EASTMAN

Eastman™ products

for food and beverage applications

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Eastman produces a wide range of products for use in food and beverage applications. They comply with multiple sections of the United States Code of Federal Regulations administered by the U.S. Food and Drug Administration (FDA) for various applications involving food contact, coatings, adhesives, and packaging materials.

- For modification of chewing gum, four Eastman™ ester gum rosin esters offer wide latitude in achieving the desired end properties.
- For weighting of beverage flavorants, Eastman™ ester gum 8WA-M rosin ester and Eastman Sustane™ SAIB (sucrose acetate isobutyrate) food grade provide the industry with a choice between two distinct but time-tested agents for flexibility in formulating.
- For specialty applications, Eastman offers Staybelite™ and Foralyn™ hydrogenated rosin esters that meet demanding performance needs.

Eastman™ rosin esters are based on gum rosin harvested from live pine trees and glycerol derived from vegetable sources, methanol, or pentaerythritol. The Eastman™ ester gum family of products is refined with the esterification process to remove volatile components that might compromise formulation flavor and odor yields. Hydrogenation is an additional product-enhancement process that reduces resin color, decreases the resin contribution to product flavor and odor, and increases resin resistance to oxidative degradation.

The specific compositions of these products and the processing conditions they experience determines their softening point, which ranges from 81°C to 108°C, and makes them suited for classification as a "D grade" for chewing gum modifier or as a "WA-grade" beverage weighting or clouding agent.

Outstanding product characteristics

- Eastman™ ester gum products provide pale color, low acid number, low odor, wide solubility and compatibility with gum bases, and a 20°C range of softening points which allows flexibility in formulation.
- Staybelite™ ester 5-E resin provides higher performance than esters based on nonhydrogenated rosins, in particular, contributing less to a formulation's initial and long-term odor, flavor, and color.
- Foralyn™ 5020-F ester of hydrogenated rosin has very low color and outstanding efficiency as a liquid plasticizer or softener used alone or in combination with other esters, allowing the greatest flexibility in formulation to achieve soft and pliable products.
- Foralyn™ 90-FG ester of hydrogenated rosin has the lowest odor and best color stability of products available from Eastman for chewing gum formulations.
- Eastman Sustane™ SAIB food grade is a high-purity distilled product that is odorless and flavorless at levels used in beverages. Sustane SAIB food grade is a stable, viscous liquid used primarily in citrus beverages as a weighting agent or flavor emulsion stabilizer to prevent separation of essential citrus oils. Sustane SAIB food grade is produced by the controlled esterification of natural sugar (sucrose) with acetic and isobutyric anhydrides and is provided as a kosher product by Eastman.

Eastman Sustane™ SAIB MCT is a new, ready-to-blend weighting agent that provides significant handling and aesthetic benefits for the beverage industry. The enhanced weighting agent prevents the oil-soluble ingredients and water in beverages like fruit juices, energy drinks, carbonated soft drinks, nutritional tonics, malt beverages, and new-age drinks from separating during storage. Sustane SAIB MCT also improves the appearance and stability of beverage "cloud" to help brands achieve the natural look consumers demand. Sustane SAIB MCT is alcohol-free.

Available product grades

Eastman offers four grades of ester gum rosin ester having the distinguishing characteristics listed in Table 1, three grades of hydrogenated rosin ester having the distinguishing characteristics listed in Table 2, and four grades of Eastman Sustane™ SAIB food grade having the distinguishing characteristics listed in Table 3. Values in these tables are average properties determined on typical samples and are not product specifications.

Eastman has facilities in a number of manufacturing locations around the world, including China, Europe and Mexico. The source of a specific product will depend on the manufacturing technology and the grade of the rosin derivative. Each manufacturing site is responsible for the test methods it uses to be sure its products meet Eastman specifications. References describing the test methods applied to a specific product are always part of the product's Certificate of Analysis that accompanies the product shipment. Upon request, Eastman can provide its customers information about test methods used at manufacturing sites.

