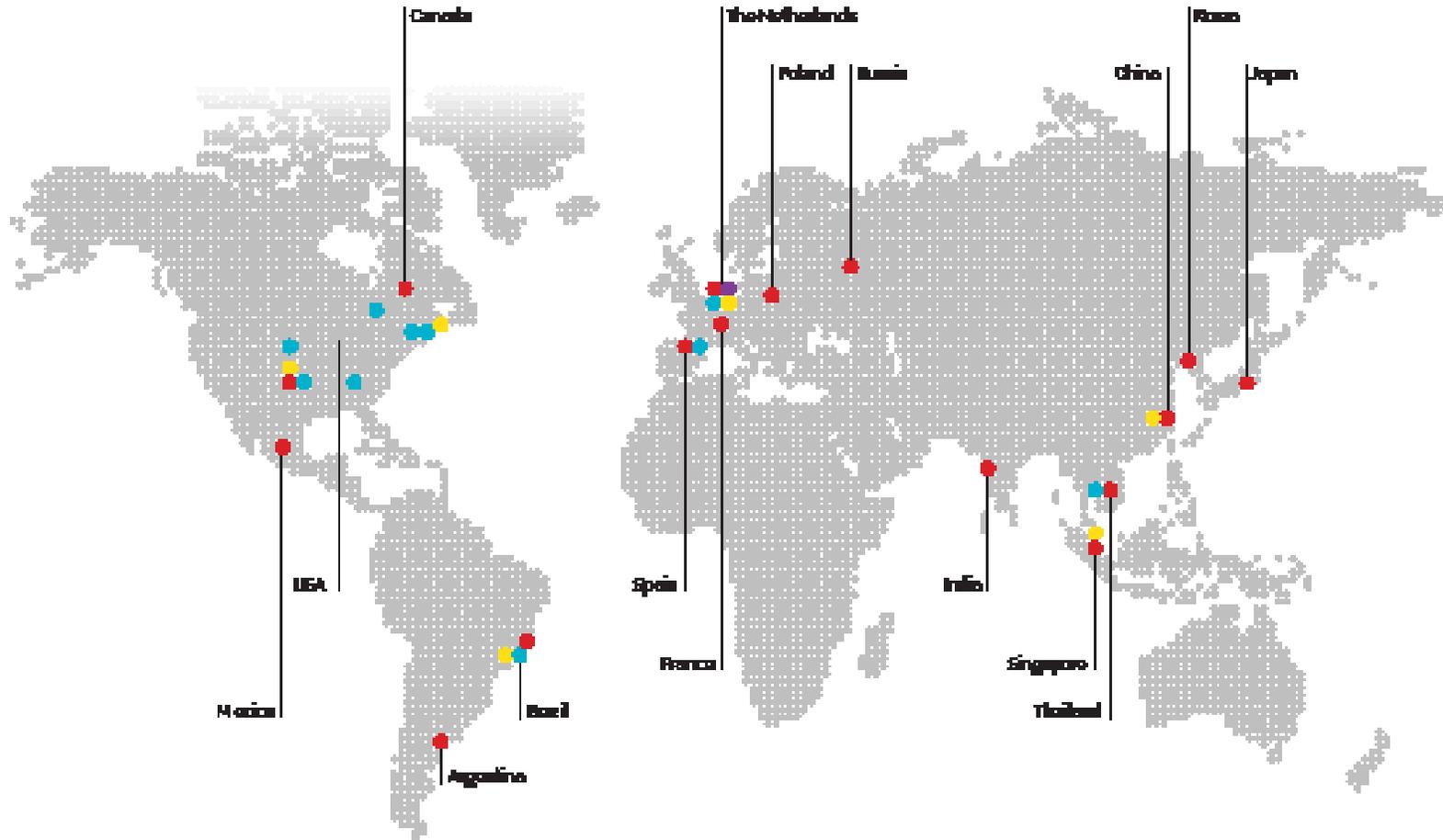
Low-melting distilled monoglycerides, such as Alphadim® 90 NLK, tend to form gels with water at or below room temperature. They cannot be readily dispersed in aqueous systems unless pre-blended with fat or aided by a co-emulsifier such as Polysorbate 60.

Elimination of undesired gel formation with distilled monoglycerides can be accomplished by either of the following procedures:

1. Addition of approximately 15% by weight of triglyceride. The distilled monoglyceride can be readily incorporated with the fat and then added to an aqueous system, without gelation.
2. Addition of a small amount of oil-in-water type co-emulsifier. For example, substitute 2 to 10 percent of the monoglyceride with polysorbate ester. Melt the polysorbate ester into the monoglyceride or dissolve into the water phase. Combine the oil and water phases with vigorous agitation to produce a smooth dispersion.

Global Presence

■ Corbion Headquarters
 ■ Corbion Production Location
 ■ Corbion Sales Office
 ■ Corbion Innovation Center



About Corbion

Corbion creates innovative ingredient solutions for leading food manufacturers around the world. Our expertise inspires customers to craft foods that start flavorful, stay fresh and remain safe, from date of production to date of consumption. Using sustainable solutions that deliver real, consumer-focused value, we work side-by-side with customers, helping them grow and create delicious food that capture peoples' palates and earn their trust. At Corbion our priorities as consumers shape the solutions we create, and as a result, feel confidence and pride in serving our own families and friends the products we help make possible.



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