**Effect of stabilizers on the rheological properties of sugar solutions analyzed at negative temperature**

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A sorbet mix is mainly composed of water and/or concentrated fruit juices, sugars and stabilizers which are hydrocolloids. During the manufacturing process of sorbets, the freezing step takes place in a scraped surface heat exchanger (SSHE) where air is incorporated and part of water contained in the mix turns into ice. The unfrozen residual solution cryoconcentrates continuously in sugars and stabilizers. The aim of this study is to analyze the rheology of hydrocolloids in sucrose solutions at low temperature in order to better understand the behavior of stabilizing macromolecules in the unfrozen phase that concentrates during the process.

Different formulations of mix have been characterized by changing amount of sugar and type and amount of stabilizers (Locust bean gum, HPMC and CMC). The rheological properties of stabilizers have been analyzed either individually or in mixture and at temperatures slightly above the freezing points.

Intrinsic viscosities and critical overlap concentration were defined to evaluate expansion of polymers in solution and transition of concentration regimes (diluted, semi-diluted) according to formulation conditions. The flow behavior of the solutions was described by the two parameters of Ostwald model (n and K) and the Newtonian viscosities were recorded. The apparent viscosity of the solutions was calculated at the shear rates encountered in the SSHE. These results allow us to better understand the hydrocolloids behavior during the freezing process of sorbets: hydrocolloids are less solvated in sucrose solutions than in water and macromolecules tends to aggregate as the freezing proceeds. The mixes evidenced an increase of the shear-thinning and viscous features. The viscoelastic properties of the mixes were also determined to study the possible cryogelation of the polymers. The challenge is now to better understand how the particular behavior of the hydrocolloids at low temperature in sugar solutions can explain their influence on ice crystallization.