Table 1

Eastman™ ester gum typical properties

Product	Ring & ball softening point, °C (ASTM E28)	Gardner color 50% NV	Acid number (mg KOH/g)	Density, g/cm^3
Eastman™ ester gum 8D-M	85	4–5	5	1.08
Eastman™ ester gum 8WA-M	86	5	6	1.10
Eastman™ ester gum 10D	108	7–8	6	1.102
Eastman™ ester gum 15D-M	94	4–5	6.5	—

Table 2

Food-grade hydrogenated rosin ester typical properties

Product	Ring & ball softening point, °C (ASTM E28)	Gardner color 50% NV	Acid number (mg KOH/g)	Density, g/cm^3
Staybelite™ ester 5-E	81	5	7	1.06
Foralyn™ 5020-F	Liquid[1]	1–2	6	1.03
Foralyn™ 90-FG	86	5	7	1.06

[1]*Brookfield Viscosity LVTD, Spindle 21, 25°C, mPa•s: 4,000–6,600*

Table 3

Eastman Sustane™ SAIB typical properties

Product	Viscosity, Brookfield, @ 25°C	Color Pt-Co (Test D 1209)	Blend component	Density, g/cm^3
Eastman Sustane™ SAIB, food grade	105 cP (@100°C)	200 max.	None	1.146
Eastman Sustane™ SAIB ET-10 20080	1,000 cP	200 max.	Ethanol, 9–11%	1.10
Eastman Sustane™ SAIB MCT	1,000 cP	200 max.	Medium chain triglycerides	1.10
Eastman Sustane™ SAIB CO 19144	3,000 cP	200 max.	Orange terpenes, 9–11%	1.10

All Eastman™ products for food and beverage applications (with the exception of Eastman™ ester gum 10D) are kosher certified.

Regulatory and safety information for rosin esters

Eastman™ ester gum 8D-M, ester gum 10D, and ester gum 15D-M comply with the requirements of 21 CFR 172.615 for use as a base for chewing gum.

Eastman™ ester gum 8WA-M, kosher, complies with 21 CFR 172.735 as a glycerol ester of rosin allowed for adjusting the density of citrus oils in the preparation of beverages. Concentrations of the rosin ester will not exceed 100 ppm (mg/kg) in the finished beverage. Ester gum 8WA-M is kosher and pareve for year-round use, excluding Passover.

Additional food-contact compliance information on these products and other Eastman™ rosin ester products is provided on Eastman's Product Regulatory Information Sheets (PRIS) for our products. In addition, Material Safety Data Sheets (MSDS) provide specific compositional, physical and chemical property, safe handling, and proper storage and disposal information about rosin esters. Product publications can be downloaded by registered Eastman Customer Center users from http://www.eastman.com/products/chemicals.htm. PRIS publications are in English and only available to registered customers; MSDSs are in multiple languages.

Please direct any questions you have concerning the regulatory compliance or kosher certification of our products to your Eastman representative through the addresses listed on the back cover of this brochure or electronically using the website http://www.eastman.com/ContactUs.htm.

Regulatory and safety information for sucrose esters

Eastman Sustane™ SAIB is a food-grade, kosher stabilizer approved for use in the United States as a stabilizer of emulsions of flavoring oils in nonalcoholic beverages at concentrations not to exceed 300 ppm (mg/kg) of the finished beverage, as cleared under 21 CFR 172.833 and subject to the limitations of that regulation. It can be considered 100% carbohydrate in accordance with the Nutrition Labeling and Education Act and contains 400 calories/100 g.

The FDA had no questions in response to an Eastman filing of GRAS Notice No. 104 for Eastman Sustane™ SAIB. The notice informed the FDA of Eastman's viewpoint that Sustane SAIB is GRAS, through scientific procedures, for use as a stabilizer of emulsions of flavoring oils used in alcoholic beverages such that the level of SAIB in the finished beverage will not exceed 300 ppm (mg/kg). The intended uses encompass such beverages as pre-mixed liquid or solid cocktail products, malt beverage coolers including flavored products containing beer, and alcoholic "cooler beverages" or wine coolers.

