Explanation of Sugar (Sucrose) Esters

1. BACKGROUND

The term “sugar ester” embraces a broad range of chemicals made from a sugar and a fatty acid, where the latter is derived either from tallow or from a vegetable oil. The sugar can be sucrose or one of the polyols, such as sorbitol or xylitol. The fatty acids are those with carbon chain-lengths ranging from 6 to 18.

Sugar esters are surfactants. The latter are widely used in detergents, in industrial cleaners, in agricultural chemicals and as emulsifiers in foods and beverages and as excipients in pharmaceuticals. Sugar esters are non-ionic surfactants, of which there are several major types.[1]

The sugar esters discussed herein are those conforming to the specification, “Sucrose Fatty Acid Esters”, of the U.S. Food and Drug Administration (FDA).[2] Sucrose esters conforming to the FDA specification may be used as food emulsifiers and in related food applications. The FDA specification is also used as a quality guideline by the pharmaceutical industry and by the personal care industry.

Within the non-ionic surfactant market, FDA-grade sucrose esters are high-end specialty products that are used to achieve specific performance features. Their advantages, compared to other non-ionic surfactants, include mildness; lack of color, odor and taste; rapid biodegradation following use; no toxicity concerns (they are ethylene oxide free); and (in many applications), they require a lower usage rate than do other surfactants.

Sucrose esters also have a unique functional characteristic. They can be formulated with a wider range (1-16) of hydrophilic-lipophilic balance (HLB)[3] than any other non-ionic emulsifier type. They are unique in that they can be

[1] Freedonia Group, a market research form, estimates U.S. demand for non-ionic surfactants at about 2.0 billion pounds, representing about 25% of all surfactant demand.
[2] The FDA specification is contained in 21CFR 172.858. The European Union, Japan and World Health Organization have similar specifications.
[3] The HLB scale ranges from 1 to 18. It is a common means of characterizing the functional characteristics of surfactants.

formulated with HLB values above 8. The wide HLB range allows their use in many applications and the high HLB characteristic opens up some unique applications opportunities.

Because of these features as well as relatively high production costs, the sucrose esters are priced at a large premium relative to other non-ionic surfactants and they are targeted for niche rather than bulk applications.

The food industry applications of sucrose esters include dairy products, fats and oils, bread and bakery products and confectionery. In the personal care industry the primary applications are in various skin care products, including sun screens; and in shampoos, toothpaste and mouthwash.

Most surfactant applications in the food, personal care and pharmaceutical industries involve the blending of multiple ingredients into an “emulsifier system” to achieve a specific functional effect in a consumer product type.

Emulsifier systems are typically developed by specialty ingredients formulators who sell them to the makers of brand-name consumer goods. Typically, formulators specialize in either food ingredients or personal care ingredients and are relied upon by the consumer goods manufacturers to maintain the R&D capability needed to deliver innovations in emulsifier systems. The formulators are the target customers for a sucrose ester manufacturer.