

WATER IN SOFT MATERIALS – ISOPOW XII CONFERENCE (2013)

FISKEBÄCKSKIL, SWEDEN

AUGUST 19 – 23, 2013

The first ISOPOW Symposium was organised in Glasgow, Scotland in 1974 with focus on food products. Since then, ISOPOW meetings promoted the exchange of knowledge of the role of water for material properties in fields of foods, pharmaceuticals and biological systems. The congress has a strong participation of industry and has been an important platform for a dialogue between academic and industrial scientists/technologists. The twelfth ISOPOW conference was held at hotel Gullmarsstrand in Fiskebäckskil, Sweden. Fiskebäckskil is a small fishing village situated in the archipelago at the Swedish west coast. In total, 81 scientists/technologist from industry, institute and academia participated in the conference. The participants came from 17 different countries. All parts of the world except Africa were represented. Figure 1 shows the participants that attended the conference dinner.

The main topic of the ISOPOW XII conference was “Water in soft materials”. The content of the conference were divided into ten different themes covering different aspects of water in soft materials. Each theme involved one or two invited keynote speakers who gave an overview of the field and presented high-lights of their research. The themes for the 20th of August were:

- Mass transport in soft water based materials
- Water and microstructure in soft materials
- Water in soft structures

Anette Larsson, Chalmers University of Technology, Sweden, presented the VINNExcellence centre SuMo Biomaterials. The focus of SuMo is to understand structure-mass transport relationships in soft biomaterials. An extensive review of different models and the different mechanisms acting during mass transport in soft materials was presented. Measurements obtained by magnetic resonance imaging showed diffusion front reaction gelation during capillary formation in alginate gels. New advanced microscopy techniques for imaging of liquid samples using electron microscopy and new sample containers with electron transparent windows were presented. Images of eukaryotic cells at micrometer and nanometer level were obtained by correlative microscopy using fluorescent quantum dots and light microscopy (LM) and scanning transmission electron microscopy (STEM). The physical properties and anomalous diffusion of supercooled water in porous materials were discussed. Dielectric spectroscopy and differential scanning calorimetry (DSC) measurements showed that confined

water lacks a clear calorimetric glass transition and associated viscosity related structural relaxation process. New concepts to prevent bio-fouling at interfaces between water and man-made materials were presented. Especially “closed cycle mechanisms” involving electrochemical manipulation where copper ions are captured, concentrated and released from the trace-amounts naturally occurring in seawater.

Keynote lectures on the 20th of August were given by Joseph Seymour, Montana State University, US, Niels de Jonge, Leibniz Institute for new materials, Germany, Jan Swensson, Chalmers University of Technology, Sweden, and Magnus Nydén, The Ian Wark Research Institute, Australia. The titles of the keynote lectures can be found in the program at the conference website. In the afternoon, several posters with different aspects of mass transport in soft materials were introduced orally following which, the participants had the chance to look at the poster and discuss the data. Some highlights from the poster session were: mass transport in biofilms, porous biomaterials, pasta, olive cakes, soya protein gels and carbohydrate model systems as well as 3D TEM imaging of silica structures, spatial modelling of material microstructures and results on encapsulation by complex coacervation. The themes for the 21st of August were:

- water in powder processing
- powder properties during processing and storage
- powder structure and functionality

Lilia Ahrné, SIK – The Swedish Institute for Food and Biotechnology, Sweden, gave a general presentation regarding the Marie Curie Initial Training Network PowTech. PowTech ITN aims to integrate inter-sectoral and multidisciplinary research in particle and powder technology into the training of 15 highly skilled young researchers, to strengthen the competitiveness of food and pharmaceutical industry and to strengthen the European Research Area. The PowTech ITN has 20 partners including 9 from industry.

Keynote lectures the 21st of August were given by Erich Windhab, ETH Zurich, Switzerland, Tim Althaus, Nestlé Product Technology Centre York, United Kingdom and Thomas Rades, University of Copenhagen, Denmark. The mechanisms (water immobilisation, pore compression, saturation and fluid rheology) determining the critical normal stress to shear stress ratio where either flow is initiated or flow blockage may

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occur in wet food powder systems were thoroughly discussed. An analytical model for determination of stress fields during wet powder extrusion was presented. The impacts of water on the properties of confectionaries and waters interaction with various food components such as carbohydrates, and crystalline and amorphous materials were reviewed. Results on how water influences the kinetics of chemical changes such as browning reactions or oxidation of lipids were presented and the importance of the state diagram to understand the behaviour of water in foods was stressed. Solubility of drugs is a big hurdle for development of new drugs and strategies to improve this includes salt formation, co-solvents, cyclodextrins, particle size reduction etc. New concepts for improved drug delivery such as combinations of drugs with low molecular weight excipients, co-amorphous systems or control of the spatial distribution of crystallinity were highlighted.

In the afternoon, many posters regarding different aspects of powder technology were briefly introduced, followed by an open poster session. Many posters discussed the importance of the glass transition temperature and the rehydration kinetics on the behaviour of the powder. The themes for the 22nd of August were:

- Microstructure and nanostructure design
- possibilities of scattering techniques
- new measurement techniques and modelling

Different approaches to control diffusion in lipid-based self-assembly systems were presented. These involve endogenous stimuli such as pH, charge unbalance, modulation of channel size, topological interconnectivity, or exogenous stimuli by for instance external magnetic fields. The mechanisms acting during formation of protein particles and the transition between particle and network formation were discussed. Surface

charge density and net charge of the native proteins were two important factors. The action of protein particles for Pickering stabilisation of emulsions was demonstrated.