We invite you to visit the Eastman Sustane™ SAIB website, http://www.eastman.com/Brands/SUSTANE/Introduction/Introduction, to obtain more information about Sustane SAIB including available grades, regulatory clearances, formulation suggestions, technical information and MSDS.

Rosin ester solubility information

Eastman™ ester gum rosin esters, Staybelite™ hydrogenated rosin esters, and Foralyn™ hydrogenated rosin esters are soluble in aromatic and aliphatic hydrocarbons, terpenes, esters, ketones, citrus, and most other essential oils. They are insoluble in lower molecular weight alcohols. They are compatible with most forms of gum base at the levels considered useful for formulation. Foralyn 5020-F is additionally soluble in alcohols, ethers, petroleum hydrocarbons, and vegetable and mineral oils, but is insoluble in water.

Table 4

Eastman™ rosin ester product forms

Resin grade	Form	Packaging	Package wt.
Eastman™ ester gum 8D-M and 15D-M	Pastilles	Craft paper or polypropylene bags	25 kg or 55 lb bags
Eastman™ ester gum 10D and 8WA-M	Flakes	Aluminum-lined, heat-sealed craft bags on shrink-wrapped pallets (30 bags/pallet)	25 kg or 55 lb bags
Staybelite™ ester 5-E Foralyn™ 90-FG	Pastilles	Polypropylene bags on shrink-wrapped pallets (40 bags/pallet)	25 kg or 55 lb bags
	Solid	Fiber drums on shrink-wrapped pallets (4 drums/pallet)	225 kg or 500 lb drums
Foralyn™ 5020-F	Liquid	Tight-head steel drums on shrink-wrapped pallets (4 drums/pallet)	225 kg or 500 lb drums

Table 5

Eastman™ SAIB product forms

Grade	Form	Packaging	Package wt.
Eastman Sustane™ SAIB, food grade	Viscous liquid	Closed-head or open-head steel drums with food approved linings	208 liters; 215.5 kg (475 lb), net
		Open-head steel drums with food-approved linings	19 liters; 20.0 kg (44 lb), net
Eastman Sustane™ SAIB ET-10 20080	Liquid	Closed-head or open-head steel drums with food-approved linings	208 liters; 215.5 kg (475 lb), net
Eastman Sustane™ SAIB MCT	Liquid	Closed-head or open-head steel drums with food-approved linings	208 liters; 215.5 kg (475 lb), net
Eastman Sustane™ SAIB Co 19144	Liquid	Closed-head or open-head steel drums with food-approved linings	208 liters; 215.5 kg (475 lb), net

All Eastman™ products for food and beverage applications (with the exception of Eastman™ ester gum 10D) are kosher certified.

Storage and inventory control

Flakes or pastilles of solid products may stick together, fuse together, or form aggregate lumps if subjected to temperatures above 30°C even for a short time. Store product in a cool, dry location away from steam pipes or other sources of heat and never place bags outdoors in excessively hot weather. Don't keep product beyond the recommendation in the MSDS.

All rosin-based resins are prone to gradual oxidative degradation that results in darkening of the product and may decrease product solubility. For this reason, the best resin inventory management practice is to always use the oldest material in storage.

Using rosin esters in chewing gum formulations

Chewing gum consists of a natural or synthetic rubber base compounded with softeners, waxes, sweeteners, lubricants, and flavorants. The rubber base may be *chicle*, the traditional base obtained from the latex sap of the *Manikara chicle* tree, or a synthetic, such as butyl rubber. Rubber by itself is not, however, chewable. This essential property results from compounding the rubber with a compatible softener. The softener, besides being compatible with and effective at softening the rubber, must be biologically and chemically inert and nontoxic. Finally, it must not detract from the desired flavor and odor of the final product.

Rosin esters are the most commonly used chewing-gum base softeners because of their compatibility with a variety of common gum-base rubbers. Food-grade rosin esters, such as Eastman™ ester gum rosin esters, are subjected to rigorous steam stripping to remove volatile impurities. They are low in odor and do not detract from the product flavor. Furthermore, Eastman ester gum 8D-M, 15D-M, and 10D, rosin esters are low in color, have a range of softening points providing formulating flexibility, and have good economy in use.

