



**Newsletter**  
**Annual Meeting I**  
**DSM January 2019**





## **DSM Material Science Center**

*Geleen, The Netherlands*

The first annual meeting took place in January in the Netherlands. The first day was in DSM Material Science Center: the day started with a welcome and introduction of DSM and followed by interesting lectures and debates based mostly on the importance of Safety in a working environment and differences between an industry and academic career, as for example on how to read a patent, the role of a Product Developer and of a Sustainability Engineer.

The lectures were followed by Lab tours: the ESRs were guided through the mechanical lab, where they attended a tensile test executed on different materials and they discussed about the main issues which are possible to face while running such tests. In the rheology lab, all the different equipments for rheological tests were shown. Each test is done to investigate specific material's features under different external conditions. And finally, the students went to the compounding area. They were shown how a material is produced in an industrial scale together with all the possible issues that could arise when working in an environment like that and how to avoid them.



## 02.



## DSM OVERVIEW



### Industry

Royal DSM is a global purpose-led, science-based company in Nutrition, Health and Sustainable Living.



### History

DSM and its associated companies deliver annual net sales of about €10 billion with approximately 23,000 employees. The company was founded in 1902 and is listed on Euronext Amsterdam.



### Services

**Creating better, more sustainable materials**  
DSM's expertise in Materials Sciences is what helps them produce many of the engineering thermoplastics, resins, high performance fibers and coatings that appear in products essential to everyday lives – from cars to electronics to packaging to construction to sports and medical equipment and the energy sector.

## AGENDA

Later in the day the group moved to Vaalsbroek where the intermediate meeting continued over the course of the week. During the first day in Vaals lectures on mechanical tests and fracture mechanics, small and wide angle x-ray techniques and on fatigue and lifetime prediction took place. The following lecturers were given.

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Costantino  
Creton  
ESPCI Paris

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Introduction to  
mechanical testing of  
soft solid polymers  
Large strain  
viscoelasticity in solids,  
fracture mechanics,  
elements of adhesion

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Julian Oberdisse  
Université de Montpellier

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Small angle scattering  
techniques (neutrons  
and X-rays), examples  
of structure  
modification upon  
deformation

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Luigi Balzano  
DSM Research

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Wide angle X-ray  
scattering upon  
deformation : what can  
we learn ?

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Tom Engels  
DSM Research

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Fatigue and lifetime  
prediction strategies  
for polymers

## 04.

### Project Meeting

All ESRs have started their project since a few months now. So for the following two days, ESRs presented the progress they made on their project and their plan for future work.

The first day started by an interesting lecture by Ralph Colby (Penn State University) on the flow induced crystallization of semi-crystalline polymers.

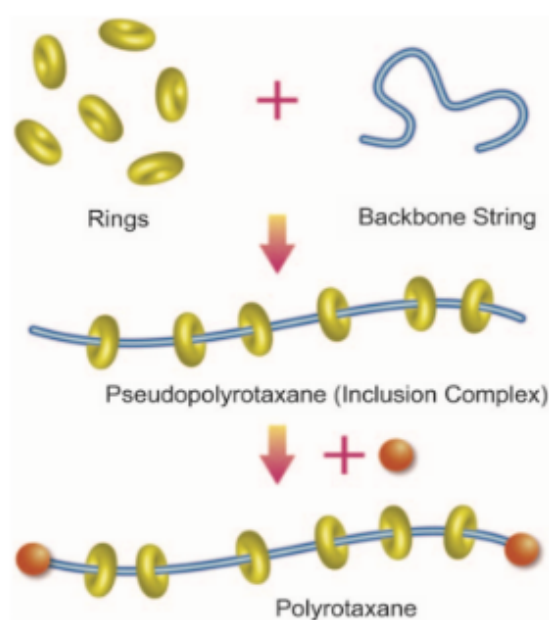
### ESR Presentations

ESRs showed quite impressive progress in their work.

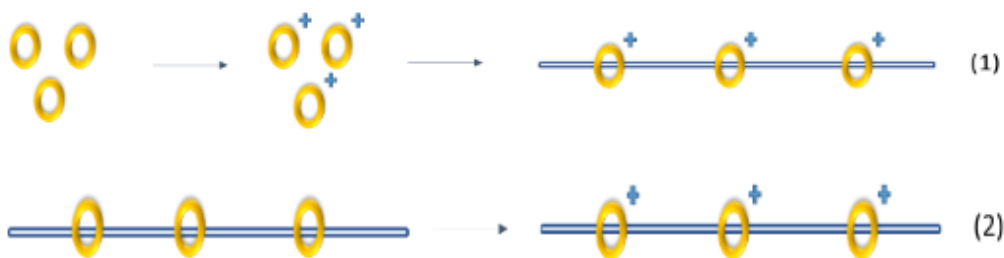
The presentations started with the ESRs in charge of the synthesis of DDNs towards the study of their properties and the modeling part.

