Rheology, Tribology and Food Texture Perception

Supervision :
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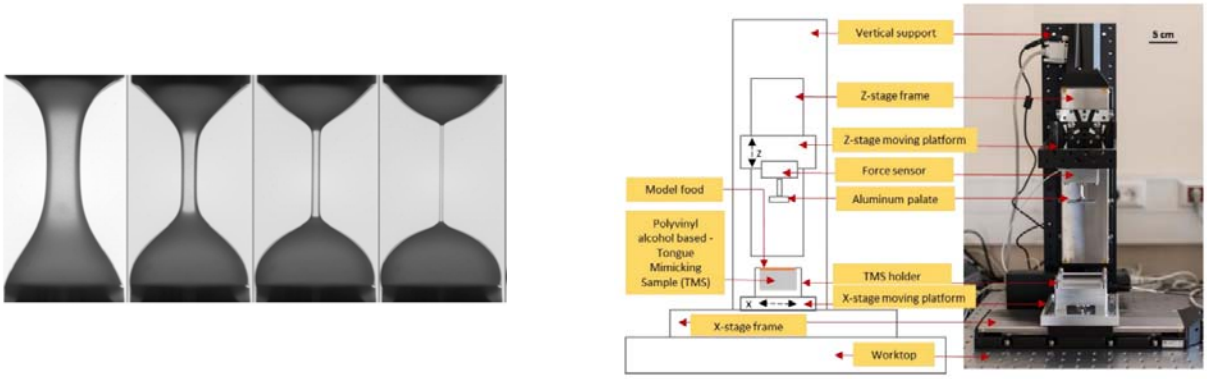
Objectives :

Developing appreciated food, adapted to the specific needs and preferences of different consumers (e.g. more sustainable sources of proteins, specific protein needs of older adults, etc) requires a finer understanding of the link between food structure, food physico-chemical properties, their evolution in mouth and the perception during consumption.

In a recent study[1] we showed the importance of viscoelasticity and of the resulting extensional properties (Fig.1a) on bolus cohesion and swallowing. In separate studies we have also developed a biomimetic tribometer[2] (Fig.1b) to assess food tribological properties in regimes relevant to tongue-palate shearing and a soft robotic *in vitro* experiment[3] to simulate the glosso-palatal peristalsis during swallowing.

This industrially funded project will focus on understanding the perceived texture of gel products and drinks (suspensions of fine particles), which is influenced in subtle ways by the rheological and tribological properties and their evolution under the effect of saliva hydration[4] and heat transfer (e.g. melting). Different model products will be produced and characterized instrumentally to understand the effect of the product structure on the rheological and tribological properties. Sensory tests will also be performed by a trained panel to assess the sensory attributes of the products and their evolution with time[5], with a particular focus on grittiness and creaminess. A statistical analysis will be performed to link the physical properties of the products and the texture perception.

This project will pave to way to engineering the product properties towards a desired texture perception.



a) b)

Fig. 1: a) Capillary breakage extensional rheometry[1] b) Biomimetic tribometry[2]

Host Unit and Project Duration :

This Postdoctoral Fellowship will last 12 month with a possible extension to 24 months and will be based at the joint research unit **SayFood**, in the campus AgroParisTech/INRAE of the Université Paris-Saclay in Palaiseau, France.

Candidate profile :

The postdoctoral candidate should i) hold a PhD in Physics, Food Science, Mechanical or Chemical Engineering and ii) have a documented experience in rheological and/or tribological characterisation and iii) a strong interest for multidisciplinary food research at the frontier with physiology.

References :

1. *M. Marconati and M.Ramaioli, The role of extensional properties in the oral phase of swallowing: an in vitro study, Food Funct. 2020.*
2. *R. Srivastava et al., A new biomimetic set-up to understand the role of the kinematic, mechanical, and surface characteristics of the tongue in food oral tribological studies, Food Hydrocolloids, 2021.*
3. *A.Lavoisier et al., A novel soft robotic pediatric in vitro swallowing device to gain insights into the swallowability of mini-tablets, International Journal of Pharmaceutics, 2022.*
4. *A.Lavoisier et al., Effect of α-amylase and pH on the rheological properties of thickened liquids containing starch in in vitro conditions relevant to oral processing and swallowing, J.Text. Studies, 2022.*
5. *A.Cosson et al., Using multiple sensory profiling methods to gain insight into temporal perceptions of pea protein-based formulated foods, Foods, 2020.*