Applications demanding even better color stability, lower odor, better flavor, and greater oxidative resistance require the use of a hydrogenated rosin ester as the base softener, for example, Staybelite™ ester 5-E rosin ester or Foralyn™ 90-FG ester of hydrogenated rosin. Because it is a liquid, Foralyn 5020-F ester of hydrogenated rosin gives formulators a way to increase product chewiness well beyond that of products based on solid softeners alone.

Table 6

Recommended chewing gum applications for Eastman™ rosin ester products

Product grade	Composition	Recommended application
Eastman™ ester gum 8D-M	Glycerol ester of rosin	Moderate compatibility with polyisobutylene (PIB). Good for styrene-butadiene rubber (SBR). Good choice for commodity chewing gum.
Eastman™ ester gum 15D-M	Mixed pentaerythritol-glycerol ester of rosin	
Eastman™ ester gum 10D,	Glycerol ester of partially dimerized rosin	
Staybelite™ ester 5-E	Glycerol ester of partially hydrogenated rosin	Good compatibility with PIB. Good for SBR. More stable against oxidation. Improved taste and odor profile. Good choice for value-added chewing gum.
Foralyn™ 90-FG	Glycerol ester of partially hydrogenated rosin	Best compatibility with PIB. Good for SBR. Maximum oxidative stability. Neutral taste and odor profile. Excellent choice for value-added and medical chewing gum.
Foralyn™ 5020-F	Methyl ester of partially hydrogenated rosin	Very good compatibility with PIB. Good for SBR. Best for a value-added chewing gum. Useful as a fine-tuning additive.

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Using rosin esters in beverage formulations

Flavor ingredients for beverages commonly are not soluble in the sweetened water phase comprising the bulk of the formulation. Unweighted, a flavorant dispersion is therefore inherently unstable and will separate given time. The oil rises to the top since its specific gravity is less than that of the bulk. The low viscosity of most beverages worsens the problem.

Adjusting the density of a flavorant such as citrus oil with Eastman™ ester gum 8WA-M is an effective way to prevent oil-water phase separation. In order to comply with U.S. Food and Drug Administration regulation 21 CFR 172.735 which permits resin concentrations up to 100 ppm (mg/kg) in a finished beverage, use the following procedure:

- Dissolve a sufficient amount of Eastman™ ester gum 8WA-M in the flavorant or mixture of flavorants chosen to deliver the desired flavor to the finished beverage to adjust the oil specific gravity to 1.00 ± 0.02.
- Disperse the weighted flavorant oil in water along with the emulsifier, antioxidant, and colorant required by the product to produce a stable flavor concentrate. The weighting agent concentration at this stage is commonly less than 3% by weight.[1]
- Combine the flavor concentrate with additional water, sweetener, water-soluble flavors, and antioxidant to produce a flavored syrup. Since flavor concentrate comprises about 2% by weight of this syrup, the weighting agent concentration at this stage is less than 0.1% by weight.
- Finally, dilute syrup with water, either carbonated or noncarbonated, using weight proportions about five parts water to one part syrup.[2] This operation reduces the flavor concentrate use level to less than 0.2% and the weighting agent concentration to less than 0.01% (<100 ppm) of the finished beverage.

Contact your Eastman representative today to learn more about Eastman™ products for food and beverage applications.

[1] *Fischetti, F. Workshop in Food Flavors: Creation and Manufacturing, Dept. of Food Science and Nutrition, University of Minnesota, 2002.*

[2] *Mitchell, A., ed. Formulation and Production of Carbonated Soft Drinks, Chapter 8, Van Nostrand, 1990.*

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Material Safety Data Sheets providing safety precautions, that should be observed when handling and storing Eastman products, are available online or by request. You should obtain and review the available material safety information before handling any of these products. If any materials mentioned are not Eastman products, appropriate industrial hygiene and other safety precautions recommended by their manufacturers should be observed.

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