The possibilities with the world's brightest neutron source (ESS) and brightest synchrotron source (X-ray) for photon energies up to 30 keV (MAX IV) were presented. Examples of possibilities were imaging of membrane protein structure, tomography, determination of magnetic phenomena etc. Nano- and microporous properties of polyelectrolyte multilayer materials were determined using different nuclear magnetic resonance methods applied to hydration water. Pore size of about 1 nm was found using NMR cryoporometry.

Keynote lectures were given by Raffaele Mezzenga, ETH Zurich, Switzerland, Taco Nicolai, University du Maine, France, Lars Börjesson, Chalmers University of Technology, Sweden, and Monica Schönhoff, Westfälische Wilhelms Universität Munster, Germany. In the afternoon, a session was led by ISEKI (Integrating Food Science and Engineering Knowledge Into the Food Chain), regarding third cycle education and training to meet industry needs for progress in the understanding of the properties of water in food. Paola Pittia, Facoltà di Agraria & Dipartimento di Scienze degli Alimenti, Università degli Studi di Teramo, Italy, presented the ISEKI program and Yrjo H. Roos, Food Technology, School of Food and Nutritional Sciences, University College Cork, Ireland, talked about the role of water in foods. A historic exhibition on important concept for the behavior of foods in relation to water such as water activity was presented. The ISEKI session was concluded by a large group discussion regarding industry needs and education.

The theme the 23rd of August was Product Design. A keynote lecture on Static and Dynamic Self-assemblies



Figure 1: Conference photo from the twelfth ISOPOW conference that was held at Fiskebäckskil.

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Figure 2: Anna Ström, Chalmers University of Technology, Sweden, and SuMo Biomaterials, presented her work on mass transport in alginate gels.

for Functional and Biomimetic Materials was presented by Olli Ikkala, Aalto University. He showed examples of the use of superhydrophobic channels for droplet transport, structure formation using ice templating, magnetic fluids and the behavior of mixtures of biomimetic clay and PVA. Routes towards hierarchical self-assemblies for novel functions were reviewed.

The ISOPOW XII conference was organized by SuMo Biomaterials (www.chalmers.se/chem/sumo-en) and Powtech ITN (www.powtech.sik.se) in close collaboration with Chalmers University of Technology (www.chalmers.se), SIK – The Swedish Institute for Food and Biotechnology (www.sik.se) and ISEKI (www.iseki-food4.eu). The conference was sponsored by VINNOVA, www.vinnova.se/en, FORMAS, www.formas.se/en, AstraZeneca, www.astrazeneca.se/home, AkzoNobel, www.akzonobel.com/se, Lantmännen, www.lantmannen.se, IUFOST, www.iufost.org, and Material Science, Chalmers Area Of Advance, www.chalmers.se/en/areas-of-advance/materials/Pages/default.aspx.

More information about the conference and presentations can be found at the conference webpage <https://www.chalmers.se/chem/isopow-xii-en>.

Niklas Lorén^{a,d}, Anette Larsson^{b,d}, Lilia Ahrné^a, Anne-Marie Hermansson^{a,b,d}, Peter Lillford^{c,d}

^a SIK – The Swedish Institute for Food and Biotechnology, Box 5401, SE-402 29 Göteborg, Sweden

^b Department of Chemical and Biological Engineering, Chalmers University of Technology, Göteborg, Sweden

^c University of Birmingham, United Kingdom

^d SuMo BIOMATERIALS, VINN Excellence Centre, Chalmers University of Technology, Göteborg, Sweden
Niklas.Loren@sik.se

THE 1ST INTERNATIONAL RILEM SYMPOSIUM ON RHEOLOGY AND PROCESSING OF CONSTRUCTION MATERIALS

PARIS, FRANCE
SEPTEMBER 2 – 4, 2013

The 1st International RILEM Conference on Rheology and Processing of Construction Materials was held in Paris (France) in September 2013 along with the 7th RILEM Conference on Self-Compacting Concrete and the 67th RILEM Week. These combined RILEM events gathered in Paris international experts dealing with various aspects of the rheology and processing of construction materials.

Sixty-six years after its birth, the RILEM association was back to Paris. Indeed, in 1947, two years after the founding of the United Nations in San Francisco at the end of the Second World War, Europe was slowly rebuilding its infrastructures. Upon the invitation of Robert L’Hermite, a group of laboratory directors met in Paris, France. These directors represented fifteen

different nations and their goal was to renew international relations in the field of materials and structures, which were interrupted by the war.

Since 1947, the RILEM association has of course changed through the years but it has remained, in many different aspects, faithful to its initial objective. The mission of the association has turned through the years into “advancing scientific knowledge related to construction materials, systems and structures and encouraging transfer and application of this knowledge world-wide”. This mission is now achieved through collaboration of not only testing laboratories but also leading experts in construction practice and science including academics and researchers.

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