Howard See Young Rheologist Travel Award 2014 Report to the Australian Society of Rheology
Author: Davoud Zare
Conference: The 7th International Symposium on Food Rheology and Structure - ISFRS 2015
Location: Zurich, Switzerland
Date: June 2015

Overview
First of all, I wish to acknowledge the travel fund by Howard See Young Rheologist Travel Award (2014) and faculty research grants of Victoria University (2015) which made it possible for me to attend ISFRS 2015 conference in Zurich. The goal of this trip was to attend one of the most precious food rheology and structure conference and give a seminar. The research topics ranged from basic and applied research in rheology of food and related systems, to food structure and structure analysis, all the way to the complex relationship between food processing, structure, rheology and resulting food quality. Reports of novel findings were organized into nine parallel oral presentation sessions held concurrently (129 oral presentations in total) and 112 poster presentations which were set up in the morning of first day to let people have chance to glance them during conference break and allocated poster session in the evening. The conference began with opening lecture given by eminent scientist Jan Vermant (ETH) about structural and mechanical anisotropy in sheared colloidal followed by some amazing keynote lectures on the following days. A brief overview of the history and main topics covered in ISFRS 2015 are given below.
The 7th International Symposium on Food Rheology and Structure - ISFRS 2015

The International Symposium on Food Rheology and Structure (ISFRS) was hosted by the Institute of Food, Nutrition and Health at ETH Zürich. The symposium was initiated in 1997 by Erich J. Windhab and E. Dewald and since then held every three years in 2000, 2003, 2006, 2009, 2012 and 2015. The next symposium will take place in 2018.

The International Symposium on Food Rheology and Structure addresses the needs of food rheology and structure researchers. The symposium is devoted to rheology of food and related systems, to food structure and structure analysis, and to the complex relationship between food processing, structure, rheology and resulting food quality.

An overview of the state of the art and a detailed focus on recent problem areas are given by the opening lecture and several keynote lectures that are presented by well-known scientists. Oral and poster contributions are organized in individual symposium sessions grouped around the introduced research topics in food rheology and structure. All papers presented during ISFRS are published in Conference Proceedings. For ISFRS 2006 special issues of the International Journal of Food Science & Technology and Applied Rheology were published. For ISFRS 2012 special online issues in Food & Function and Soft Matter as well as in Applied Rheology were published.

Zurich/Switzerland, June 7 - 11, 2015

The 7th International Symposium on Food Rheology and Structure - ISFRS 2015 was during June 7 - 11, 2015 in Zurich/Switzerland.

The Book of Abstract is now available as pdf download.


Conference venue

ETH Main Building (Hauptgebäude)

ETH Zürich/ETH Zentrum

Rämistrasse 101

8092 Zürich

Switzerland
**ISFRS 2015: Keynote Speakers**

**Kees de Kruif** (NIZO & Fonterra): Casein hydrogels: Waterholding capacity related to swelling and rheology of caseinates

**Taco Nicolai** (University Le Mans): The effect of competition for calcium ions between κ-carrageenan and β-lactoglobulin on the rheology of mixed gels and of the elasticity on the structure

**Nicolas Roussel** (LCPC Paris): Mixing laws on different length scales

**Jason Stokes** (The University of Queensland): Insights into food design and oral processing using soft matter physics, thin film rheology, and tribology

**Jan Vermant** (ETH Zurich): Structural and Mechanical Anisotropy in Sheared Colloidal Gels

**Erich Windhab** (ETH Zurich): Interplay of Rheology and functional structure processing along the food value chain

**Bettina Wolf** (University of Nottingham): Food rheology and structure for nutritionally
enhanced foods

**Timothy Wooster** (Nestlé Research Center Lausanne): Gastric Structuring - how food structure and rheology impact on fat digestive processing

**ISFRS 2015: Symposium Program**

**Rheology and Structure Analysis:** Rheological Methods · Rheological Modelling and Numerical Methods · Rheo-SALS, SANS, SAXS

**Food Materials and Characteristics:** Dough · Biopolymer Solutions and Gels · Colloidal Dispersions · Emulsions, Foams and Interfaces · Semi-Solid Foods

**Food Processing:** Influence of Processing on Structure and Rheology · Structure, Nutrition and Health

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<th>Sunday</th>
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<th>Tuesday</th>
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<tr>
<td>June 7, 2015 17:00 - 20:00</td>
<td>June 8, 2015 9:00 - 18:00</td>
<td>June 9, 2015 8:30 - 19:00</td>
<td>June 10, 2015 8:30 - 18:00</td>
<td>June 11, 2015 8:30 - 12:00</td>
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<td>Plenary: J. Vermant</td>
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<td>Plenary: C. de Kruijff</td>
<td>Plenary: J. Stokes</td>
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<td>Rheology</td>
<td>Biopolymer Emulsions</td>
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<td>T. Nicolai</td>
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<td>Biopolymer Dough</td>
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<td>17:00 - 20:00</td>
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<td>19:00 - 19:00</td>
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<td>Banquet</td>
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<td>Get together</td>
<td>Welcome Reception</td>
<td>Poster Session</td>
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The Final Program including all oral and poster presentation is now available.


