PAUL SCHERRER INSTITUT

Friday, September 20, 2019, 11:15 h, WHGA/001

PSI Colloquium

Prof. Jan Vermant

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Beer foams and engineering - thin film flow by interfacial design

Beer foams are quite ubiquitous but the stability of beer foam varies greatly from one beer to another. Looking somewhat closer at this, it turns out that surface tensions and viscosities of different beers are very similar, even though their stability against gravitational drainage is quite different. Several mechanisms are involved in generating a macroscopic stable foam, but they are all related to what happens to (and at) the interface.

Spatial and temporal variations of surface active components will play a role and can lead to so-called Marangoni stresses, but even more so, when surface active components accumulate at in interface between two liquids, they can even create structured (near 2D) interfacial soft materials. This will occur in particular when lateral interactions forces are present between the moieties. This implies that the interfaces can exhibit interesting mechanical properties such as viscoelastic or viscoplastic behaviour. In this colloquium we will first demonstrate novel experimental techniques which look into the stability of thin films under hydrodynamic condition and then see how the different mechanisms can be identified and controlled. Inspired by beer (sometimes a good idea). We will try to see how we can design such interfaces and control these in complex multiphase systems so they have the right interfacial properties. We will demonstrate how this can lead to engineered stable foams (2), emulsions (3) and planar films (4). Special attention will be given to controlling but also measuring the interfacial rheological properties and separate these from variations of the thermodynamic state variables. I will end with a discussion of a need for more in-situ structural studies and how to go about this.

1. Jaensson, Nick, and Jan Vermant. "Tensiometry and rheology of complex interfaces." *Current opinion in colloid & interface science* (2018) 37, 136-150
2. Beltramo, Peter J., et al. "Arresting dissolution by interfacial rheology design." *Proceedings of the National Academy of Sciences* 114.39 (2017): 10373-10378.
3. Dockx, Greet, et al. "Designer liquid-liquid interfaces made from transient double emulsions." *Nature communications* 9.1 (2018): 4763.
4. Blair, Victoria E., et al. "Electrically conductive thin films derived from bulk graphite and liquid–liquid interface assembly." *Advanced Materials Interfaces* 6.4 (2019): 1801570.

Coffee before the colloquium

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