Here we will present briefly the work of Rowanne, Larissa and Simone.

Rowanne Lyons, ESR 2 UCLouvain, has been working on the synthesis of double dynamics networks based on slide ring gels. Synthesis on the design of these new materials is a two-step synthesis by first adding the rings on backbone String and then add a stopper at the end-chain to keep the slide rings along the backbone.



The main target is to develop functionalized rings. For this objective, two strategies are studied: firstly with pre-functionalization rings (1) and secondly with post-functionalization rings (2).

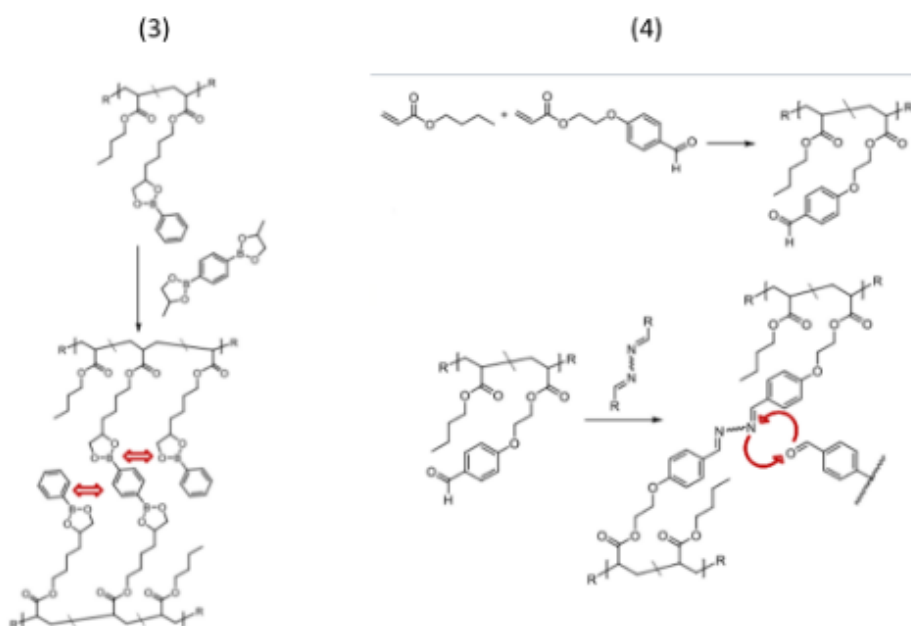


We can already see great improvement in the synthesis and we hope gels will be available soon.

### **Design and synthesis of double dynamics networks based on reversible covalent bonds**

Larissa, ESR 3, ESPCI has been working on the design and synthesis of double dynamics networks based on reversible covalent bonds.

Two systems are currently studied, one based on Boronic ester exchange (3) and the other one, on imine exchange (4).



So far, Larissa reported impressive results on the improvement of synthesis route to form the first network based on boronic ester exchange. The aim is to develop two interpenetrating networks structures using orthogonal cross-links.



06.

## Mechanical tests on soft thermoplastic elastomers

Simone Sbrescia, ESR9, presented the results he obtained in DSM from mechanical tests on soft thermoplastic elastomers developed by DSM itself. He demonstrated the influence that molecular weight and composition can have on the mechanical properties of these materials and how these properties change by increasing temperature. In particular, they show an unexpected embrittlement by increasing temperature, while standard semi-crystalline polymers show the opposite behavior (FIGURE A). Based on these results, to understand the failure mechanism of these materials, it was decided to run fracture tests on these materials to see what happens locally, where the failure starts.