**Organizing Committee of ISFRS 2015**

**Main Organizer**
Peter Fischer
Erich J. Windhab

**Organizing Committee**
Peter Bigler
Fabian Birbaum
Lukas Böni
Peggy Heunemann
Bernhard Koller
Volker Lammers
Viviane Lutz Bueno
Lucie Rejman
Nathalie Scheuble

Scientific committee
Jan Engmann (Nestlé Research Center Lausanne, Switzerland)
Philipp Erni (Firmenich SA, Switzerland)
Anne-Marie Hermansson (Chalmers University, Sweden)
Erik van der Linden (Wageningen University, The Netherlands)
Taco Nicolai (University Le Mans, France)
Jan Vermant (ETH Zurich, Switzerland)
Bettina Wolf (University of Nottingham, UK)
My presentation

My presentation was in Emulsions and Interfaces session and one before the last talk in the afternoon session. There were around 30 people in the room and I began by thanking the ASR and Victoria University for the funding and acknowledged support from my supervisors. I then went into the presentation ‘Interfacial viscoelasticity of protein-polysaccharide composite layers at an oil/water interface’, and managed to get through this in about 15 minutes, leaving 5 or so minutes for questions, of which I had two questions. One of the questions came from Prof. Raffaele Mezzenga (ETH, Zurich), who is world leading scientist working with beta lactoglobulin and its fibrils.

Networking & discussions

I also had the chance to discuss with Prof. Jason Stokes (UQ, Australia) and Prof. Taco Nicolai (University Le Mans, France) in the coffee break about my research. I also had the conference dinner with Prof. Peter Munro ( Fonterra, New Zealand) and Dr. Tim Wooseter (Nestlé Research Centre, Lausanne, Switzerland) and we had good discussions about my research and Swiss cheese and chocolate. I also spent some times with PhD students and postdocs in Prof. Peter Fischer’s lab (ETH, Zurich) and got to know more about their research and Zurich.

Conclusion Attending ISFRS 2015 in Zurich was an amazing experience for me. I got to know some world leading scientists in my research area in person and had fruitful discussion with them. I sincerely acknowledge the ASR again for giving me this opportunity through the Howard See Young Rheologist Travel Award.
Interfacial viscoelasticity of protein-polysaccharide composite layers at an oil/water interface

Davoud Zare

Prof. Kate McGrath
Dr. Jane Allison
Prof. Peter Fischer
Acknowledgement

The Australian Society of Rheology

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI

VICTORIA
UNIVERSITY OF WELLINGTON

ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Riddet Institute
FOOD | INNOVATION | HEALTH

The MacDiarmid Institute
for Advanced Materials and Nanotechnology
Multilayer Interfaces

- Protecting droplets against aggregation and preventing lipid oxidation
- Controlled or triggered release of active ingredients

The missing link and Open questions

Bulk properties
stability and rheology

Interfacial characteristics

Atomistic behaviour
Atomistic simulation
Materials and Method

- Oil: Medium-chain triglycerides (MCTs)
- Protein: Beta lactoglobulin (blg)
- Polysaccharides: Sodium Alginate and Chitosan

Sodium Alginate

Beta lactoglobulin (blg)

Chitosan
The set up

Patrick A. Rühs, Peter Fischer, Simultaneous Control of pH and Ionic Strength during Interfacial Rheology of β-Lactoglobulin Fibrils Adsorbed at Liquid/Liquid Interfaces, *Langmuir*, 2012, 28 (34), pp 12536–12543
Kinetics of blg adsorption

0.01 wt% blg in phosphate buffer (10mM) pH=7
Strength of the adsorbed layer
Reversible/irreversible adsorption?

![Graph showing Storage and Loss Modulus over time](image-url)

- **Storage Modulus (Pa.m)**
  - Logarithmic scale: $10^{-2}$ to $10^{-4}$

- **Loss Modulus (Pa.m)**
  - Logarithmic scale: $10^{-2}$ to $10^{-4}$

**Legend:**
- Black solid line: blg
- Blue dashed line: blg subphase exchange
Strength of the adsorbed layer

![Graph showing the relationship between strain and modulus for different phases.](image)
Kinetics of adsorption at different pHs
Strength of adsorbed layer

![Graph showing storage and loss modulus vs. strain for pH=3 and pH=7]
0.01 wt% blg in phosphate buffer (10mM) pH=3, 10 mL of 0.05 wt% of polysaccharides.
Strength of the composite layer

![Graph showing the strength of composite layers with different compositions. The graph plots Storage Modulus (Pa.m) and Loss Modulus (Pa.m) against Strain (%). The compositions include Protein, Protein-alginate, Protein-alginate-alginate, and Protein-alginate-alginate-Chitosan. The horizontal axis represents Strain (%), while the vertical axes represent Storage Modulus and Loss Modulus on a logarithmic scale. The graph illustrates the varying strength of these composite layers under different conditions.]
Conclusion

• These coated lipid droplets by elastic laminated layers are prepared by simple cost effective method

• These emulsions have improved stability to environmental stress

• Encapsulation, controlled release, triggered release