21. CHARACTERIZATION AND PROPETIES OF HYDROCOLLOIDS

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The term «hydrocolloids» is commonly used to describe a range of polysaccharides and proteins that are nowadays widely used in a variety of industrial sectors to

perform a number of functions including thickening and gelling aqueous solutions, stabilising foams, emulsions and dispersions, inhibiting ice and sugar crystal formation and the controlled release of flavours, etc.

The food industry, in particular, has seen a large increase in the use of these materials in recent years. Even though they are often present only at concentrations of less than 1% they can have a significant influence on the textural and organoleptic properties of food products. Hydrocolloid selection is dictated by the functional characteristics required but is inevitably influenced by price and security of supply.

Main hydrocolloid thickeners: Xanthan gum. Very high low-shear viscosity (yield stress), highly shear thinning, maintains viscosity in the presence of electrolyte, over a broad pH range and at high temperatures. Carboxymethyl cellulose. High viscosity but reduced by the addition of electrolyte and at low pH. Methyl cellulose and hydroxypropyl methyl cellulose. Viscosity increases with temperature (gelation may occur) not influenced by the addition of electrolytes or pH. Galactomannans (guar and locust bean gum). Very high low-shear viscosity and strongly shear thinning. Not influenced by the presence of electrolyte but can degrade and lose viscosity at high and low pH and when subjected to high temperatures.

Xanthan gum is an extracellular polysaccharide secreted by the micro-organism Xanthomonas campestris. Xanthan gum is soluble in cold water and solutions exhibit highly pseudoplastic flow. Its viscosity has excellent stability over a wide pH and temperature range and the polysaccharide is resistant to enzymatic degradation. Xanthan gum exhibits a synergistic interaction with galactomannans such as guar gum and locust bean gum (LBG) and the glucomannan konjac mannan. This results in enhanced viscosity with guar gum and soft, elastic thermally reversible gels with LBG and konjac mannan

Guar gum belongs to the galactomannans. The basic functional feature of galactomannans is primarily their ability to alter the rheological properties of aqueous systems. All galactomannans when dissolved in water exhibit effective properties of the substituents and are capable of interacting with the agar-agar, carrageenans and xanthan gum, which leads to the formation or increase of the strength of the stabilizing three-dimensional structures. These thickeners and gelling agents are widely used in food products in order to give them an attractive appearance to the consumer, and to increase their shelf life by binding water. Galactomannans also regulate texture affect crystallization bundle or prevent precipitation, to increase the stability during freezing-thawing prevent syneresis retrogradation of starch-containing products, and also may be used as the food fibers.

Carboxymethyl cellulose is soluble in both hot and cold water to give clear and colourless solutions with neutral flavour. As with other modified celluloses, the solution viscosity depends on dp, but it is possible to produce 1% aqueous solutions with viscosity Cellulosics 713 of 5,000 mPas at ambient temperatures. These solutions do show a reversible reduction of viscosity on heating but in food systems do not gel either alone or with other hydrocolloids. The rate of viscosity build-up is obviously dependent on dp, particle size and to some extent on ds. With suitable fine grind powders an extremely rapid viscosity development can be obtained.

Although hydrocolloids have historically been used in foods to control the rheological properties and texture, consumers are being made increasing aware of their

nutritional benefits. Many hydrocolloids (e.g., locust bean gum, guar gum, konjac mannan, gum arabic, xanthan gum and pectin) for instance, have been shown to reduce blood cholesterol levels. Others introduction to food hydrocolloids (e.g., inulin and gum arabic) have been shown to have prebiotic effects. All in all the hydrocolloid market is currently very buoyant and the prospects for future growth are excellent.