New kinds of gels, new physical and chemical behavior

Dr. Hervé This, AgroParisTech, Inra, Université Paris-Saclay

Food can be described at various scales (from the molecular level to the macroscopic scale) using a formalism taking into consideration the nature of phases as well as their relative topological arrangement (This, 2009). It can change during processing such as in the culinary practice (Aguilera, 2012). The Disperse System Formalism (DSF) scheme (This, 2007) can apply to any scale, according to their "degree of complexity". For example, custard which is made of oil droplets O (from milk), air bubbles G (introduced during the initial whipping of sugar and egg yolks) and small solid particles S (due to egg coagulation during thermal processing) all dispersed in an aqueous phase (W), may be described as $[D_0(O) + D_0(G) + D_0(S)]/D_3(W)$. When applied to French classical sauces compiled from culinary books, 23 categories of products were found.

For the "solid content" of food, it was recognized that it is primarily made of gels (This, 2012), i.e. colloidal systems made of a liquid phase in a solid phase. However, the same word "gel" applies traditionally to very different systems, either non connected such as plant tissues (assuming the cytosol is a liquid), or connected, such as jams. Using the DSF, all kinds of gels could be recognized, and in particular new dynamic gels, called dynagels. Their original bioactivities can now be explored, making the basis of a new way of preparing food structured at any scale: "note by note cooking".

References

J.M. Aguilera, 2012. Edible Food Structures. CRC Press/Taylor and Francis, NY.

H. This, Formal descriptions for formulation. *International Journal of Pharmaceutics,* 344 (2007) pp. 4-8.

H. This, Molecular Gastronomy, a chemical look to cooking. *Accounts of Chemical Research*, 42(5) (2009) pp. 575-583.

This, H., Solutions are solutions, and gels are almost solutions, *Pure Appl. Chem.*, (2012) pp. 1-20.