Isomalt in Hard Candy Applications

The demand for low-fat and low-calorie confectionery increases steadily worldwide. Consumers understand the message and functions of these product categories which serve their demands for "healthy eating" when thinking about less calories and kind-to-the-teeth functions. Nowadays new sugar replacers like isomalt can be used providing sugar comparable taste and texture to guarantee good quality products. In addition to sugar free chewing gum and breath mints, which are already well established, sugar free hard candies and cough drops start playing an important role in the sugar free market. Isomalt, a sugar substitute derived from sucrose, plays a major role in these fields of sugar free products due to its sugar-comparable taste and preferred shelf-life properties. Isomalt started to sell in the U.S. when the intense sweeteners acesulfame K and aspartame were regulated for the use in confectionery early in 1994 (which was important as isomalt is less sweet than sugar).

There are still few companies in the U.S. that are using isomalt, compared to Europe where some major brands build their success in sugar free on the properties of isomalt. This paper will briefly describe the manufacture of isomalt, its properties and especially the use of isomalt in sugar free hard candy applications.

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DEVELOPMENT AND PRODUCTION

Isomalt belongs to the chemical group of disaccharide alcohols and is derived from sucrose. Research work carried out by Südzucker's central lab showed that the isomerizing action of the microorganism protaminobacter rubrum transforms the non-reducing sucrose into a reducing disaccharide 6-O-α-D-glucopyranosyl-D-fructose. This new 'sugar' was called isomaltulose and given the brand name Palatinose® after the German place where it was discovered—Obrigheim in der Pfalz (in Latin: Palatinum). The main difference compared with sucrose is that the 1,2 bond between the sugar components glucose and fructose is isomerized into a much more stable 1,6 bond, making isomaltulose considerably more resistant to acids and microbial influences. By means of a further processing step, hydrogenation, it was possible to obtain the sugar alcohol isomalt from isomaltulose.

A simplified flow-chart of the production process is given in Figure 1.

PRODUCTION PROCESS

Starting from a sucrose solution, isomaltulose is obtained through transglucosidation as already mentioned. (Figure 2.1)

After crystallization, isomaltulose is hydrogenated in a neutral aqueous solution using a Raney nickel catalyst. This produces isomalt, a mixture of the isomers 1-O-α-D-glucopyranosyl-mannitol, 1,1-GPM-dihydrate, and 6-O-α-D-glucopyrano-syl-D-sorbitol, 1,6-GPS. (Figure 2.2)

In the crystallization process, especially developed for isomalt, GPM crystallizes with 2 mol water whereas GPS crystallizes without water. As a result, isomalt contains approximately 5 percent water of crystallization. Finally, isomalt is an odorless, white, crystalline, sweet-tasting substance with a very low hygroscopicity.

Crystal Structure and Surface

The crystal structure and surface of isomalt differ from that of sucrose. Electron micrographs show clearly that isomalt is not made up of crystals with regular surface, as sucrose is, but of a bond of agglomerates that are made up of individual crystals—probably smaller than 5 μm. The surface of the crystals is of a design which promotes cohesion of the crystals, a characteristic that is a distinct advantage when isomalt is compressed directly into tablets. Isomalt can be easily ground to grain sizes of < 100 μm which is desired for applications like chocolate or chewing gum.

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