Cellulose Gel and Carrageenan—Their Functionality in Confections

Cellulose gel—alone and in combination with carrageenan—provides unique textural and stabilizing properties in addition to allowing for the reduction or removal of fat in chocolate coatings, caramels and marshmallows.

Over the past several years the confectionery industry in the United States has experienced solid growth, rising at an average annual rate of 6.4 percent. According to the U.S. Department of Commerce (1994 study), Americans are eating 24.3 pounds of confectionery products per person per year. Today this $12 billion industry is faced with the consumer demand for healthier products, specifically, products with reduced fat and calories (Manufacturing Confectioner September 1995). In addition, the candy manufacturer is looking for unique presentation or innovation to make their product stand out in the market.

Cellulose gel and carrageenan provide a range of functions, including thickening, gelling, stabilizing and fat replacement. They are effectively used as fat and sugar replacers because of their ability to add structure, texture, mouthfeel and bind water.

**CELLULOSE GEL TECHNOLOGY**

The starting material for cellulose gel is alpha cellulose. The cellulose fibers are composed of millions of microfibrils. Each microfibril is composed of two areas: the paracrystalline region, an amorphous flexible mass of cellulose chains, and the crystalline region, which is composed of tight bundles of microcrystals in a rigid linear arrangement. During processing, this fibrous material is hydrolyzed to remove the amorphous region, leaving only the crystalline bundles. The resulting cellulose gel can be further processed into either powdered or colloidal cellulose gel. Powdered cellulose requires a drying step after depolymerization. Colloidal cellulose gel undergoes a wet mechanical disintegration step after depolymerization which breaks up the microcrystals. The microcrystals are then co-processed with carboxymethyl cellulose (CMC) to prevent them from reaggregating during the drying process.

**POWDERED CELLULOSE GEL**

Powdered grades of cellulose gel are 100 percent microcrystalline cellulose and 98 percent dietary fiber. Some of the primary applications are:

- tabletting,
- anti-caking,
- flow aid,
- non-nutritive source of fiber,
- sugar replacement,
- carrier for flavor and spice oils.

Recently a new type of powdered cellulose gel has been developed, designed specifically for low moisture applications. This powdered cellulose gel is less absorptive than the standard powdered grades. It has been used in both base cake and creme filling portions of sandwich cookies to not only reduce the fat by 66 percent, but provide a total calorie reduction of 28 percent. Other areas where low absorptivity powdered cellulose gel has been effective is in reduced fat and fat-free caramels and reduced calorie aerated marshmallows, which will be discussed later.

**COLLOIDAL CELLULOSE GEL**

Colloidal grades of cellulose gel are co-processed with CMC and are used as functional stabilizers. The unique

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