TIME TO SHARE

Food Science and Technology at the Nanoscale

November 24, 2021 | 8:00 AM PST | 11:00 AM EST | 5:00 PM CET

Scope of the Symposium

We kindly invite you to join us and two esteemed guest speakers for this mini-Symposium on Food Science and Technology at the NanoScale. Food technology is a dynamic field of science that incorporates disciplines as diverse as chemistry, physics, microbiology, biochemistry and chemical engineering. In this mini-symposium, we will delve a level deeper and demonstrate the role of Nanotechnology in this field of science.

Atomic Force Microscopy (AFM) is an advanced multiparametric imaging technique that delivers 3D profiles of the surfaces of biological samples in the nm-range and enables the characterization of their molecular structure and nanomechanical properties.

The aim of this symposium is to provide key insights into the role AFM can play in the search for new and innovative analysis and characterization methods, and ultimately how AFM can contribute towards improved food delivery systems and the rational design of food. The talks will focus on:

- Combining AFM with polymer physics and statistical analysis to study the conformation, properties and structure of food polymers and colloids
- Colloidal food delivery systems and the principles of their rational design
- Understanding the link between the colloidal properties of V-type amylose architectures and the bio-accessibility and bio-availability of bioactives, such as omega-3 fatty acids and capsaicin
- Studying the structure, functionality, and digestibility of proteinaceous nano-colloids with AFM

Program – Wednesday, November 24, 2021 | 8:00 AM PST | 11:00 AM EST | 5:00 PM CET

5:00 **Welcome Address**
Carmen Pettersson

5:10 **Understanding Food Polymers using AFM and Statistical Analysis**
Prof. Raffaele Mezzenga, ETH Zurich, Switzerland

5:40 **Developing Food Delivery Systems with Tailored Digestibility: The Utility of AFM**
Prof. Uri Lesmes, Faculty of Biotechnology and Food Engineering, Technion, Israel

6:10 **Open Forum Discussion**
Carmen Pettersson

6:20 **Closing**
Carmen Pettersson

Please don't hesitate to contact us at productinfo.emea@bruker.com if you have any questions.

Talk abstracts

Understanding Food Polymers using AFM and Statistical Analysis

Prof. Raffaele Mezzenga, Department of Health Sciences and Technology & Department of Materials
ETH Zurich, Switzerland

The focus of this talk is on how the conformation, properties and structure of food polymers and colloids can be understood by combining AFM high resolution imaging with statistical analysis and polymer physics concepts. Three illustrative examples will be discussed: 1) protein nanofibrils, 2) polysaccharides with secondary structures, and 3) cellulose nanocrystals. The talk will also include an introduction to the open-source code FiberApp with which it is possible to perform an automated analysis of these systems.

The focus of Prof. Raffaele Mezzenga's research is on the fundamental understanding of self-assembly principles in proteins, polymers, liquid crystals, food and biological colloidal systems. He has co-authored over 300 publications. He has been a visiting Professor at the Helsinki University of Technology (now Aalto University), RMIT Melbourne, Monash University and NTU Singapore.

His work has been recognized by several prestigious international distinctions such as the 2017 Fellowship and the 2013 John H. Dillon Medal of the American Physical Society, the 2013 Biomacromolecules/Macromolecules Young Investigator Award of the American Chemical Society, the 2011 American Oil Chemists' Society Young Scientist Research Award, and the 2004 Swiss Science National Foundation Professorship Award.

Developing Food Delivery Systems with Tailored digestibility: The Utility of AFM

Assoc. Prof. Uri Lesmes, Faculty of Biotechnology and Food Engineering, Technion
Israel Institute of Technology, Israel

The strong link between food and human health in this dynamic era maintains a constant need for fundamental and applied food research. To this end, the development of food delivery systems offers a pharmacological paradigm to develop functional foods that deliver extra-nutritional value to different consumers. This talk will provide an overview of the field of colloidal food delivery systems and provide an overview of a set of studies that seek to underpin the principles for their rational design. Firstly, I will describe how AFM imaging has aided in understanding the link between the colloidal properties of V-type amylose architectures and the bio-accessibility and bio-availability of bioactives, such as omega-3 fatty acids and capsaicin.[1–3] Secondly, I will summarize some studies on proteinaceous nano-colloids where AFM has been used to elucidate their structure, functionality and digestive fate.[4,5] Overall, this talk will show participants examples of AFM use in research on food carbohydrate, protein and coacervate assemblies.

Assoc. Prof. Uri Lesmes joined the Technion in 2010 after holding appointments as visiting scholar, lecturer, and post-doctoral fellow at the University of Reading (UK) and the University of Massachusetts-Amherst (USA). His expertise lies mainly in the rational design of food and the investigation of food's digestive fate using in vitro digestion models and foodomics tools and approach. Uri has an h-index of 31 with over 4400 citations and he is the academic supervisor of the Center for Health and Food Innovation as well as the EIT Food Accelerator program at the Technion.

He is publicly active in many international scientific activities and professional committees (such as the INFOGEST network, FWO Flanders, BBSRC, SNF, EFFoST) and has received various recognitions for outstanding academic teaching and research.

References

1. Zabar, S., Lesmes, U., Katz, I., Shimoni, E. & Bianco-Peled, H. Structural characterization of amylose-long chain fatty acid complexes produced via the acidification method. *Food Hydrocoll.* 24, 347–357 (2010).
2. Cohen, R., Schwartz, B., Peri, I. & Shimoni, E. Improving bioavailability and stability of genistein by complexation with high-amylose corn starch. *J. Agric. Food Chem.* 59, 7932–7938 (2011).
3. Isaschar-Ovdat, S., Shani-Levi, C. & Lesmes, U. Capsaicin stability and bio-accessibility affected by complexation with high-amylose corn starch (HACS). *Food Funct.* 12, 6992–7000 (2021).
4. Jones, O. G. O. G., Lesmes, U., Dubin, P. & McClements, D. J. D. J. Effect of polysaccharide charge on formation and properties of biopolymer nanoparticles created by heat treatment of ??-lactoglobulin-pectin complexes. *Food Hydrocoll.* 24, 374–383 (2010).
5. David-Birman, T., Mackie, A. & Lesmes, U. Impact of dietary fibers on the properties and proteolytic digestibility of lactoferrin nano-particles. *Food Hydrocoll.* 31, 33–41 (2013).