

CHEMICAL AND PHYSICAL GEL POINT TUNING



INTRODUCTION

Each biopolymer has its own characteristic gel strength and gelation behavior, which makes them adequate or not for a specific application. However, in some cases it is necessary to use another biopolymer. Chemical and physical methods can adjust the gel point of a biopolymer to make it similar to usual ones used in the application. A first example is gelatin replacement in gummy. Gelatin has a unique property. It forms a very strong gel, but almost melts at mouth temperature around 30-35°C, which give gummy candies this special mouth feeling. However, gelatin is a product derived from animals, and is not convenient for everybody. In order to match the gelatin properties, some attempts were made to chemically modify carrageenans. This includes a decrease of gel point, while maintaining the gel strength at a high level.

Another example on gel point tuning is made physically. By adding silica submicron particles to carrageenan dispersions, the gel temperature can be decreased, but the gel strength remains high. This can be useful to lower the working temperature for manual work.

CHEMICALLY MODIFIED CARRAGEENAN IN GUMMY CANDIES

Gummy candies contain usually gelatin, sugar, water and flavours. The high sugar content increases the gelation temperature, especially in the case of carrageenans. Figure 1 shows the evolution of the elasticity index (EI) as a function of the temperature during cooling for standard gelatin gummy candy (Gel) and for three formulations with chemically modified carrageenan formulations (Carr1, Carr2, Carr3). The higher this index is, the higher is the elasticity of the sample. GEL is the reference sample with a standard formulation of gummy candies. CARR1 is non-modified carrageenan, while CARR2 and CARR3 are modified carrageenan samples. One can see that CARR3 has almost the same behaviour than the reference sample in terms of gelation temperature (between 43-46°C) and final Elasticity Index.

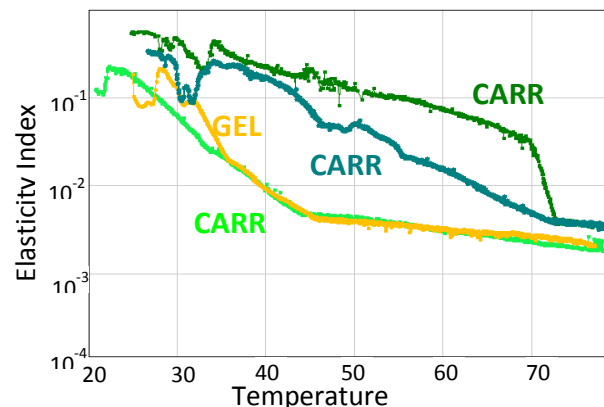


Figure 1 : Evolution of the elasticity index (EI) as a function of temperature during cooling from 80°C to 25°C.

ADDITIVES TO DECREASE GEL POINT IN COSMETICAL APPLICATIONS.



For some handmade applications, it is inconvenient to manipulate with hot dispersions. It has been shown that submicron silica particles can decrease gelation temperature of carrageenan dispersion due to barrier effects between the polymeric chains. The size of the particles has a significant influence on the gel strength. Medium sized and large particles may reinforce the gel structure, while small particles decrease the gel strength. (Daniel-da-Silva et al., J. Colloids Int. 2008)

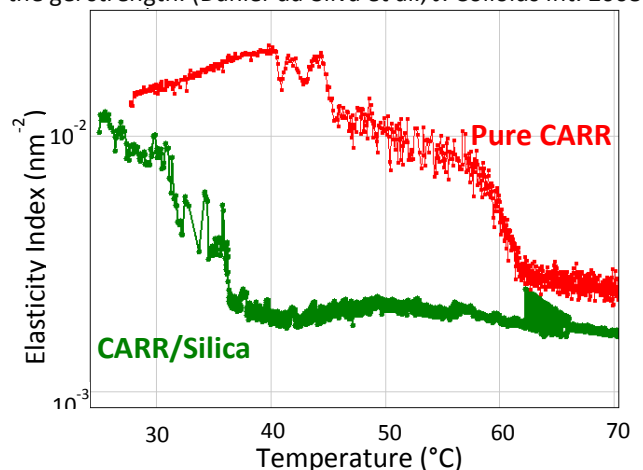


Figure 2: Evolution of the elasticity index (EI) as a function of temperature during cooling from 80°C to 25°C.

The silica particle dotted carrageenan sample has a significantly lower gel point, whereas final elasticity was almost equally to the pure carrageenan sample. This made it an ideal choice for handmade products.