RHEOLOGY AND TEXTURE OF FOOD GELS

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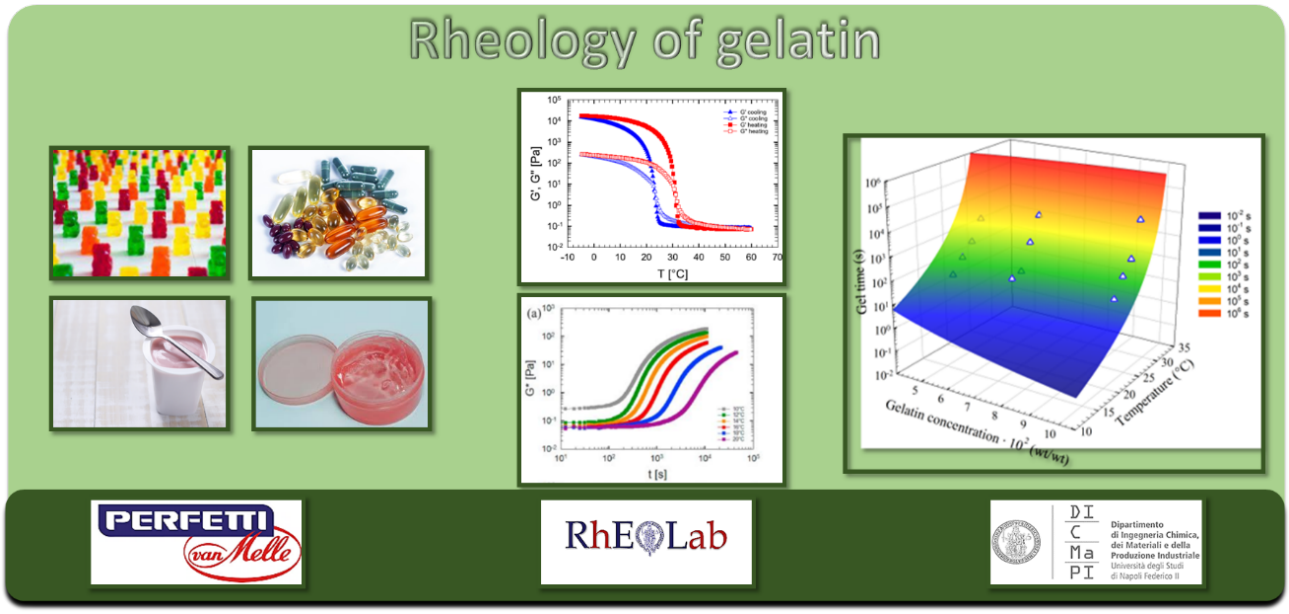
Gummies and jellies are a class of confections based on a hydrocolloid, sometimes called a stabilizer, which provides a three-dimensional network to hold relatively high moisture content sugar syrup. Hydrocolloids used in the formulation of jellies influence appearance, flavour release, and textural attributes.
Traditionally, the term gummy (sometimes written as gummi) is reserved for candies made with animal gelatin, although this practice is not strictly followed around the world.
The most common hydrocolloid used as gelling agent in the formulation of jellies is the animal gelatin, although other stabilizer are used, such as starch and pectin. Each hydrocolloid imparts its own unique texture and organoleptic properties to the candy. Thus, both physicochemical and mechanical properties of jellies arise due to on formation of cross-linking of hydrocolloids with water and sugars.
My research project focuses on the characterization of the hydrocolloids used in the confectionery field. Rheology plays a key role in the study of hydrocolloid behaviour in solution. Through rheological measurements, it is possible to understand physical and microstructural parameters, and the keys to tune them in a way to improve both industrial formulations and plant schemes.
Due to the increasing request of the confectionery industry for raw vegetable materials, the aim of my project is to "produce" a system with the same sensory activities and texture of the products currently on the market, but replacing the animal gelatin with another vegetable hydrocolloid.



During the first year of the PhD, the attention was focused on an extensive bibliographic research of the main hydrocolloids of vegetable origin, already used in the confectionery field. Subsequently, we began to perform the preliminary experiments on the water/gelatin solutions in order to understand which properties needed to be mimicked. To ensure repeatability of measurements, a uniform protocol for the preparation of aqueous gelatin solutions was developed, as well as a protocol for rheological measurements.

During the second year of the PhD program, my attention was focused on the gelation kinetics of gelatin aqueous solution by tuning two key parameters, such as temperature and concentration. Importance was also given to the *gelation time*, evaluated under isothermal conditions. We calculate the characteristic transition temperatures, i.e. the gelation temperature (also known as $T_{sol-gel}$) and the melting temperature ($T_{gel-sol}$). The evaluation of these three parameters (transition temperature, gel time and gelatin concentration) is essential in order to understand and develop an innovative product and process. A mathematical model was also derived, capable to predict the gelation time from temperature and gelatin concentration.
During the first part of the third year of the PhD, the attention was focused on a better understanding of how co-solutes influence gelation of aqueous gelatin solution, since there was little information available in literature on the behaviour of hydrogels with high-solid content.

References:

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