Solubility and sorption kinetics of gases in complex media

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Foam on food products is a feature that strongly drives consumer preference in visual as well as in-mouth conditions, as it improves the texture, appearance and taste and it creates expectations about the quality. Some effects can be controlled in order to maximize the quality of the products.

However, foams begin to destabilize soon after the foam formation stops, causing their characteristics to change continuously over time. Foam stabilization is commonly linked to the properties of the adsorbed interfacial layer and its destabilization involves three different processes: liquid drainage, inter bubble diffusion and film coalescence (Fig. 1).

Fig. 1 Phenomena that occur in a foam column
Foams require the use of surface-active agents for stabilizing the thin liquid films (lamellae) between two bubbles at the gas-liquid interface. The strong adsorption of a surfactant at the bubble walls opposes the collapse and eases the foam generation because of a reduction of the surface tension. Foods' macromolecules, such as proteins and polysaccharides, are widely used as surfactants for the formation and stabilization of these systems. However, for mixed systems such as colloidal systems, there is a competitive adsorption of the components that could change the form and function of the stabilizing system. The understanding of these structures is quite relevant for the control of foam formation in the food industry.

On the other hand, the growing of the bubbles leads to the collapse and disappearance of the foam. In such a way, solubility and the diffusion of gases in liquid mixtures are features that strongly affect its formation and the stability. However, a thorough characterization of these parameters in relevant food systems is still needed today.

The objective of the current work is to establish a sound scientific understanding of the thermodynamics and kinetics of gas solubility in complex media. Both theoretical and experimental research on the structure, appearance and stability of foams made from different gases dissolved in a food matrix will be conducted.

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