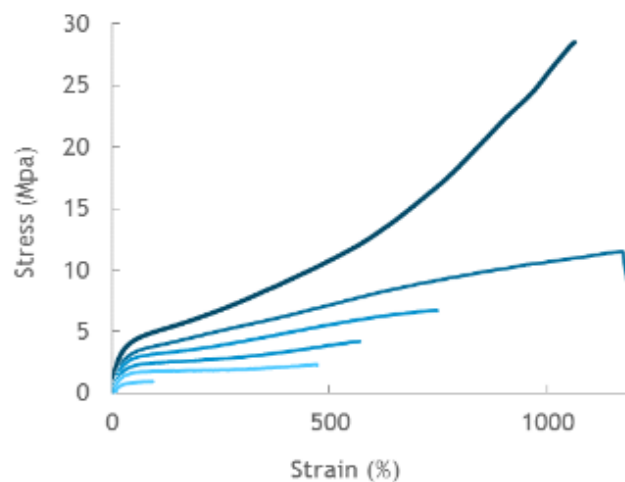


FIGURE A : Engineering stress-strain curves obtained for a soft thermoplastic elastomer at different temperatures. Temperature is increasing from dark to light

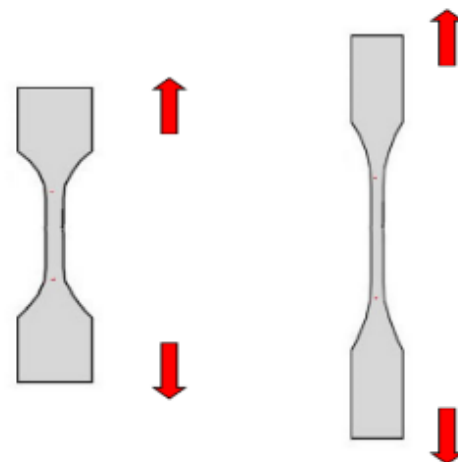


FIGURE B : Typical dog bone shaped specimen used for tensile testing. Displacement is applied along the direction pointed by the arrows. Force and displacement between the two dots are collected leading to the graph of FIGURE A

## 07.



During the DSM meeting, exchanges between partners universities and industrial partners were fruitful.

For example, Consiglia Carillo, ESR 8 FORTH, is already doing Rheological studies on samples Clément, ESR 1 UCLouvain, provided. Others are working on star polymer and samples agreements have already been done. And of course, tesa, Allnex and DSM are supplying samples for rheological and mechanical studies helping ESRs build a process to further study Double Dynamics Networks.



*Our ESR Team at work with Michelle Seitz, DSM*





## Next Meeting DTU May 2019

The next meeting will be organized by DTU in Denmark from 6th to the 9th of May 2019.

We will have our first Mid-Term Check with our traditional Project Meeting. Followed by Advanced Modules II for our students.

We are happy to have Zuowei Wang, University of Reading, UK as invited speaker !

*See you then!*

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# DODYNET

## Summer School on transient and complex polymer networks

22 – 27 July 2019, Capri, Italy



### Organisers

The summer school is organized by Prof. Giovanni Ianniruberto, (Dipartimento di Ingegneria chimica, dei Materiali e della Produzione industriale, Università Degli Studi di Napoli Federico II) and Prof. Evelyne van Ruymbeke (Bio- and Soft-Matter, Université catholique de Louvain). This project has received funding from the European Union as an Innovative Training Networks under the H2020 Marie Curie Actions programme.

### Confirmed Invited Speakers

- Ralph Colby (Penn State University, USA)
- Salvatore Coppola (Versalis, Italy)
- Emanuela Del Gado (Georgetown University, USA)
- Emmanouela Filippidi (University of California, USA)
- Jian Ping Gong (Hokkaido University, Japan)
- Giuseppe Marrucci (Naples University, Italy)
- Yuichi Masubuchi (Nagoya University, Japan)
- Bradley Olsen (MIT, USA)
- Daniel Read (University of Leeds, United Kingdom)
- Michael Rubinstein (Duke University, USA)
- Ilja Voets (Eindhoven University of Technology, The Netherlands)
- Zuowei Wang (University of Reading, United Kingdom)
- Hiroshi Watanabe (Kyoto University, Japan)

### Registration fee

- 300€ this includes all course materials, coffee breaks and lunches, as well as a social dinner
- Note that places are limited to 70 participants, please register early
- Registration at <https://www.dodynet.eu/capri-summer-school-july-2019/registration/>
- Deadline for registration: 29 April 2019
- Deadline for poster submission: 14 June 2019
- Please book your accommodation as soon as possible – July is peak tourist season on the island
- Contact: [iannirub@unina.it](mailto:iannirub@unina.it) or [dodynet-manager@uclouvain.be](mailto:dodynet-manager@uclouvain.be)

The DoDyNet Summer School will be held from the 22<sup>nd</sup> to the 27<sup>th</sup> of July 2019, on the beautiful island of Capri.

The school aims to explore all aspects of polymer networks containing supramolecular junctions or several dynamics of association.

The school is addressed to students and researchers both from industry and academic institutions, and is open to all with an interest in this field.

Participants will also have an opportunity to present their own work during poster sessions.