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Investigation on the gelation of soy protein materials

Food protein gels are complex viscoelastic materials consisting of a protein network and entrapped water. The protein network is generally induced by heat and the addition of a coagulant. The protein source, heating conditions, and coagulant type will influence protein interactions and water mobility creating gels with distinct microstructure, viscoelastic and texture characteristics. Gel formation is critical when developing formulations for food protein gel materials and the rheological properties can assist with the understanding and tailoring of interactions between the constituents and the associated gel formation. Viscoelastic materials can be characterized by their rheological properties, namely storage modulus, and loss modulus. These properties can be related to the different steps of gel formation, induction, growth, and stabilization. The evolution of these properties during gel formation has been reported in the literature for soy protein gels. While extensive experimental observations are available for a range of conditions and formulation, the analysis of the kinetics of gel formation is limited.

The objective of my master project is to formulate guidelines for the selection of heating conditions and coagulant types for the creation of soy protein gels with targeted viscoelastic properties. The methodology adopted consisted of the use of an empirical model for the fitting of experimental results of the storage modulus reported in the literature. Preliminary results suggest that the rate of gelation increases with temperature as expected. Significant differences in the induction time and the rate of gel formation were observed according to coagulant type. Soy protein gels produced by calcium sulfate coagulation had a higher rate of gelation speed and shorter gel induction time compared to soy protein gels produced by glucono –delta- lactone coagulation.

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